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...linking the science and practice of Environmental Health

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linking the science and practice of environmental health

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Call for Papers

The Journal is seeking papers for publication.

Environmental Health is a quarterly, international, peer-reviewed journal designed to publish articles on a range of issues influencing environmental health. The Journal aims to provide a link between the science and practice of environmental health, with a particular emphasis on Australia and the Asia-Pacific Region.

The Journal publishes articles on research and theory, policy reports and analyses, case studies of professional practice initiatives, changes in legislation and regulations and their implications, global influences in environmental health, and book reviews. Special Issues of Conference Proceedings or on themes of particular interest, and review articles will also be published.

The Journal recognises the diversity of issues addressed in the environmental health field, and seeks to provide a forum for scientists and practitioners from a range of disciplines. Environmental Health covers the interaction between the natural, built and social environment and human health, including ecosystem health and sustainable development, the identification, assessment and control of occupational hazards, communicable disease control and prevention, and the general risk assessment and management of environmental health hazards.

Aims

- To provide a link between the science and practice of environmental health, with a particular emphasis on Australia and the Asia-Pacific Region
- To promote the standing and visibility of environmental health
- To provide a forum for discussion and information exchange
- To support and inform critical discussion on environmental health in relation to Australia's diverse society
- To support and inform critical discussion on environmental health in relation to Australia's Aboriginal and Torres Strait Islander communities
- To promote quality improvement and best practice in all areas of environmental health
- To facilitate the continuing professional development of environmental health practitioners
- To encourage contributions from students

Papers can be published under any of the following content areas:

Guest Editorials

Guest Editorials address topics of current interest. These may include Reports on current research, policy or practice issues, or on Symposia or Conferences. Editorials should be approximately 700 words in length.

Research and Theory

Articles under Research and Theory should be 3000-5000 words in length and can include either quantitative or qualitative research and theoretical articles. Up to six key words should be included. Name/s and affiliation/s of author/s to be included at start of paper and contact details including email address at the end.

Practice, Policy and Law

Articles and reports should be approximately 3000 words in length and can include articles and reports on successful practice interventions, discussion of practice initiatives and applications, and case studies; changes in policy, analyses, and implications; changes in laws and regulations and their implications, and global influences in environmental health. Up to six key words should be included. Name/s and affiliation/s of author/s should be included at start of paper and contact details including email address at the end.

Reports and Reviews

Short reports of topical interest should be approximately 1500 words. Book reviews should be approximately 700 words and Review Articles should not exceed 3000 words in length.

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Middle Yarra Tributary

John Jenkins

Its thin blue line snakes between a web of roller-coaster
contours, probes a brief and legendary trance of life.
Dew climbs ladders as it hits the spider silk
and pasture weave. Tributary 12,023 pours, downhill
all the way, out of the unfolding map of light.
Watch it from my window, through the winter
rain, silt weeping yellow under water sheets.

Gully-fed, a drainage line, not even creek, with just
one permanent, year-round pool, it scarcely runs for weeks,
even in wet years, after spring downpours turn
the hills to sponge-cake, and you can pull
the cape weed effortlessly, like candles from green icing.

Ink-edged reflections are inverted into liquid silver,
stars shatter when green bulls make their dates
out on the hop. Ewing's tree-frog is small but loud.
Poised on the brink of summer, he stakes his band-width
in a nightly pitch for mates - another jumped-up tenor in the
aleatory chorus for ratchet, click-toy and pobblebonk.

Dead white bones of trunks stick out from
broken circles, each water-widening base. Little cormorants
dive, blue cranes wade and dip. No one knows who
introduced the roach, an English sporting 'coarse' stock:
a larder for the wading birds - no lazy stirrer like carp
or goldfish. A fringe of ragged sleeves and hollow arms
poke through, leaves shift random sun-bursts over water.
Here, bats compete for living space with bees and parrots,
owls with sugar gliders in a brilliant 'stag'.

Old sun-bleached arms multiply in water. Annual
insiders have first choice. Swallows skim and lift
for dragonflies, wrens seek sanctuary in the rushes.
On its day, and in its own sweet way, the watercourse
flows through here. Trees stagger onwards, down
the valley sides to an unseen river where cockatoos,
those volatile alarmists, screech and weave, just
missing trees. Or, wham! You pull your head in suddenly
as ducks whoosh past your ears. As they buzz you,
you duck low. Twenty pairs of feet thrust forward,
skid water, ski to a stop. The ripples widen, like the
day does, and everything suddenly shivers and then clears.
Distantly, a concrete mixer chugs on the new estate.

You could hear it then, at times, calm summer nights -
the river is almost two kilometres from here; from our
semi-detached little pool of it. The horses, when they stretch
and drink, barely crease the surface of the dam, hardly
ruffle water with their breath. Tenemented birds and nesting
ducks ignore them. Worlds blink below. Dew drops fall
from lolling tongues, breaking the meniscus of taut light.

A planes slides over Middle Yarra valleys, its shadow
leaps the track a Kato leaves, crawling on tank treads
to the new estate. A spare bucket lined with teeth
swings from a chain. A spike for splitting mudstone
gives point to its mantis reach. Neighbours have installed
'the new pool' upstream, on their side of the wire.
I'm downstream of their dream, which now includes
a fantasy of mock Spanish opulence, plus two blunt pipes,
black cylinders, the filter unit. A motor hums at night.

The gully still looks healthy on their side. I'm amazed,
and wonder why. They may be simply ignorant of how
to empty it. I imagine council rules, guidelines from the EPA
remain unread. It's just water. No big deal. Recently,
I crept across and fished two plastic tubs out of the
ooze: chlorine and fungicide, for "healthy swimming pools".
They won't speak to us since we complained about their 'pets'.
Five chained and half-wild dogs, barking stupid at the sky.

Tick them off. I've piled logs across my side - Fortress
Wildlife - to help check the rush. There's no chlorine scald on
turf below their pool - not yet - but raw roads
and excavations on the new estate have increased flow
this year to a rapid, turbid yellow. Since we put the cattle
off, there's been 're-gen.' on our side... That's one big plus -
swamp gum and blue box toddlers now lean on gully sides.
Tucked up in plastic guards and weed mats from recycled
pizza trays, an infant army guards the ephemeral lifeline
I've planted - lots of sedge, poa, spiky mat rush; really
tough and daggy stuff, stuck firmly in the mud; thickening
clumps to sieve, return lost oxygen, divide run-off
into micro-flows, to slow things down to last year's calm.

It's said some native plants can break down poisons,
lap up truly noxious stuff - like formaldehyde - if it doesn't
kill them first. In summer, they'll stand dry and thirsty,
making 12,023 good habitat - flattened mats of native grass
for roos, until the rain revives the silver blur of seed,
green and yellow whorls, the microscopic wonder.

Recently, we sent out invitations, had an annual
picnic here. Locals say it's more like a soak
than ordinary dam. Stays full all year, has always been
refreshed with groundwater from deep beneath
the Yarra's legend, the bones of these enduring hills.

Middle Yarra Tributary, by John Jenkins, was originally published in Dark River, Five Islands Press, Australia, 2003. It is reproduced here by permission of the author.

GUEST EDITORIAL

Australia Adopts a National Environmental Health Strategy

Owen Ashby

Australian Institute of Environmental Health

The Australian Government in conjunction with its six states and two territories has adopted a National Environmental Health Strategy[1]. In announcing the Strategy on 7 October 1999 the then Federal Minister for Health, Dr Michael Wooldridge, stated "The movement [i.e. the sanitation movement] has ensured that communities had access to clean water, waste removal and sewerage, services which are now often taken for granted. It is clear from these advances in health that environmental health is indeed a cornerstone of public health, providing the foundations on which modern society is built". The Strategy was developed in close consultation with the Australian Institute of Environmental Health, and the Institute would be heavily involved in implementing the Strategy.

Until a few years ago, Environmental Health in Australia was mainly the sphere of local government and was centred on Environmental Health Officers. The Strategy widens this scope to cover all environmental health and it involves all three levels of government, national, state and territory, and local governments.

The National Strategy states:

> *Environmental health is highly intersectoral, embracing a broad range of subject areas and involving a wide variety of stakeholders. The purpose of the National Environmental Health Strategy is to enhance environmental health management nationally by providing a framework to bring these stakeholders together across the range of issues, which encompasses environment health.*

The Australian Charter of Environmental Health

The key components of the National Environmental Health Strategy include the Australian Charter of Environmental Health. The Charter sets out the basic entitlements and responsibilities for individuals and communities, business and industry to live in safe and healthy environments. It emphasises the particular responsibilities of governments at all levels to deliver services and provide leadership and direction. By having both entitlements and responsibilities, the Charter encourages people to become involved in the promotion and protection of their own health.

It proposed the establishment of a National Environmental Health Council, the enHealth Council, addressing environmental health issues such as:

- Environmental Health Justice, including an Indigenous Australian Environmental Health workforce.
- Improving Environmental Health Practice, including Risk Assessment and management in Australia and Health Impact Assessment.
- The Human-Environment Interface, including drinking water quality.

The National Environmental Health Strategy was approved by the Australian Health Ministers Conference in August 1999 and was launched by the Federal Health and Aged Care Minister, Dr Michael Wooldridge, on 7 October1999.

The enHealth Council

This peak environmental health advisory group for Australia provides national leadership and a focus for cooperation on all environmental health issues. Improving environmental health in Australia requires a well planned and sustained team effort from all partners. The Council provides the leadership necessary to achieve this and actively pursues strategic partnerships across the wide range of stakeholders.

enHealth Council membership includes the Directors of Environmental Health for the States and Territories of Australia, the Australian Institute of Environmental Health, the Australian Local Government Association, Environment Australia and representatives from the Indigenous community, academia, and groups representing consumers and communities. The enHealth Council is a sub-committee of the National Public Health Partnership (See Appendix A enHealth Council Membership and Meetings).

Review Background

The Commonwealth, on behalf of enHealth, is conducting the Review of the National Environmental Health Strategy. The Statement of Requirement for the Request for Tender (SRFT) was endorsed by the National Public Health Partnership (NPHP) and enHealth Council in January 2003. An open tender process was undertaken. Initially, a select tender process was preferred although it then became apparent that open tender would produce a wider field. The SRFT was advertised in the *Australian* and in the *New Zealand Herald* on 25 January 2003. Four tenders were received. The successful tenderer was MooreConnections Pty Ltd and Quality & Quantitative Social Research (QQSR). A preliminary report has been prepared and is being reviewed by a reference group.

Summary of issues for discussion

The National Public Health Partnership (NPHP) considered the Review of the National Environmental Heath Strategy at a teleconference held on 6 March 2003. NPHP decided that a Steering Group be established to steer the Review. It will consist of representatives from:

- NPHP (Chair)
- Food and Environmental Health Branch, Commonwealth Department of Health and Ageing (DoHA)
- EnHealth Council

The Assistant Secretary, Food and Environmental Health Branch will represent DoHA. A Reference Group will also be established to provide advice on the progress and outcomes of the Review and to be involved during the consultation phase of the Review. The Reference Group will comprise representatives from:

- NPHP
- Food and Environmental Health Branch, DoHA
- enHealth Council
- Australian Local Government Association
- National Indigenous Environmental Health Forum
- Australian Institute of Environmental Health
- Office for Aboriginal and Torres Strait Islander Health, DoHA
- Aboriginal and Torres Strait Islander Commission
- Public Health Association
- National Health and Medical Research Council
- Environment Australia

Draft Business Plan 2003 - 2005

Overview

Aim:

To improve the management of environmental health in Australia.

Objectives:

- improved co-operation and co-ordination of government and key organisations;
- to ensure an increased ability to predict and reduce environmental threats to health;
- and to achieve better health outcomes as a result of co-ordinated assessment, correction, control and prevention of environmental factors that can adversely affect health and enhancement of those aspects of the environment that can improve human health.

Statement of Purpose:

The enHealth Council Chair is appointed by the National Public Health Partnership (NPHP). The enHealth Council is a sub-committee of NPHP and reports to Health Ministers, through the NPHP, collectively or individually. The enHealth Council has representation from a range of sectors including government, the environmental health profession, environment and public health sectors, the community and the Indigenous community.

Terms of Reference:

The enHealth Council Terms of Reference were established by the National Environmental Health Strategy (Chapter 3, Note 3.1), amended in November 2002,and are as follows:

1. Provide national leadership on environmental health issues by:
   - coordinating and facilitating environmental health policies and programs
   - establishing strategic partnerships between environmental health stakeholders
   - setting priorities for national environmental health policies and programs
   - providing an open consultative system for policy development
   - facilitating cost effective use of environmental health resources
2. Drive the implementation of National Environmental Health Strategy
   - provide guidance on national environmental health issues to Commonwealth, States and Territories, local government and other stakeholders
   - undertake the development of environmental health action plans at the national level and facilitate their development at a local and state level
   - promote and develop model environmental health legislation, standards, codes of practice, guidelines and publications
   - strengthen the national capacity to meet current and emerging environmental health challenges
   - provide a pivotal link between international and environmental health stakeholders in Australia and strengthening Australia's collaboration with countries in the Asia-Pacific region

Modus Operandi:

Given the multisectoral nature of environmental health, enHealth Council depends on the co-operation of a number of agencies. The enHealth Council has a memorandum of understanding and meets regularly with particular agencies with cross-cutting interests such as the National Environmental Protection Council (NEPC) and the National Health and Medical Research Council (NHMRC).

Council recognises the imperatives for both broad and specific consultation in implementing and addressing the goals and activities of the National Environmental Health Strategy. As part of consultation processes, consultation plans and communication strategies are produced for individual activities.

The Council form provides States, Territory and Commonwealth Governments an opportunity to address emerging environmental health issues and to implement actions to reduce environmental threats to health. The development of environmental health indicators will further enable Council to predict and monitor trends and health outcomes in this area.

Achievements:

1. *Health Impact Assessment Guidelines* (second stage)

By producing and promoting the uptake of these national guidelines, the enHealth Council aims to enhance the incorporation of Health Impact Assessment (HIA) into environmental and planning impact assessment generally, thereby improving the consideration of health issues. In particular, the guidelines seek to provide those involved in impact assessment across all levels of government and developers, along with their advisers, with an introduction to HIA and general guidance on the key steps involved. The Guidelines were released in September 2001 and enHealth is currently monitoring their use by the State and Territory jurisdictions.

2. Environmental Health Risk Assessment

Completed in June 2002, the *Environmental Health Risk Assessment* document provides a national approach to environmental health risk assessment. The document presents a general environmental health risk assessment methodology applicable to the range of environmental health hazards. The core methodology is intended to be able to accommodate specialised "modules" that will deal with issues such as physical and microbiological hazards and mixtures as they become available.

3. National Indigenous Environmental Health Map of Agencies Roles and Responsibilities

This report, released in June 2002, titled *Accountability in Indigenous Environmental Health Services: Australia 2002*, offers a snapshot of the agencies and organisations, and their roles and responsibilities, in managing or funding Indigenous environmental health. It is complementary to the report on public health legislation in Indigenous communities completed by NPHP.

4. National Review of Indigenous Environmental Health Workforce

The National Environmental Health Strategy identified support for Indigenous environmental health as a priority issue. It recognises that Indigenous Environmental Health Workers (IEHWs) are key personnel in obtaining improvements in the provision of environmental health services to communities.

The enHealth Council, in its Implementation Plan, highlighted the need for a consensus on national standards for education and training of IEHWs in Indigenous communities to enhance their effectiveness and career opportunities. The enHealth Council has undertaken a Review of the Indigenous Environmental Health Workforce. The Review commenced in July 2001 and was completed in November 2003.

5. Rural & Remote Potable Water Project
The enHealth Council recognises the imperative of completing this data audit and risk assessment on potable water supplies in current rural and remote communities. The purpose of this audit is to develop an evidence-based risk assessment framework for identifying priorities to improve potable water supplies in non-urban communities. A final progress report on the audit stage has been received. A preliminary report on the subsequent risk assessment stage has also been received and is being finalised. Recommendations from these reports, on the use, quality and availability of water and possible health implications were considered by NPHP in 2003.

6. Economic Evaluation
The method of economic evaluation is quite general and has many public policy applications. The *Guidelines for Economic Evaluation of Environmental Health Planning and Assessment* describe the method of economic evaluation and its application to environmental health policy issues. While environmental health practice is concerned with all impacts of the environment on human health, economic evaluations draw on both environmental and health economics.

The *Guidelines for Economic Evaluation of Environmental Health* will inform environmental health practitioners of specific economic evaluation techniques that can be applied in certain circumstances for planning and assessment purposes and provides environmental health case studies as examples. A draft document was circulated for consultation in August 2002 and was revised according to comments received. The final report was completed in December 2003.

7. Health v Homes
"Healthy Homes: A guide to indoor air quality in the home for buyers, builders and renovators", is a consumer booklet produced by the enHealth Council and provides householders, home-buyers and home renovators with balanced information and health advice about the air pollutants that may be found inside homes. It describes the actions that can be taken to improve indoor air quality, including advice that will allow more informed decision-making when discussing maintenance or renovation activities with architects, builders or suppliers of building materials. The publication, *Healthy Homes: A Guide to Indoor Air Quality in the Home for Buyers, Builders and Renovators*, was released in February 2003.

8. Noise
The Non-Auditory Health Effects of Noise report examines the range of noise sources that may affect communities and reviews the recent national and international literature on the non-auditory health effects of noise. It seeks to refine our understanding of sensitive groups of the Australian population that are at risk from excessive noise exposure. It also summarises a number of international policy frameworks that address noise and examines the feasibility of their application in Australia. In addition, some potential areas for further research are identified. The final report was published December 2003.

9. Asbestos
The enHealth council established an Asbestos Steering Group chaired by Michael Jackson, Department of Health Western Australia (DoH WA), to oversee the development of a set of guidelines for the management of asbestos in the non-occupational environment.

The document will provide practical guidance to environmental health professionals on:

- Methodologies used to identify, sample and estimate asbestos fibre levels in materials, air and soil risk assessment and risk characterisation;
- Acceptable levels of asbestos fibres in air and soils; and
- Strategies for managing asbestos in

various circumstances.

A draft report was released for public consultation in December 2003.

Environmental Health Indicators

To date the enHealth Council has been progressing the development of indicators specific to environmental health through an enHealth Council Information Working Group. The recommendation to develop environmental health indicators stems from the national Environmental Health Strategy and was recognised as a high priority action within the NEHS Implementation Plan.

An environmental health indicator provides information about a scientifically based linkage between the environment and health. An indicator, which purely described the state of the environment or a pure health status indicator with no obvious link to environmental causations cannot be considered an environmental health indicator. The enHealth Council agreed to a framework for development of environmental health indicators. A document on the development of these indicators was distributed for consultation between December 2002 and February 2003.

Other tasks completed by the Information Working Group include:

- a national directory of environmental and health data that is routinely collected (available and accessible on the Web); and

- a national director of published information, reports, documents on environmental health issues.

11. Health Impact Assessment of Intensive Animal Husbandry

An information booklet on health impacts associated with intensive animal husbandry is being developed as a resource to inform developers/planners of likely health impacts associated with industries such as poultry, piggeries, and cattle lots. This booklet aims to complement the enHealth Council Health Impact Assessment Guidelines that were produced last year. It is expected that the booklet will be completed by March 2004.

New Initiatives:

Areas identified for future consideration and action by enHealth Council includes:

- Role of enHealth Council in Chemical Incident and Emergency Management;

- Prioritising and actioning Indigenous Environmental health issues;

- An action plan to address Environmental Health Workforce issues;

- Provision of accurate and timely environmental health advice to NPHP and Australian Health Ministers Advisory Council on current and emerging issues;

- Provision and promotion of national environmental health guidelines on current and emerging issues; and

- Review of the National Environmental Health Strategy and Implementation Plan to provide a renewed platform for developing direction and initiatives in environmental health for 2004/2005.

Environmental Health Sector Performance Indicators:

i) Percentage of communities that incorporate and implement environmental health action plans.

ii) The number of jurisdictions that have Health Impact Assessment (HIA) requirements built into legislative framework.

iii) Percentage of communities with a reticulated water supply where a drinking water quality management plan (as per draft Australian Drinking Water Guidelines) is in place.

Draft Australian Exposure Assessment Handbook

The aim of the Draft Australian Exposure Assessment Handbook is to provide

- details on conducting appropriate exposure assessments;
- a range of exposure factor data relevant to Australia; and
- where appropriate, default point estimates or, in some cases, probability distributions of exposure data for use in exposure assessments.

Other Publications by enHealth Council:[2]

Foundation Documents

The National Environmental Health Strategy (1999)

The National Environmental Health Strategy Implementation Plan (2000)

Healthy Communities

Healthy Homes: *A Guide to Indoor Air Quality in the Home for Buyers, Builders and Renovators* (2003)

Human Environment Interface

Water Series

Guidance for the control of Legionella (1996)

Guidance on water quality for heated spas (1996)

Guidance on the use of rainwater tanks (1998)

Soil Series

Health-based soil investigation levels, 3rd edition (2001)

Exposure scenarios and exposure settings, 3rd edition (2001)

Composite sampling (1996)

Metal series

Aluminium, 2nd edition (1998)

Zinc (1997)

Copper (1997)

Air series

Ozone (1997)

Benzene (1997)

Nitrogen Dioxide (1997)

Sulphur dioxide (1999)

General series

Pesticide use in schools and school grounds (1997)

Paint film components (1998)

Guidelines for the control of public health pests - Lice, fleas, scabies, bird mites, bedbugs and ticks (1999)

Exposure series

Child activity patterns for environmental exposure assessment in the home (1999)

Counter Disaster Series

Floods: An environmental health practitioner's emergency management guide (1999)

Environmental Health Justice

Indigenous Environmental Health series

Indigenous Environmental Health No. 1 (1999)

Indigenous Environmental Health No. 2 (2000)

Indigenous Environmental Health No. 3 (2001)

Accountability in Indigenous Environmental Health Services - Australia (2002)

Environmental Health Systems

National standard for licensing pest management technicians (1999)

Environmental Health Risk Perception in Australia (2000)

Health Impact Assessment Guidelines (2001)

Environmental Health Risk Assessment - *Guidelines for Assessing Human Health Risks from Environmental Hazards* (2002)

Developing National Environmental Health Indicators - *Discussion Paper* (2002)

Endnote:

1. Copies of the publications are available by visiting the enHealth Council website: <http://enhealth.nphp.gov.au/council/pubs/ecpub.htm http://enhealth.nphp.gov.au or http://www.health.gov.au/pubhlth/publicat/environ.htm>
2. NB Any monographs published before 1999 were produced by the National Environmental Health Forum, which the enHealth Council has replaced.

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Appendix A: enHealth Council Membership and Meetings

The current membership of the enHealth Council

Mr Michael Jackson - Chair
Mr Owen Ashby, Australian Institute of Environmental Health
Ms Jan Bowman, Department of Human Services, Victoria
Dr Kevin Buckett, Department of Human Services, South Australia
Dr Helen Cameron, Commonwealth Department of Health and Ageing
Mr Peter Burnett, Environment Australia
Dr Vicki Sheppeard, NSW Health Department
Mr Brian Devine, Department of Health Western Australia
Ms Sophie Dwyer, Queensland Health
Professor Ian Lowe, Australian Consumers' Association
Mr John Woollard, Department of Health and Community Care, ACT
Dr Anne Neller, Public Health Association of Australia
Ms Merle O'Donnell, National Indigenous Environmental Health Forum
Ms Linda Parmenter, Aboriginal and Torres Strait Islander Commission
Mr Paul Prendergast, Ministry of Health, New Zealand
Mr Chris Russell, Australian Local Government Association
Dr Roscoe Taylor, Department of Health and Human Services, Tasmania
Mr Xavier Schobben, NT Department Health and Community Services
Dr Cathy Mead, National Public Health Partnership
Mr Shane Nicholls, Standing Committee on Aboriginal and Torres Strait Islander Health (SCATSIH)
Ms Karen Roger, National Public Health Partnership

Other participants, Secretariat:

Ms Shannon Clarkson, Executive Officer
Ms Nicole Parkes, Senior Policy Officer
Ms Krista Williams, Senior Policy Officer NIEH Forum

Meetings conducted to date:

Thirteen meetings have been conducted at the following locations:

1. 14-15 December 1999, Julianna House, Woden ACT
2. 7 February 2000, Griffin Business Centre, Kingston ACT
3. 6-7 April 2000 , Woden ACT
4. 25-26 July 2000, Carlton Crest Hotel, Darwin, NT
5. 12-13 October 2000, Hotel Sofitel, Cairns, QLD
6. 21-22 March 2001, Canberra, ACT.
7. 28-29 June 2001, Yamba Club, Canberra, ACT
8. 17-18 October 2001, Burswood Resort, Perth WA
9. 13 February 2002, Albermarle Building, Canberra, ACT
10. 11 June 2002, Botany Room, Stamford Hotel, Sydney, NSW
11. 5 November 2002, Dept Human Services Adelaide, SA
12. 8 May 2003, Cambridge Park Inn, Sydney, NSW
13. 14 October 2003, Hadleys Hotel, Hobart, Tasmania

There have been a number of teleconferences prior to face to face meetings.

Community Process and the Recovery Environment Following Emergency

Rob Gordon

Victorian State Emergency Recovery Unit, Department of Human Services

On the basis of 20 years experience with emergency recovery, a model of community process inaugurated by emergencies and disasters is described, based on the role of social communication in creating social bonds. Disaster impact causes a sudden, dramatic alteration in social structure with victims tending to "debond" from the social structure of their community under the threat. This is followed by a community-wide process of "fusion" bringing about a social system adapted to immediate needs but not to long-term recovery. With time, tensions develop leading to the appearance of "cleavage planes" between conflicting groups. An alternative form of constructive social differentiation follows with coordinated recovery interventions. Each stage of this process is analysed in terms of the alteration in social communication. Strategies are described to mitigate each aspect of this process using interventions in social communication.

Key words: *Disasters; Emergency Recovery; Victims; Community Processes; Social Communication*

Emergency Recovery and Environmental Health

Surviving emergencies is not just a matter of what happens at the impact, but also of how the environment supports the complex and protracted processes of recovery. The social environment of the aftermath is crucial in determining how well people adapt to stress, change and emergencies (Coman 2003; Gist & Lubin 1999). Traumatic events shatter essential assumptions for psychological health, which are formed in the context of community life (Janoff-Bulman 1992; Kauffmann 2002). Recovery from disaster and trauma involves not only personal psychological work, but also support for the reconstruction of these assumptions as part of the social system in which they live. It is a protracted environmental health problem and environmental factors that may compromise it are often consequences of social processes within which individuals' personal and family experiences are situated. People with access to a supportive community (even if its services and resources are impaired) have for a long time been shown to recover better than those who leave (Haas et al. 1975; Milne 1977).

To provide the healthiest environment possible for recovery requires recognition of the social environment as a whole (Ursino et al. 1994). Social phenomena and the dynamics of affected communities provide the context for psychological recovery. This paper outlines a model that has been developed from first hand observations of Victorian and other Australian emergencies over the last two decades. It has been taught in the Australian Emergency Management Institute recovery courses for the last decade, where participants have found it an important framework for recovery management and validated its descriptive value in a variety of emergencies, ranging from the Port Arthur shooting to the Victorian drought of 2002-2003.

Phases of Emergency Recovery

Early research in emergencies consistently identified distinct community phenomena (Drabek 1986), usually described as an initial state of disorganisation or shock on impact, followed by a rebound or "heroic" phase in which the community demonstrates altruism and cooperation to organise itself for search and rescue tasks. Then follows a period of high morale, common action and organisation for recovery, often referred to as the "high" or "honeymoon". This does not last, the unity is broken, and a period of conflict and discord between affected groups, government and recovery providers ensues. Morale falls, people become prey to depression, despondency and emotional exhaustion, leading to misunderstanding and alienation throughout the social fabric. Often those who develop psychological problems after emergencies are found to be casualties of the isolation common in this phase (Kaniasty & Norris 1999; McFarlane & Girolamo 1996). Eventually this period subsides as reconstruction proceeds and leads to a return to effective functioning.

The extent and duration of these phases vary, but their consistency suggests a community process initiated by the disaster. If this process can be understood, it may be predicted and better managed to mitigate the consequent psychosocial health hazards.

The social context of impacts on individuals

The incidence of psychiatric disorders caused by emergencies is usually similar to that expected in non-emergency circumstances, between 10-20% (Smith & North 1993), although terrorist bombings may cause elevated incidence (up to 45%) of posttraumatic stress disorder, depression, anxiety and substance abuse (North et al. 1999). However, there is widespread degradation of the quality of life and erosion of the fabric of relationships (Gist & Lubin 1999). While such problems are not easily identified as psychiatric illnesses (American Psychiatric Association 1994), they have lasting effects, meaning that people are unhappy, go through the motions of life without enthusiasm, lose the heart of relationships and neglect goals that motivated them. Recent research has identified social embeddedness as a crucial characteristic related to impact; greater embeddedness associated with reduced psychosocial impacts (van den Eynde & Veno 1999). Such effects are part of the social environment formed by the emergency. People with identifiable psychological disorders can be referred to services, but degraded quality of life needs to be addressed by environmental social health interventions based on an understanding of the community processes within which they unfold. Social phenomena are more than the summation of individual problems; they are social dynamics. The community must be understood as a whole, composed of individuals and groups, bound together to respond collectively.

The community as a social system

Although the idea of community is often criticised (Dyke & Dyke 2002), it is a necessary dimension of human existence (Miami Theory Collective 1991). Community is not a static entity, but a combination of open ended groupings defined by organising cultural beliefs and practices, constantly open to change (Masolo 2002). Members of communities are united by what they have in common as part of their identity and sense of self, in spite of their differences (Wiggins & Schwartz 2002). Loss of community threatens identity, and is distinct from the loss of primary relationships (Harré 1993). "Communal bonds" linking people to communities are dependent on communication and provide the interactional matrix for meeting the needs of daily life (Crittenden 1992). Dramatic change in community and living arrangements itself constitutes stress (Farley & Werkman 1990; Kaminoff & Proshansky 1982).

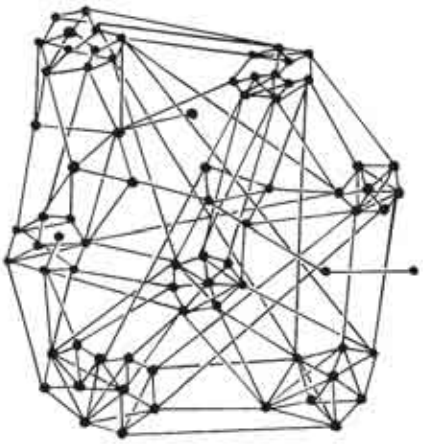
People speak about the groups and communities they belong to as entities (Sandelands & St Clair 1993) and media commentators often refer to the "common mind", "the community", or "rate-payers", as though they are a collective entity. The present purpose of developing a model to predict and explain collective dynamics in post-emergency communities is served by the tradition of considering communities as communicational systems (Luhmann 1995).

In this view, a community is a large, relatively stable collection of groups and individuals, organised with coherent relationships on multiple dimensions (represented in the members' minds with surprising consistency (Woelfel & Fink 1980).

A community occupies a common locality with a relatively stable social structure of authority, power and prestige and with a common culture (Alperson 2002). Its members are interdependent, with networks enabling them to meet each other's needs and provide security. Threats to survival are delegated to subsystems such as police, fire, medical and other agencies. Although all these characteristics can be debated, they form the basis of a model that can be adapted to the features of actual communities. In this model, a community can be likened to a crystalline structure with social units and subsystems bonded to each other in patterns of varying strength and distance as shown in Figure 1.

The complexity of social systems includes not only multiple dimensions of formal systems, but other dimensions of informal systems such as friendship, acquaintanceship and family networks. Social elements close to each other on one dimension may be distant on another. Neighbours may have occupations remote from each other in terms of their social relatedness; colleagues in the same workplace may have religious, cultural or political affiliations that distance them from each other. Yet as a whole, the structure provides a complex texture of affiliations where close and distant social bonds

Figure 1: The community as a structure of social units bonded to each other with differing closeness on a variety of dimensions



complement each other on different social dimensions, ensuring each individual has a niche conferring a unique identity, and members divided on one dimension have bonds of mutual interest on others. Conflict is also an inherent part of social life and structure, and can be considered as a different form of bond to cooperation. The fact that communities meet the needs of their members and enable them to lead their lives indicates that close bonds on one dimension compensate for weak, distant or conflictual ones on another so that it does not break up when tensions or conflicts occur.

Social bonds as communication

Since the community is the environment for personal and family life, it is necessary to define the bonds that provide its texture. A central concept which forms the basis for interventions in community processes is that communication is the material expression of social contact and social bonds are expressed as communicational relationships (Harré 1993; Luhmann 1995; Sigman 1987). Social structure is reflected in the structure of communicational relationships; communication between social units creates a relationship between them regardless of its

content, which affects the nature and quality of the bond rather than its existence. A functioning community has social bonds reflected by the full range of modes of communication from personal verbal and non-verbal, to proximity, movement and mass media, among others, each modality making its own contribution to the social fabric. There is a direct connection between the bonds that hold communities together and members in the structure and their communicational relationships. Social interventions that work with communicational opportunities have direct consequences on the social fabric of those brought together by the communication.

Social processes as the environment of personal health

Social relationships provide more than emotional support and comfort to individuals. People only function effectively when part of a functional social system. Emotion, cognition, attitudes, identity and other essential aspects of personal functioning are inherently social (Harré 1993). The integrity, organisation and processes of the social environment comprise the greatest resource for personal recovery, mediate the impact of stress and trauma and determine the effects on health and wellbeing following disaster (Freedy et al. 1992). The informal social system is most important in this process, but is often overwhelmed and people have to draw on their neighbourhood and the formal social systems of their community, often for the first time. It is crucial to their recovery that the social system is adapted to these needs, which means specific communicational relationships and opportunities. To provide these, the social process needs to be understood and managed.

The Impact of the Emergency

Debonding

At impact, danger makes people highly aroused and they respond to the specific demands of the situation. Panic, in the sense of the breakdown of social ties and self-preservation without regard for others is almost non-existent (Cornwell et al. 2001; Johnson et al. 1994; Mileti 1999). The normal social system is set aside because the immediate threat requires they act as individuals or with those who happen to be near, regardless of previous relationships. Roles are discarded in favour of improvised responses to the immediate threat. Individuals or small groups act alone and feel isolated. Emotional responses are usually suppressed in favour of highly aroused, rational action, which may or may not be appropriate given the knowledge, experience and understanding of the situation, but it is not panic. Only where the entire physical and social environment is destroyed (e.g. Hiroshima) are people shocked, dazed, wandering aimlessly and become dependent on outsiders (Mileti 1999).

While survival is uncertain, victims focus on themselves and are out of communication with others in their networks. The priorities of usual social life recede in favour of survival tasks. Because of its importance, this situation means the purpose of social life fails, which for this model can be characterised as to remove threats to survival, and the community is temporarily irrelevant. The accompanying separation or loss of communication means those involved fall out of the complex, multidimensional social system. They become "debonded" from each other and from the social system, since communicational relationships are the expression of social bonds, and are plunged into the uniqueness of their own individual lives.

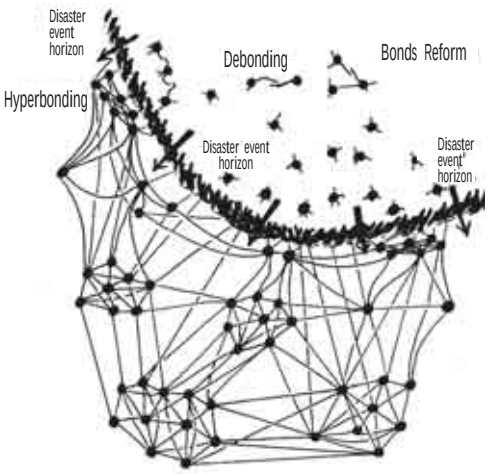
Debonding may be partial or pervasive, depending on the severity of the threat. It may be (i) predominantly psychological as when a person expects to die and readies her or himself by detaching from loved ones and their own future, (ii) predominantly interpersonal as when a person is changed by

their experience so that the assumptions on which their relationships have been based no longer seem important, (iii) predominantly social as when isolation or lack of knowledge means other people or the community is not available or cannot be relied on, or (iv) some combination of all three.

Wherever communication is disrupted there exists an "event horizon" marking the impact zone separating victims from the rest of the community. Event horizon is a term borrowed from black holes in space where the gravitational field is so strong as to prevent the escape of any light or other radiation so nothing can be known about them. At a critical distance from the star, the gravitational field is weak enough for light to escape and events can be detected; this line is called the event horizon. In disasters, the event horizon is where communication between victims and the rest of the social system is disrupted, such as behind the fire front, within the flooded area, inside the siege building, or in the area cordoned off by police where a gunman is active. For a period, those in the intact social system do not know what is happening or the fate of those inside, nor do the latter know what those outside know or whether they will arrive in time.

Debonding is disconnection from the social system. However, at the time, it is often submerged for the victims in the priority of survival, which makes their immediate environment the focus of their attention. Its consequences are felt later, when they become aware of how difficult it is for those outside the disaster to appreciate their experience. At the time, the focus on survival makes available the totality of their resources in dealing with the crisis and debonding is adaptive. When debonding occurs to the members of a group or a locality, the social system described in Figure 1 undergoes a loss of structure. Instead of a multidimensional crystalline structure of interlinked social elements bonded together by communication, there are two zones of change. The first immediately precedes impact, where warning produces a tightening and multiplication of communicational bonds as people attempt to come to terms with the threat and decide what to do; this can be considered as "hyperbonding". The second zone is behind the event horizon where the threat leads to debonding as those affected battle the crisis, out of contact with each other and the larger social system. This situation is portrayed in Figure 2 below.

Figure 2: Disaster Impact: The disaster event moves across the community



There is increased communication in the warning process producing hyperbonding; then communicational bonds are severed at impact as people confront the survival threat individually, creating a communicational event horizon beyond which members are debonded.

Debonding is evident within organisations as authority and normal communication lines are suspended and responses improvised unless there has been previous planning and training. Consultation is reduced, autonomy increased and decisions are made at lower levels. People alone in a disaster are likely to be more severely affected, while those in small groups have enhanced functioning; group factors such as a sense of interpersonal attachment to present or absent loved ones, modelling appropriate behaviour for each other, and

maintaining hope for others improve survival (Drabek 1986).

Debonding initiates the social process that occurs during the recovery period. It represents a drastic alteration in the social environment and in its capacity to support its members (Gordon & Wraith 1993). But isolation and disconnection from others, if too pronounced or lasting, seriously undermine a person's wellbeing (Kaniasty & Norris 1999). Early intervention in the form of social contact and support as components of "psychological first aid" is crucial to their recovery (Gordon 1997). Debonding initiates a compensatory search for connectedness as soon as the threat is removed, and this leads to the next process to be described.

The Immediate Aftermath

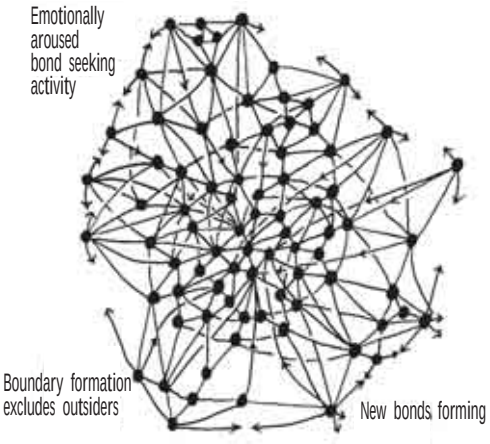
Fusion

As soon as the threat has passed, the state of high arousal and debonding motivates intense social connectedness as people reestablish communication, bursting into action, setting about search, rescue and stabilisation. They are usually controlled and rational, providing or seeking help with skill, competence and effectiveness (Mileti 1999). There is much to do and a lack of organisation. High levels of commitment to the common good, altruism and self-sacrifice are common in most disasters. Up to 75% of healthy survivors engage in rescue activities without waiting for official guidance, making their own way to medical or other resources, using their initiative and local knowledge (Drabek 1986). Large numbers of people gather in the affected area and milling by those not directly affected is common. Pre-existing and emergent social networks are strengthened with common values of sacrifice and altruism, and barriers between them tend to disappear (Leiversley 1977).

Fusion as compensation for debonding

Much behaviour in the immediate aftermath is communicational, information seeking and contacting loved ones or community members. However, available information may be incorrect or inconsistent. Contact with those they seek often fails, sustaining isolation and uncertainty, prolonging debonding. But those affected respond actively to these problems, improvising a new social system as soon as possible, which is energised by survival excitement and designed for immediate tasks. The new system has multiple communication channels, little hierarchy and involves everyone in a common process. It serves personal support functions as well as the practical tasks. It is a social system defined by the survival task, but lacks the differentiation of the crystalline structure in Figure 1 because it dispenses with the formality and functions of pre-emergency social life. It can be likened to a state of "fusion" where bonds reform out of the communication required

Figure 3: The Fused Community: Following impact, debonded community members join in intense indiscriminate social bonds based on the common experience of the disaster and the tasks required



and constitute a relatively homogeneous network illustrated in Figure 3.

Bonds formed under the pressure of these circumstances are present oriented, task-focussed, uni-dimensional around the disaster experience, hyper-aroused because of the danger and unusual situation, indiscriminate as people attach to whomever is available, stereotypic around the common experience, and differences are viewed as irrelevant. The social system rapidly becomes overloaded in that everyone needs more than is available and it is unstable because of the rapidly changing emotional state.

Fusion as mobilisation of recovery resources

Affected people are sensitive to others who do not share the experience, and tend to form a boundary around the affected community for protection and to facilitate their own organisation. This excludes or treats outsiders with suspicion, even when they have legitimate roles and contributions to make. There is a centripetal orientation to the fused community around their common problem, and the intensity of their relationships risks them debonding from the larger society on which recovery depends. Recovery agencies and service providers present in the community as it fuses are welded into the system and become part of it. However, if they are delayed, tension may develop as they endeavour to insert themselves into the fusion and restructure the system to serve recovery needs. Community cohesion in the fusion is favoured by external threat, high consensus about priorities, urgent common problems, focussing attention onto the present, levelling social differences and strengthened community identification (Drabek 1986).

As community resources reorient towards recovery, some functions are reduced, such as not enforcing regulations and laws irrelevant to the situation, while there is likely to be reduced crime (Siegel et al. 1999). Formal channels of social participation are replaced by informal mutual support functions. Disaster-specific norms and principles organise activity. While there is continuity of social resources and culture, there is discontinuity of functions not suited to the emergency situation as new groups, organisations and leaders emerge (Drabek 1986). Emergent roles are filled because of people's experience, skills or other relevant qualities rather than their formal position.

There is heightened community solidarity, intolerance of outsiders and temporary reduction of social distance, especially across class boundaries. Inter-group differences are lessened, cooperation is increased and conflict reduced. Unification of the community compensates for reduced organisation. Social inhibitions and formalities subside and people are bound by a common bond of intimacy called the "altruistic community," "therapeutic community", or "democracy of common disaster." However, only a proportion of members may sustain this structure while the remainder continue with their own lives. Temporary suspension of pre-emergency social regulations may encourage some disadvantaged people to exploit the situation to improve their position by seeking more assistance than they are entitled to or otherwise taking advantage of the relative availability of resources not previously accessible (Drabek 1986).

The presence of others sharing the same fate helps individuals evaluate the impact and validates their judgements, but it also encourages them to make light of their own problems in comparison with those of others. Mobilisation of community support and sharing the experience allow assumptions that may have been shattered by the event to be reestablished by the collective experience. Where affected people are dispersed from the scene, the formation of a sense of community may be prevented. However, if all members are affected, support providers may be unable to meet the needs owing to their own condition (Kaniasty & Norris 1999).

Fusion as a threat to community integrity

The fusion breaks the continuity of normal community structures in a highly energised reorganisation of the communicational system. It is a secondary source of disruption after debonding and is a threat to the pre-emergency structure that provides for long term needs. The quality of communication between the victims and helpers meets people's needs and provides comfort from contact. The intensified involvement often results in loss of privacy and erosion of normal roles and boundaries between individuals, families and groups. Provision of short-term emergency needs may be at the expense of long-term recovery and return to pre-emergency modes of function. Tension develops between these trends, which reverse the fusion state, often within a month (Sweet 1998). Established social tensions associated with ethnic or group solidarity in disaffected groups cause conflict between groups rather than encourage solidarity with the community; this is particularly observed in technological disasters (Mileti 1999). The fusion state is unsustainable and relatively brief, leading to the next process.

Breakdown of Fusion

Differentiation

As the emergency and its consequences subside and other demands of life accumulate, the unity of the fusion breaks down. The fusion's temporary arrangements must give way to the reemergence of the multidimensional crystalline structure of Figure 1. Compared to the homogeneity of the fusion this involves a process of "social differentiation" as social units and subsystems previously unified around the common values and priorities of the emergency, reorganise themselves around differences of role and relationships into a complex system. Ideally, this is a planned transition from the highly energised, improvised collective state to the preestablished community. However, lack of planning, inexperience, conflicting agendas and social inequality make it likely to produce tensions and conflict. While the differentiation process itself is necessary and inevitable, how it proceeds differs according to the emergency and community. Two pathways can be described: (i) uncoordinated resurgence of differences causing differentiation through conflict, and (ii) coordinated development of social complexity integrating emerging needs into the existing system.

Uncoordinated differentiation through negative emotion: Cleavage planes

Pre-existing divisions and conflicts that are overridden by the initial high solidarity, common emotions and altruistic cooperation begin to reappear. Social fault lines of political, ethnic, cultural and economic differences reassert themselves. This often occurs at a precise turning point, marking the beginning of a conflict phase, which is most likely to occur when effects of various forms of deprivation begin to be felt. Experiences and emotions are communicated in the close interdependence of the fusion, where social interaction and emotional contagion exacerbate stress and increase the sense of aloneness rather than alleviating it. Observations of numerous emergencies and extensive reports in the literature (Drabek 1986) indicate that in these circumstances, rumours thrive, amplifying conflicts and inequalities. Personal relationships reflect these qualities as couples find their partner is unable to be supportive and listen to problems because of their own stress (Drabek 1986; Kaniasty & Norris 1999).

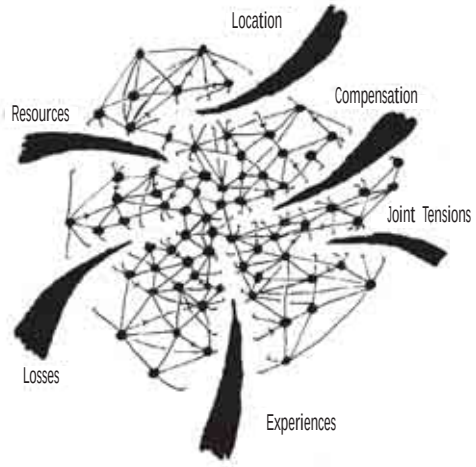
The emergence of differences in the unified experience of the emergency comes into conflict with stereotypic assumptions engendered by the focus on external circumstances of the emergency. Preexisting differences and those deriving from the complex impacts of the emergency, with

their many and varied effects are set aside by the fusion. But they become important with time. The emotionally charged communication of the fusion promotes rumours about the actions or responsibilities of community groups. Tensions are amplified since fused social structures have inadequate systems to evaluate information or manage emotions and they develop into conflict and rivalry. They are expressed personally, but represent different effects of the disaster on various groups. Emotion and hostility are evoked at the boundaries between these groups as their representatives meet in public forums (Drabek 1986).

In a flood or bushfire, the groups may comprise those who lost houses versus those who lost other possessions, those who are insured versus those who are not, those eligible for assistance versus those who are not, those who remained during the emergency versus those who did not, those who intend to rebuild versus those who do not. The boundaries between these groups generate animosity, competition and conflicts. A public meeting, in which a politician announces aid measures, splits those who are advantaged from those who are not. This can be likened to "cleavage planes" in a crystal that represent structural weaknesses in a unified structure and enable it to split. The apparently unified social system of the fused community has multiple differences embedded in it, and when they are brought into salience by recovery processes, it splits into bitterly competing groups. Differences cut across existing bonds and sever their connections as they battle with intense emotions. The fusion breaks up as shown in Figure 4.

Cleavages are defined by emergency and recovery circumstances including how arrangements unify or differentiate community members. They are circumstantial and inconsistent with preemergency attachments or structures and destructive to personal support networks. Families may be close friends and provide

Figure 4: Cleavage Planes develop in the fused community on the basis of divisions between groups affected differently by the disaster or recovery factors



support to each other, but if one is insured and the other not, it is likely to interfere with their ability to assist each other. Cleavage planes disrupt the fusion's tendency to unify people, diminish their group or personal resources and assert what they share with subgroups or their uniqueness. They fracture support structures and may be independent of pre-disaster social structures. They tend to remodel the community system so that it incorporates the disaster effects into its structure. New identities, systems of communication, common values and boundaries, are formed and maintained at the expense of earlier systems. Bonds are not broken and reformed by social affiliation itself, but out of the sufferings brought on by recovery.

Signs of this loss of solidarity include: disorientation about the recovery situation; leaders' and organisations' failure to respond to needs effectively; agencies clinging to pre-disaster modes of functioning; reduction in social controls; weakening of the system of rights and obligations defining members' community roles; disruption or breaking down of traditional groupings or social forms that provide the framework for interpersonal loyalties; practical or

emotional inability to plan for the future; and reduced openness to innovations (Klinterberg 1979). Conflict is amplified by politicising recovery, bringing political allegiances into salience, by ideological values (e.g., equal opportunity or anti-discrimination) that do not reflect loss patterns, or by vested interests being inconsistent with emergent community needs (Drabek 1986).

However, cleavage planes are not just a function of differences in recovery; they also dismantle the fusion and allow community members and groups to reestablish their identity. The same principle is evident in individual or family development where relationships that do not allow enough independence lead to conflict as a means of creating the required separation. Cleavage planes have an adaptive function in the absence of more constructive processes of differentiation and separation. They are not just a function of real differences, but also of how they are perceived. Observations of disasters indicate their potency can be reduced if an active program to support early differentiation of community groups begins before the fusion breaks down. Coordinated differentiation beginning as soon as possible is the basis for an alternative process to the destructive dynamics of cleavage planes.

Coordinated differentiation through planned recovery

Plans to manage recovery using adaptations of pre-emergency community systems can be activated, and by incorporating emerging groups into a broad system of communication, the existing community processes and structures can reorganise themselves to adapt to recovery needs. As long as the complexity of subgroup and individual differences is acknowledged and equitable relief measures backed by appropriate support provided, the need for cleavage planes as social organisers is diminished. But rigid reassertion of pre-emergency relations of power and control will not recognise emergency needs and will motivate cleavages. Coordination depends on adequate information about all parts of the community and differentiating groups around their legitimate needs and differences. This can be seen as a complex communication task ensuring that interest groups are validated and integrated into a larger coordinating group.

The ideas that the community is a system of communication and social bonds are products of communicational relationships provide a technique to transform the fusion into a new crystalline structure. New bonds need to form to serve the changing affiliations of community members as issues and differences arise breaking up the fusion. New communication channels facilitate opportunities for new bonds, which lead to new structures, and in turn establish new post-disaster identities. These structures will be recovery adapted if communication is focused around identifying and communicating needs and difficulties within the community. Each issue needs to be related to the whole so there is scope for a new sense of community that can integrate the disaster into its history and facilitate development of new support networks among those who have new disaster-related issues to bring them together.

The constructive differentiation process is illustrated in Figure 5, as an intermediate step towards the establishment of a new crystalline structure. A central coordinating group in the centre (usually with a combination of managers, service providers and community representatives) facilitates communication between the emerging groups so that as concerns become evident they are communicated throughout the system and acknowledged (even if not necessarily remedied). These ordered relationships promote a social environment in which individuals and groups can find new relationships around new needs; they also preserve pre-disaster support networks, by ensuring that rumours and myths are detected and corrected by effective communication, consultation and decision making.

Figure 5: Constructive differentiation through coordinated development of interest groups and building active communicational relationships between them and the coordinating body, leading to the establishment of new social bonds

Research shows support networks and help patterns are extensions of pre-emergency personal relationship and community systems, indicating the therapeutic community is not purely emergent, but an enhancement of the pre-disaster community. Those with trust in the community and its structures are more likely to provide help to others. Cohesion and mutual support protect against longer-term deleterious effects. However, in large scale or highly traumatic disasters, emerging needs often outstrip resources leading to disappointment and disillusionment. Support mobilised is often insufficient to compensate for the gradual deterioration in personal and community relationships as social networks and relationships become fractured and overloaded (Drabek 1986; Kaniasty & Norris 1999).

New organisations create new links and associations with each other and established services forming a "synthetic community" (Thompson & Hawkes 1962). The community is restructured with a modified network of organisational relationships that may involve new and more extensive agencies. As stability is attained and normal relationships are restored, the synthetic community gradually loses its function with the return to more complex, pluralistic decision making and allocation of resources.

Strategies for Managing Post-disaster Community Process

A number of strategies mitigate the social process of debonding, fusion, cleavage planes and differentiation. It is tempting to see them as discrete phases, but the complexity of emergencies and their impact on social systems suggests that this is simplistic. It is more accurate to consider them as interlinked processes initiated when an emergency threatens a social system that is unable to respond. It is a matter of assessing when and how much debonding has occurred and to whom; how much fusion occurs in consequence and how the fusion responds to the need for differentiation as opposed to forming cleavages. Using the principle that social bonds are constituted by communication relationships, strategies can be developed to mitigate each of these processes.

Prevent debonding

Anything that prevents or reduces the phenomenon of debonding will intercept the process at its start. The following are some strategies to assist with this:

- plan and prepare to ensure survival actions are well rehearsed and do not require suspension of community systems;
- provide roles and tasks related to the emergency to preserve social organisation;
- preserve pre-disaster organisation by adapting it to the emergency;
- preserve continuity of social systems, community norms and availability of personal support;

- curtail the event horizon by establishing communicational continuity with victims as soon as possible;

- preserve communication links to affected people; and

- provide relevant, accurate information about all aspects of the emergency to the community as a means of promoting common understanding and collective identity.

Reduce fusion

Anything that can be done to reduce the intensity and disruptiveness of the fusion and begin differentiation at the earliest opportunity by reasserting normal roles and processes will reduce its disruption of the normal crystalline community structure. Strategies to promote this include:

- preserve or reestablish pre-disaster roles and communication systems;

- integrate new disaster-related tasks and roles into existing systems by extending and adapting them to emerging needs;

- provide information about all aspects of the situation to combat naive ideas, myths and rumours;

- encourage checking and validation to discourage emotional contagion;

- provide opportunities or media for structured communication to activate community processes;

- promote emergent groups and coordinate formal and informal networks;

- encourage community advocacy and self-efficacy; and

- assist in defining the membership of interest groups and work with inclusive identities.

Anticipate and intercept cleavage planes

Since cleavage planes come into operation because of perceptions of difference as much as the differences themselves, there is scope to reduce their effect by engaging with the issues that form their basis:

- constitute a community "sense organ" by convening groups to identify differences as they emerge before they become cleavages;

- support this with outreach programs to affected people to consolidate information and encourage representation of all interests in the coordinating system;

- view all anecdotes of tension and conflict as potentially inter-group events and identify whether the problems would be present for other members of groups involved;

- map pre-disaster cleavages and differences and anticipate the effect of the disaster on them;

- identify information lacks and inequalities; and

- take the initiative with community consultation and representation.

Mitigate cleavage planes

Since the destructive consequence of cleavages is to sever bonds, information about what people have in common, in spite of their differences can "suture" the split by providing a new basis for communication. Strategies to bridge cleavages include:

- provide facts to actively manage rumours and myths;

- repeat important information as people vary when they are able to absorb it and when it is relevant to them;

- provide overview information about events and actions so the context is evident, especially for decisions and policies;

- provide media to encourage inter-group communication and exchange, provide anecdotes that disrupt simplistic assumptions about effects;

- provide or facilitate symbols and rituals of an embracing community identity;

- contrast backward and forward looking issues and place these all in the context of recovery;

- promote a concept of a new inclusive future for the community; and

- meet practical needs and provide care as the medium for communicating inclusion and respect.

Promote constructive differentiation

Recovery from disaster means the formation of a new community social system that preserves continuity with the past, but recognises it will never be the same for those who were affected. A new community fabric needs to be developed with a new communicational infrastructure to promote new patterns of social bonds. A principle to promote this is that circulation of information promotes communication, communication promotes the formation of social bonds, social bonds promote the formation of groups and support structures, groups promote common action and common action creates constructive differentiation. Some strategies to assist this are:

- facilitate new, self-determined community structure and advocacy groups;

- work through community structures where possible, including forming community reference and advisory groups in conjunction with recovery managers;

- encourage self-management with advice and resource support to enable people to make their own decisions;

- assist community communication in all its forms as the precondition to coordination;

- establish disaster-specific communication media to complement existing channels; and

- establish integrated social systems around the developing tasks of recovery.

Conclusion

Community life is usually taken for granted not only as the context of social life, but also as providing the conditions for maintaining many aspects of personal and interpersonal functioning. In disasters and emergencies, the integrity of community life is affected leading to a sequence of processes initiated by the usually sudden and extensive changes in the integrity of community members' bonds to each other at impact. This "debonding" leads to a compensatory "fusion" state, which is effective for initial recovery, but is unsustainable in the long term. The intensity of the psychosocial forces aroused by high threat mean that reconstruction of the social environment must be actively facilitated or the high-energy state begins to form "cleavage planes"

and splits. This destructive recovery environment can produce lasting social and psychological problems.

These dynamics and the role of communicational processes in mitigating and managing them provides a theory to intervene in the psychosocial environment which is as important as environmental interventions to maintain physical health. This theory has been found helpful in managing many events in Victoria over the last decade where the phenomena and strategies described here have been observed. Two recent examples involving consultations by the author illustrate its use. In Canberra following the bushfires in January 2003, the establishment of a consultative committee with representation by residents and active promotion of community process strategies has been successful in managing complex potential cleavages. Recent consultations in the Goulburn Valley in Victoria to communities recovering from the 2002-2003 droughts illustrate that in this type of event without a discrete start point, the same phenomena occur, but are concurrent. After a presentation of this model to a community group, a dairy farmer who had at first appeared highly sceptical remarked at the end: "What you have presented here exactly describes all of what is happening in our community". Once affected community members and service providers have a common understanding of the process and a set of general strategies, their local knowledge and creative capacities are harnessed for recovery, since they know their community best and will live with the results. Recognising general social processes helps to depersonalise as typical post-emergency phenomena what otherwise would be painful uncertainties and disappointments, reduces personal hurt, and provides a common framework for cooperative reconstruction of the community.

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The Effect of Season on House Dust Mite Allergen (Der P 1) Concentrations in Reservoir and Aeroallergen Samples in Australia

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Background: House dust mite (HDM) allergen levels in homes with very low or very high levels may be influenced differently by season.

Objective: To compare the effect of season on HDM allergen concentrations in the dust samples in homes with very low and very high HDM allergen levels and to examine the correlation between reservoir and aeroallergen HDM allergen concentrations.

Methods: Baseline bedding HDM allergen concentrations were measured in the bedding of 126 homes in Sydney, Australia. Fifteen homes with the highest and 15 with the lowest HDM allergen levels were then selected for repeat HDM allergen measurements.

Results: Reservoir and aeroallergen HDM allergen concentrations were generally higher in autumn and winter compared to spring and summer. In the high HDM group, bedding HDM allergen concentrations were higher than floor concentrations and there were weak to moderate correlations between reservoir and aeroallergen concentrations.

Conclusion: The group of homes with high Der p 1 concentrations at baseline continued to have significantly higher levels than the group of homes with low Der p 1 concentrations at baseline. Der p 1 concentrations were generally higher in autumn and lower in spring. There were no consistent correlations in HDM allergen concentrations. It may not be possible to substitute aeroallergens samples for reservoir samples or to substitute bedroom floor samples for bedding samples.

Key words: *House Dust Mite; Allergen; Seasonal Variation; Reservoir; Aeroallergen*

Allergy to house dust mite allergens is an important risk factor for asthma in children (Peat et al. 1996; van der Heide et al. 1994). Although the causal mechanisms are likely to be complex and involve a range of environmental, genetic and lifestyle factors, epidemiological studies have demonstrated a strong association between the prevalence of such allergy and the concentration of mite allergen in the child's bed dust (Platts-Mills & de Wit 1989). Interventions aimed at reducing asthma incidence are therefore directed at methods to reduce exposure to dust mite allergens (Htut et al. 2001; Mihrshahi et al. 2003).

Physical, climatic and microclimatic factors in homes can enhance or reduce house dust mite (HDM) numbers and thereby production of HDM allergen (Arlian, Bernstein, & Gallagher 1982). These factors may contribute to the wide variation of HDM allergen levels observed both within and between homes (Marks et al. 1995), by providing HDMs with either a source of nutrients, adequate indoor relative humidity for proliferation, or a reservoir for allergen. Season is also a contributing factor to the variations in HDM allergen levels (Arlian et al. 2001; Arlian et al. 1982; Miyazawa et al. 1996; Platts-Mills et al.1987; van der Heide et al. 1994).

These studies, however, did not examine the effect of season on HDM allergen levels in reservoir and aeroallergen samples in homes with either very low or very high HDM allergen levels. The importance of examining the influence of season on allergen levels in these two groups of homes is two fold; firstly, it is important to know the extent to which the season of sampling influences the allergen levels, and whether the two groups of homes show similar seasonal trends. It may be that the factors controlling allergen levels in these homes, which are at the extreme ends of the allergen spectrum, are not influenced by seasonal climatic changes. If seasonal patterns exist, it may reveal the timing of peak allergen levels and the season-dependent ranges of allergen levels within homes. Secondly, if there is a correlation between reservoir and aeroallergen levels, then aeroallergen sampling, which is less resource intensive, can replace reservoir dust sampling.

Reservoir HDM allergen concentrations in dust are probably a poor proxy of actual inhaled allergen exposure and aeroallergen measurements may provide a better measure of exposure as they reflect what an individual inhales and is related to sensitisation (Price et al. 1990). A number of factors can affect aeroallergen concentration, for example allergen concentration in the dust, the actual quantity of that dust in reservoirs, proximity of the person to the source, the different sites within the room contributing exposure, the degree of dust disturbance and factors such as the level of indoor ventilation that would remove aeroallergen from an enclosed space. Thus, like reservoir HDM allergen concentration, HDM aeroallergen concentrations may also vary with season and as HDM aeroallergen is thought to be a more relevant exposure proxy, it is also important to know how and why aeroallergen concentration varies over time.

Therefore, the aims of the study were, first, to examine and compare the effect of season on Der p 1 levels in the dust samples in homes with very low and very high HDM allergen levels; and second, to examine the seasonal correlation between reservoir and aeroallergen Der p 1 concentrations in these two groups of homes.

Material and Methods

Selection of homes

The 30 houses selected for inclusion in this study were the homes of children who participated in a panel study of air pollution and lung function in Sydney, Australia (Jalaludin et al. 2000). Baseline dust samples for Der p 1 measurements were collected in March/April 1994 (Autumn months) from the bedding and lounge room floor of all the 126 children enrolled in the panel study. From the baseline bedding Der p 1 measurements, 15 with the highest (high HDM group) and 15 with the lowest (low HDM group) Der p 1 concentrations were selected for repeat measurements over a further nine month period in 1994 [June/July (Winter 1), August (Winter 2), October (Spring), and December (Summer)]. For the repeat measurements, dust samples collected included: reservoir dust samples from the bedding, bedroom floor and lounge room floor; and aeroallergen samples from the bedroom and lounge room. Participating households were

aware of the nature of this study and were given results of the dust sampling if requested. Ethics approval was obtained from all relevant institutional ethics committees prior to the commencement of the study.

House dust collection and Der p 1 measurement

Reservoir house dust samples

Reservoir dust samples were collected using a portable vacuum cleaner (Makita, Model 4071D), modified to collect fine dust in a 25µm pore size nylon bag. Three separate samples of fine dust were collected by vacuuming a $1m^2$ area of the bed, bedroom floor and lounge room floor for one minute.

Aeroallergen collection

Plastic petri dishes and their lids were coated with a 2% fish gelatine/0)5% azide solution for 10 minutes, after which excess gelatine was rinsed off with distilled water and the plates left to dry. (Mahmic et al.1998). Both the dishes and lids were then left open for 10 to 14 days to collect settling aeroallergens. The dishes and lids were placed in an undisturbed area in the lounge room and the bedroom approximately three feet above the floor, to approximate the height of the breathing zone. The settled dust was then eluted from both the lid and dish with 1 mL of 0.2% BSA/PBS/0.05%Tween/0.05% sodium azide. The extracts were stored at 4°C until analysed for Der p 1.

Mite allergen measurement

Both the reservoir and aeroallergen dust samples were prepared, stored and analysed for Der p 1 as described by Mahmic et al. (1998). Reservoir house dust mite concentrations are reported as µg of Der p 1/g of fine dust. Aeroallergen Der p 1 concentration are expressed as ng Der p 1/m2/day and was calculated by dividing the mass of Der p 1 collected per day by the area of the dishes (including the lid).

Statistical analysis

Correlations coefficients were obtained using Spearman's test. Paired and independent samples non-parametric tests (Wilcoxon's Signed Ranks test and Mann-Whitney U test respectively) were performed to compare Der p 1 concentrations. A p-value less than .05 was considered statistically significant.

Results

High HDM group versus low HDM group

Der p 1 concentrations in the high HDM group for all sites, in both reservoir and aeroallergen samples, were significantly higher than the low HDM group, except for the lounge room reservoir sample in spring (p=0.06) (Tables 1, 2).

For reservoir samples in the high HDM group, bedding Der p 1 concentrations (128.2 µg/g fine dust, 98.5 µg/g fine dust, 115.8 µg/g fine dust, 83.2 µg/g fine dust and 34.7 µg/g fine dust for autumn, winter 1, winter 2, spring and summer respectively) were significantly higher than both the bedroom floor (35.9 µg/g fine dust, 46.4 µg/g fine dust, 29.5 µg/g fine dust and 36.3 µg/g fine dust for winter 1, winter 2, spring and summer respectively) and lounge room floor (70.0 µg/g fine dust, 31. µg/g fine dust, 24.3 µg/g fine dust, 12.5 µg/g fine dust and 27.7 µg/g fine dust for autumn, winter 1, winter 2, spring and summer respectively) in all seasons except summer, where bedding was significantly higher than the lounge room floor only (Tables 1, 3). Der p 1 concentrations for the bedroom floor were higher than lounge room floor for each season, but these differences were not statistically significant. In the low HDM group, except for autumn where lounge room Der p 1 concentrations (17.4 µg/g fine dust) were significantly higher than the bedding concentrations (4.8 µg/g fine dust),

Table 1: Der p 1 concentrations (g/gram fine dust) in reservoir samples by site, season and HDM group

Season	N	High HDM group			Low HDM group			p-value
		Bedding Median (Range)	Bedroom floor Median (Range)	Lounge room floor Median (Range)	Bedding Median (Range)	Bedroom floor Median (Range)	Lounge room floor Median (Range)	
Autumn	15	128.2 (88.6-652.7)	-	70.0 (0.01-316.9)	4.8 (2.9-13.0)	-	17.4 (2.2-108.3)	<0.0001[b] 0.012[d]
Winter 1	15[a]	98.5 (41.2-293.3)	35.9 (6.9-100.1)	31.9 (1.6-93.2)	9.6 (1.6-81.6)	17.3 (1.8-60.8)	10.1 (1.8-68.5)	<0.0001[b] 0.005[c] 0.04[d]
Winter 2	15	115.8 (15.6-288.0)	46.4 (4.2-77.4)	24.3 (1.9-111.8)	9.6 (3.6-79.7)	12.3 (2.4-35.7)	9.3 (0.7-66.3)	<0.0001[b] <0.0001[c] 0.01[d]
Spring	15	83.2 (19.9-153.9)	29.5 (2.3-63.0)	12.5 (4.4-74.8)	9.9 (1.5-51.1)	7.0 (1.0-36.0)	6.3 (1.4-38.7)	<0.0001[b] 0.002[c] 0.059[d]
Summer	15	34.7 (10.7-160.1)	36.3 (1.5-232.8)	27.7 (0.8-64.4)	7.2 (0.7-40.4)	6.8 (0.5-25.2)	4.2 (0.7-56.9)	<0.0001[b] <0.0001[c] 0.01[d]

[a] *n=13 for the bedding and bedroom floor samples, and n=12 for the lounge room floor samples, in the low HDM group*
[b] *p-values for comparison of bedding concentrations between high and low HDM groups (Mann-Whitney U test)*
[c] *p-values for comparison of bedroom room floor concentrations between high and low HDM groups (Mann-Whitney U test)*
[d] *p-values for comparison of lounge room floor concentrations between high and low HDM groups (Mann-Whitney U test)*

Der p 1 concentrations were similar across the sampling sites (Tables 1, 3).

For aeroallergen samples, although the median Der p 1 concentrations for the bedroom were higher than lounge room across the seasons (except in winter 1 and spring in the high HDM group), these differences were not statistically significant (Tables 2, 3).

Seasonal variation in Der p 1 concentration

Reservoir samples

High HDM group

Bedding Der p 1 concentration in autumn was significantly higher than all other seasons (Table 1), and the winter concentrations significantly higher than in

Table 2: Der p 1 concentrations (ng/m²/day) in aeroallergen samples by site, season and HDM group

Season	N	High HDM group		Low HDM group		p-value
		Bedroom floor Median (Range)	Lounge room floor Median (Range)	Bedroom floor Median (Range)	Lounge room floor Median (Range)	
Winter 1	15[a]	2.9 (1.0-12.2)	3.4 (0.8-15.4)	1.0 (0.3 - 6.6)	0.8 (0.1 - 5.1)	0.001[d] 0.005[e]
Winter 2	15	2.7 (0.7 - 6.8)	1.5 (0.6-14.7)	0.8 (0.1 - 6.0)	0.5 (0.1 - 2.8)	0.005[d] 0.002[e]
Spring	15[b]	1.6 (0.3 - 6.0	2.0 (0.3 - 6.6)	0.6 (0.2 - 4.4)	0.3 (0.1 - 3.8)	0.002[d] 0.002[e]
Summer	15[c]	2.4 (0.5 - 5.3)	2.1 (0.9 - 6.4)	0.6 (0.1 - 8.4)	0.5 (0.1 - 4.0)	0.014[d] 0.001[e]

[a] *n=13 in bedroom and lounge room samples in the low HDM group*
[b] *n=14 in bedroom sample in the high HDM group*
[c] *n=14 in bedroom and lounge room samples in the low HDM group*
[d] *p-value for comparison of mean bedroom concentrations between high and low HDM groups (Mann-Whitney U test)*
[e] *p-value for comparison of mean lounge room concentrations between high and low HDM groups (Mann-Whitney U test)*

Table 3: Comparisons of Der p 1 concentrations by type of sample, site, season and HDM group[a]

Season	Site	Reservoir Sample		Aeroallergen Sample	
		High HDM group p-value	Low HDM group p-value	High HDM group p-value	Low HDM group p-value
Autumn[b]	Bedding vs lounge room floor	0.004	0.003	-	-
Winter 1	Bedding vs bedroom floor	<0.0001	0.46	-	-
	Bedding vs lounge room floor	<0.0001	0.51	-	-
	Bedroom floor vs lounge room floor (reservoir samples)	0.31	0.70	-	-
	Bedroom vs lounge room (aeroallergen samples)	-	-	0.63	0.98
Winter 2	Bedding vs bedroom floor	0.007	0.66	-	-
	Bedding vs lounge room floor	0.003	0.49	-	-
	Bedroom floor vs Lounge room floor (reservoir samples)	0.31	0.63	-	-
	Bedroom vs lounge room (aeroallergen samples)	-	-	0.58	0.38
Spring	Bedding vs bedroom floor	0.005	0.31	-	-
	Bedding vs lounge room floor	<0.0001	0.21	-	-
	Bedroom floor vs Lounge room floor (reservoir samples)	0.054	0.79	-	-
	Bedroom vs lounge room (aeroallergen samples)	-	-	0.55	0.15
Summer	Bedding vs bedroom floor	0.55	0.85	-	-
	Bedding vs lounge room floor	0.01	0.63	-	-
	Bedroom floor vs Lounge room floor (reservoir samples)	0.11	0.66	-	-
	Bedroom vs lounge room (aeroallergen samples)	-	-	0.72	0.92

[a]*All comparisons conducted using Wilcoxon s Signed ranks test.*

[b]*Bedroom floor reservoir sample and aeroallergen samples for bedroom and lounge room were not collected in autumn.*

spring and summer. Bedroom floor mean Der p 1 levels were significantly higher in winter than in spring (winter 1: p=0.04, winter 2: p=0.01). Lounge room floor Der p 1 levels were significantly higher in autumn than other seasons and in winter compared to spring (winter 1: p=0.01, winter 2: p=0.006).

Low HDM group

Bedding Der p 1 winter concentrations were significantly higher compared to all other seasons except spring (4.8 µg/g fine dust, 9.6 µg/g fine dust, 9.6 µg/g fine dust, 9.9 µg/g fine dust and 7.2 6 µg/g fine dust for autumn, winter 1, winter 2, spring and summer respectively). Bedroom floor Der p 1 concentrations in winter (17.3 µg/g fine dust, 12.3 µg/g fine dust, 7.0 µg/g fine dust and 6.8 µg/g fine dust for winter 1, winter 2, spring and summer respectively) were significantly higher than both spring (winter 1: p=0.01, winter 2: p=0.01) and summer (winter 1: p=0.01). For lounge room floor samples, the only significant difference was between autumn and spring (17.4 µg/g fine dust and 6.3 µg/g fine dust for autumn and spring respectively; p=0.02).

Aeroallergen samples

High HDM group

The bedroom winter 1 Der p 1 concentration (2.9 ng/m^2/day) was significantly higher than both the spring (1.6 ng/m^2/day; p=0.02) and summer concentrations (2.4 ng/m^2/day, p=0.01) (Table 2). Winter 2 Der p 1 concentration (2.7 ng/m^2/day) was significantly higher than the spring concentration only (p=0.04). The lounge room winter Der p 1 concentration was significantly higher than in spring (p=0.01) and there was only a marginal difference between the spring and summer concentrations (p=0.047) (Table 2).

Table 4: Correlations between reservoir and aeroallergen Der p 1 concentrations by season

	HDM group	Winter 1	Winter 2	Spring	Summer
Reservoir bedroom floor vs aeroallergen bedroom	Low	-0.07	-0.09	0.37	0.36
	High	0.25	0.63*	0.01	0.72**
Reservoir lounge room floor vs aeroallergen lounge room	Low	0.04	0.20	-0.11	0.71**
	High	0.54*	0.09	0.44	0.60*

* $p < 0.05$ *level (2-tailed)*

** $p < 0.01$ *level (2-tailed)*

Low HDM group

Significant seasonal differences in Der p 1 concentrations were found only in the lounge room samples (winter 1 concentration (0.8 ng/m^2/day) significantly higher than winter 2 (0.5 ng/m^2/day) and spring (0.3 ng/m^2/day) concentration).

Correlation between reservoir and aeroallergen Der p 1 concentrations

In the high HDM group, significant moderate correlations were found between bedroom floor reservoir and bedroom aeroallergen Der p 1 concentrations in winter 2 (*rho*=0.63, *p*=0.013) and summer (*rho*=0.72, *p*=0.002), whereas for the lounge room floor and lounge room samples, a significant correlation was observed in winter 1 (*rho*=0.54, *p*=0.037) and summer (*rho*=0.60, *p*=0.018) (Table 4).

In the low HDM group, most of the correlation coefficients were weak to moderate except for the summer lounge room floor and lounge room samples (*rho*=0.71, *p*=0.004) (Table 4).

Correlation between Der p 1 concentrations in reservoir samples from different sites

In the high HDM group, there were weak to moderate correlations among the three sampling sites. The only marginally significant correlation was between the spring bedding and bedroom samples (*rho*=0.51, *p*=0.051). In the low HDM group, there were no significant correlations in Der p 1 concentrations among the three sampling sites and the correlations were in the weak to moderate range. There were no consistent patterns in either of the two groups.

Correlation between Der p 1 concentrations in aeroallergen samples from different sites

In both the high and low HDM groups, significant correlations were observed between bedroom and lounge room measurements in spring (High HDM group: *rho*=0.57, *p*=0.03; Low HDM group: *rho*=0.69, *p*=0.01) and summer (High HDM group: *rho*=0.63, *p*=0.01; Low HDM group: *rho*=0.64, *p*=0.01).

Discussion

As expected, in the high HDM group, both reservoir and aeroallergen Der p 1 concentrations were significantly higher than in the low HDM group (except for the spring lounge room floor concentration). In the high HDM group reservoir samples, bedding concentrations were higher than both floor concentrations, and the bedroom floor concentrations were higher than the lounge room floor concentrations. No such consistent patterns were observed for reservoir samples in the low HDM group and for aeroallergen samples for both HDM groups. Interestingly, for both reservoir and aeroallergen samples, the allergen levels at each site in the high HDM group remained high over time, and remained low in the low HDM group.

Bedding in the high HDM group exhibited significant seasonal variation in HDM allergen concentrations, with the highest levels in autumn, and the lowest in

summer, and showed a downward trend from autumn to summer. The other sampling sites did not exhibit any obvious trend in allergen levels, although levels were generally higher in autumn and winter compared to spring and summer. The greater variability in bedding Der p 1 concentrations in the high HDM group may indicate that the microclimate in bedding may be more sensitive to outdoor climatic changes, which are subsequently reflected in changes in indoor climate.

Whilst our finding of higher HDM allergen concentrations in autumn/winter is consistent with some studies that have demonstrated peak allergen level in autumn (Chew et al. 1999; Kalra et al. 1992; Meijer et al. 1996; Miyazawa et al. 1996; Platts-Mills et al. 1987), other studies have demonstrated higher allergen concentrations in summer (Arlian et al. 2001; Lintner, & Brame 1993). Varying ambient humidity levels with season in different locations is the most likely explanation for why some studies have demonstrated peaks in summer whilst others have demonstrated peaks in autumn. In countries with extreme climatic variations, HDM numbers and allergen levels fluctuate with the season, with HDM numbers reaching a peak in the summer months, and allergen levels peaking later in autumn (Arlian et al. 2001; Arlian et al. 1982; Miyazawa et al. 1996; Platts-Mills et al. 1987; van der Heide et al. 1994). In all of these studies, the seasonal fluctuation of HDM numbers and allergen levels paralleled seasonal changes in indoor relative humidity.

The lower Der p 1 concentrations in summer compared to autumn in this study is unusual as, in Australia, December is a summer month with higher ambient temperatures and relative humidity than other times of the year. The average daily temperature and relative humidity in December (a summer month) 1994 were 21.4°C and 68.8% respectively, whereas in August (a winter month) 1994, the mean daily temperature and humidity were 11.3°C and 63.3% respectively (data provided by New South Wales Environment Protection Authority, 1994). However, similar autumn peaks for Der p 1 concentration in Australia have been demonstrated in the past (Marks et al. 1995).

Even though the changes in median Der p 1 with season was small (2-4 fold), the median concentration in each season was five to 13 times that of the proposed threshold of 10 ug/g, and therefore, may be of clinical importance to individuals who are asthmatic and/or HDM sensitive. Meijer et al. (1996) have emphasized that mattresses are quantitatively the most important source for HDMs and demonstrated that seasonal differences in HDM allergen exposure in the mattress is an important factor in explaining seasonal differences in peak expiratory flow amplitudes. They further suggest that even small changes in HDM allergen exposure levels are of clinical importance for individual patients and reduction of HDM allergen levels in bedrooms of HDM allergic children is an essential aspect in the management of their asthma.

Our finding that HDM allergen concentrations were higher in bedding than floors (at least in the high HDM group) is not new and has been demonstrated by others (Marks et al. 1995; Platts-Mills et al. 1987; Tovey et al. 1981). Beds and floors differ as sites for habitation - beds are more consistent in their micro-climate whereas floors are more subject to more variability in their micro-climate. However, although floor concentrations were not statistically different from each other, bedroom floor Der p 1 concentrations were higher than lounge room floor concentrations in the high HDM group whereas they were more similar in the low HDM group. Interestingly, Thomas et al. (2001), in a study conducted in South Australia, demonstrated significantly higher Der p 1 concentrations in bedroom floor compared to lounge room floor. In floor samples, in both the high and low HDM

groups, our findings of higher levels in winter/autumn compared to spring/summer have also been reported by others (Garrett, Hooper & Hooper 1998; Marks et al. 1995; Wickens et al. 1997).

There were no differences in aeroallergen Der p 1 levels between the bedroom and lounge room in both HDM groups, and it would appear that sampling from either site would be representative of the home's aeroallergen concentration. However, in line with the reservoir concentrations, aeroallergen levels for both the bedroom and lounge room were highest in early winter and lowest in spring. The reason for higher winter levels may result from houses being more closed during winter leading to reduced ventilation and also to people spending more time indoors leading to increased dust disturbance.

Generally, there were mainly weak to moderate and mainly non-significant correlations in Der p 1 concentrations between sites and between reservoir and aeroallergen samples and these results are consistent with those previously published (Mahmic et al. 1998; Oliver et al. 1995; Paufler, Gebel, & Dunkelberg 2001). Significant correlations were found more often in the high HDM group. A recent review (Paufler, Gebel, & Dunkelberg 2001) suggests that the inability to demonstrate correlations may be due to difficulties in taking representative reservoir and air dust samples. The lack of consistent correlations across the HDM groups and seasons suggest that it may not be possible to substitute aeroallergens samples, which are less resource intensive to collect, for reservoir samples, and bedroom floor samples, which are easier to collect, for bedding samples.

Although this study has provided important information on the patterns of HDM allergen concentrations in two groups of homes, there are a number of weaknesses to this study. The small number of homes studied may have given rise to uncharacteristic results and the short time series may have either obscured or exaggerated any seasonal patterns. A longer time series would have ensured a more robust interpretation of any time series. It may also be that parents of the high HDM group may have changed their cleaning practices during the duration of the study. However this should not introduce any bias when examining seasonal trends within HDM groups, and, when comparisons are made between HDM groups, any bias will be towards the null. Further, in view of the numerous statistical comparisons conducted, some of the significant findings could have been fortuitous and therefore marginally significant results should be accepted with some caution. Further studies, with a large sample size, more frequent measurements and longer study duration, would be needed to clarify seasonal variations in Der p 1 concentrations and correlations between sites of dust collection.

In summary, the group of homes with high Der p 1 concentrations at baseline continued to have significantly higher levels than the group of homes with low Der p 1 concentrations at baseline. Der p 1 concentrations were generally higher in autumn and lower in spring. There were no consistent correlations between reservoir and aeroallergen Der p 1 concentrations and between sampling sites. Our results suggest that it may not be possible to substitute aeroallergens samples, which are less resource intensive to collect, for reservoir samples. It may also not be possible to substitute bedroom floor samples for bedding samples, which are easier to collect.

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Attitudes to Routine Testing of Blood Lead Levels of Children near a Lead Smelter in North Lake Macquarie

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Lead has been recognised as a cause of health and behavioural problems in children. Children living near an active lead smelter are more at risk of environmental lead exposure and should have regular blood lead tests to allow for an early intervention if they are found to have elevated blood lead levels. One method of monitoring children's blood lead levels is to offer a free, annual testing program through local schools and preschool. This paper reports on a self-administered, pencil and paper questionnaire conducted with participating North Lake Macquarie families on their knowledge of the blood lead testing program, satisfaction with the program, and opportunities for improvement. Overall, it found that the blood lead testing program conducted through schools is well accepted in the community with only a few families indicating problem areas to be addressed. Predictors of re-attendance were the offer of anaesthetic cream prior to venipuncture and staff attitudes.

Key words: *Lead; Children; Blood; Testing; Recruitment; Routine*

Exposure to lead has been recognised as a cause of a range of serious health and behavioural problems in young children (Advisory Committee on Childhood Lead Poisoning Prevention 2000). The effects of lead on health can include deficits in fine motor skills, reaction time, and coordination, impaired growth, aggressive and impulsive behaviour, and hearing problems (Centers for Disease Control 1991; McMichael et al. 1988; Sciarillo, Alexander & Farrell 1992). While severe lead poisoning in Australia is now rare, it has been recognised that low levels of lead exposure can cause intellectual impairment in babies and young children (Needleman & Gatsonis 1990), although there is a suggestion this may be minor compared with parental and socio-environmental factors (Pocock, Ashby & Smith 1987).

The National Health and Medical Research Council ([NHMRC] 1993) considers a blood lead level of 10 micrograms per decilitre (µg/dL) or above to be elevated and while blood lead testing is recommended for children (Centers for Disease Control 1991; NHMRC 1993) particularly for those in high-risk areas, routine screening has not always been easy to implement. Blood lead testing in North Lake Macquarie (NLM) is conducted as a venous sample, which can be distressing for both parents and children.

In the 1996 National Survey of Lead in Australian Children, one third of the parents who completed the questionnaire refused permission for venipuncture to test blood lead levels on their children aged 0-4 years (Donovan et al. 1996). The trained paediatric collector was unable to collect a sample from an additional 6.5% of the children as the children either refused to cooperate or the test was abandoned when they became distressed during collection.

A blood lead testing program has been operating in NLM since 1991 after a lead exposure risk assessment revealed widespread lead contamination in the three suburbs surrounding an active lead and zinc smelter (Galvin et al.1993). At that time, 67% of children aged 1-13 years were found to have

blood lead levels above the NHMRC recommended range. There was a mean blood lead level of 13.9µg/dL among children less than 13 years and 15.7µg/dL among children aged 0 - 4 years. While there has been a marked improvement in blood lead levels in recent years, current blood lead levels indicate that 32% of children still have blood lead levels exceeding 10µg/dL (Hunter Public Health Unit 1999).

In 1996, the Environmental Health Centre (EHC) of the Hunter Public Health Unit, now Hunter Population Health, was established to work with the NLM community of approximately 1600 homes. It has undertaken a range of actions including a major household lead abatement program, blood lead monitoring and case management activities, greening, health education in schools and preschools and health promotion. In 2001, the EHC changed its program focus away from household abatement to blood lead monitoring and to an increase in health promotion and health education activities with families.

The EHC offers free annual blood lead testing by venipuncture in the local schools and preschool to detect children with elevated blood lead levels and offer appropriate management of those children. As part of its recruitment strategy the EHC staff visit families to discuss lead safety. Parents are invited to bring their children along for a free blood lead test. While capillary or fingerprick tests are used in some parts of Australia, venipuncture has always been used at the EHC due to the difficulty of ensuring a non-contaminated sample.

If a child is found to have an elevated blood lead level, the EHC staff conduct an environmental assessment at the home in an attempt to determine the source of lead and suggest ways this can be addressed. A clinical protocol is followed and, depending on the degree of elevation, includes long-term loan of HEPA vacuum cleaners, the supply of marine carpet runners, or a consultation with a paediatrician.

Since 1991, there has been a decline in blood lead levels with an accompanying decline in the number of children 0 -13 years tested, reducing from 296 in 1993 to 170 in 1999 (Hunter Public Health Unit 1999). In particular there are low numbers of children in the critical age group (under 5 years) tested. This decline has been a concern for the EHC. Blood lead testing is the only reliable way to detect lead within the body and consequently it is important to improve recruitment strategies. In addition, when only a small percentage of children are tested, it is difficult to measure the effectiveness of the EHC program.

Anecdotal reports suggest there is a range of reasons why parents do not have their children tested for blood lead levels. Denial of lead as a health issue has been one reaction. Denial has not been an uncommon reaction to other health problems when people feel powerless to change a situation (Menahem & Halasz 2000). Verbal comments made by parents include a dislike of needles and not wanting to distress their child. The concept of popular epidemiology may also be active here, with differences between what health professionals and the community perceive as environmental health risks (Brown 1992). Given the pivotal role of blood lead testing to identify children with elevated blood lead levels, it is essential that new programs are developed that overcome barriers to testing and subsequently lead to increased screening.

As part of the 2000/2001 testing program, a quality assurance survey was conducted with participating families through the EHC. The aim of the survey was to determine families' perceptions of indicators of quality care and identify opportunities for the EHC to improve its service to these families.

Method

Sample and setting

Altogether 340 families whose children attended the three public schools, preschool, or were known to the EHC, participated. According to ABS data there is a stable population of 11,000 in NLM and most homes have a lower median income than other parts of Lake Macquarie (ABS 1998).

Design

Free blood lead testing was offered to families in the local area who had children aged under 13 years. Clinics were held at the school, preschool and the EHC during the testing period. Throughout the year, monthly clinics were held at the EHC. Parents wishing to have their children tested at school were asked to provide written consent and were welcome to attend with their child if they wished to do so. No appointment was necessary. A paediatric-trained nurse from the local public health service performed the blood collection by venipuncture. Parents were provided with written results within two weeks of the blood lead test. If a child was found to have an elevated blood lead level, that is 10µg/dL or above, their parent was telephoned and a home visit was conducted to provide appropriate advice and management.

In order to determine family satisfaction with the blood lead testing program, a two-page pencil and paper survey was developed by the EHC. It consisted of a series of coded questions, however, there was opportunity for comment to be given throughout. As the staff of the EHC were aware that many people in the area did not have their children blood lead tested, two survey forms were developed: one for families with children who chose to participate in the current program and one for families who chose not to participate

Procedure

Within one month of the testing program being conducted, the survey was distributed to the families in each of the three schools, the preschool, and to those who had attended the EHC. The survey was distributed with an information letter and reply paid envelope. The families were assured that the survey was confidential and that the information would be used to improve the EHC services to all the children who live in or attend school in the area.

The schools and preschool each agreed to distribute the surveys to the families attending their facility. The schools used their newsletters and made announcements at assembly to encourage families to return surveys, with one school giving small gifts (pens, balls, or drink bottles supplied by the EHC) to encourage children to return the form directly to the school. EHC staff collected surveys that were returned to the school or preschool. Surveys were posted to families who attended blood testing at the EHC.

Percentages of those currently and previously tested were calculated for both liked and disliked factors. Differences between ratios of these factors were used to identify factors predictive of re-attendance.

Results

Sample

During the 2000/2001 financial year, consent was given for a total of 272 children aged 0 -13 years who were tested in the two-week period of the testing program, or at the monthly clinics, resulting in 198 families participating in the current testing program. Altogether, there are 344 children in the three primary schools in the area, with 210 (61%) being tested.

A total of 340 surveys were distributed to both participating and non-participating families, with 90 families returning the completed survey form. This gave a response rate of 26%. Sixty-six of the 90 responding families had their children blood lead tested in the current program and 24 were families whose children had not been tested in the current program, however, they had been tested in previous years.

Knowledge of the program

The families were asked how they had heard about the blood lead testing program and were allowed to nominate up to six responses. Of the families whose children were included in the current testing program, the majority heard about the program from either the school newsletter (91%) or a letter sent home from the school (83%), with similar results from the families who did not have their children tested (83% and 83%). A notice in the EHC newsletter which was distributed to 1600 homes in the area two weeks before the program commenced was remembered by 39% of those families with children currently tested, and 21% of those families who did not participate in the current testing program.

Almost all the responding current families (98%) found the information they received from the EHC easy to understand, and 18% contacted the EHC to discuss the information further, with 100% experiencing satisfaction with this contact. Of the families whose children were tested previously, 79% found the information easy to understand, however, only 9% (two families) contacted the EHC to discuss the testing program.

Satisfaction with the program

Questions were asked about the use of anaesthetic cream prior to venipuncture. Three-quarters (or 48 families) of the current families used the cream, with 47 of these (98%) having the test at school. Only three families (6%) reported a problem with the cream, including "not enough cream". Of those 16 families who did not use the cream, half attended the school and half the EHC. They gave a range of reasons for not using the cream, including "she's brave, saved time", "she did not want it".

Families were asked if they had experienced problems with blood lead testing and two families (3%) from the current program and one family (6%) from previous programs reported that it was "a big performance".

Table 1: Place of testing and use of anaesthetic cream by current families

Used anaesthetic cream $n=48$	Number	%
Tested at school	47	98%
Tested at EHC	1	2%
Did not use anaesthetic cream $n=16$		
Tested at school	8	50%
Tested at EHC	8	50%

The families were asked what they liked and disliked about the program and were allowed up to 10 responses. The most commonly identified positive aspects of the program from current families were that it was free (83%), easy to get to (77%), and that the child was offered anaesthetic cream prior to venipuncture (73%) (see Table1). Three families commented on the gifts given to each child after the test: "kids get rewarded for their braveness". Others appreciated the fact they did not have to be present: "I did not have to attend as I find the children's blood test stressful".

Table 2: What was liked about the blood lead testing program

	% Currently tested $n=66$	% Previously tested $n=24$	% Combined tested $n=90$
Easy to get to	77	38	67
Free	83	54	76
Private	36	17	31
Friendly helpful staff	55	46	52
Staff talked to the child and made them feel comfortable	65	46	60
Child offered anaesthetic cream	73	42	64
There was a room that was friendly for children, friendly surroundings	39	29	37
Parents could attend if they wanted to	65	33	57
Staff let me know results quickly	59	25	50
Other - can you tell me what	5	13	7

When asked about "dislikes", three current families (5%) indicated that their

child became frightened and three families (5%) indicated that either the results were slow in arriving, or that there was a delay in testing due to insufficient staff. One commented: "it is frightening for both parents and children, especially if they have to be held".

Only one family (2%) stated they would not have their child tested again as part of the program. There was a range of general comments about the program including waiting time for tests and the results: "I think that the results should be given much quicker".

Table 3: What was disliked about the blood lead testing program

	% Attended *current testing* *n*=66	% Did not *attend previous* testing *n*=24	% Combined *n*=90
Lack of privacy	2	0	1
Unfriendly staff	2	8	3
Staff did not make the child feel comfortable	0	0	0
Child got frightened	5	8	6
Would not use anaesthetic cream	0	8	2
Clinical surroundings	2	0	1
Parents not made to feel welcome	0	4	1
Didn't get the results	2	0	1
Other - can you tell me what?	5	4	4

Twenty-four families who responded to the survey had only participated in the previous testing program. For these previous families, the three most positive aspects of the program were similar to the current familes: free (54%), friendly, helpful staff (46%), and the staff talked to the child and made them feel comfortable (46%). Very few families identified "dislikes" about the program, however, these included unfriendly staff (8%) child became frightened (8%), and child not offered anaesthetic cream (8%).

Upon examination, the factors predictive of re-attendance were found to be the welcoming of parents (1.97), the offer of anaesthetic cream (1.73) and comfort of children (1.41) during the testing.

Opportunities for the program

Non-participating families were asked the reasons why their children had never had a blood lead test and were allowed up to 12 responses. The most common reason was that: they live somewhere else (six families); only just moved into the area (four families); they thought the child would be frightened; they would want to be present or they live in a lead safe house so the tests were not necessary (two families each); and one family thought the staff may not make the child feel comfortable.

Table 4: Predictive factors of re-attendance of families participating in current and previous testing programs

	Factor Liked (%)		Liked Ratio	Factor Disliked (%)		Disliked Ratio	Predictor #
	Current	Previous		Current	Previous		
Staff friendliness	55	46	1.19	2	8	0.25	0.94
Child made feel comfortable	65	46	1.41	0	0	0	1.41*
Offer cream	73	42	1.73	0	8	0	1.73*
Surroundings friendly/ not friendly	39	29	1.34	2	0	-	-
Results given quickly	61	25	2.44	2	0	-	-
Privacy / lack of privacy	36	17	2.11	2	0	-	-
Parent welcome/ not welcome	65	33	1.97	0	4	0	1.97*
Other	5	13	0.38	5	4	1.25	-0.87

*#Liked ratio minus disliked ratio (*Indicates the predicators of attendance)*

Families were asked how the EHC could improve its blood lead testing program and a wide range of comments was received, including the need for extra staff and the importance of education on why testing is conducted: "We as adults understand, though do our children really?".

Discussion

This is the first time since its implementation that NLM parents have been asked about their acceptance of, and attitudes to, the blood lead testing program. Verbal comments had been made to the staff, however, there has not been a formal attempt to quantify the reasons behind parents' decisions to test or not to test and to determine predictors of re-attendance. There has always been a strong emphasis on blood lead monitoring since 1991; monthly clinics began in 1998. With the change in focus of the NLM program from household abatement to increased blood lead monitoring and health promotion/health education with families, parental attitudes and expectations play an important role in program development.

Overall, the survey found that while there was good acceptance of the blood lead testing program in the schools, there were some areas that could be addressed. While a response rate of 26% represents just a little over one quarter of the families attending the schools and preschool, it should be considered a good result, as there are a number of factors that may have discouraged the families from returning a form. People who were not interested in the blood testing may not have been interested in responding to the survey or may feel uneasy about putting their reasons on paper. Consequently, a potential for a response bias should be acknowledged.

There was a lower response rate to the survey from preschool families than school families. This could be indicative of a number of factors including those listed above. However, in addition, preschool families may not live in the area or may have had less exposure to information about the importance of blood lead testing. This may be overcome in the future with the introduction of a program of homevisits to all newborn babies in NLM within one month of their birth and regular follow-up contact by EHC staff.

One of the limitations of the survey was that it was only possible to contact families already attending the EHC or through the schools or preschool within the local area. The low numbers of responding families with children in the EHC's target group (the under 5 year-olds) is disappointing, however, there are limited numbers in the target group attending the local preschool and therefore access to this age group is quite restricted. The EHC is currently planning a series of indepth interviews with parents of preschoolers to determine their views on lead safety and blood lead testing, which should provide greater information.

While very few families indicated the reasons why they did not like the blood lead testing program, less than half (11%) of those previously tested intended to have their children tested again. The reasons given ranged from only having lived in the area a short length of time to living in a lead safe home, thus making the test unnecessary. The role of health care professionals was seen to be important with one family indicating that their doctor should order the blood test, and another saying their paediatrician advised them it was not necessary. The small but varied range of reasons indicated that, first, there is a need for further education of the community, as well as of health care professionals, on why blood lead testing is important for children, particularly the under 5 year-olds living in the area.

Second, the perception of staff attitude is important and could be considered a predictor of re-attendance. Half of the families thought staff members were friendly and helpful and that the comfort of the children during the testing process had been considered. Only one of the 90 families identified "unfriendly staff" as a negative about the program. For staff working in the blood lead testing clinics, the school testing program can be extremely stressful due to

the large numbers of children who are to be tested in a short period of time. The venous blood collection method can be uncomfortable for children, and older children especially tend to remember any discomfort experienced in previous years. An increased number of staff available to work with the children to reduce their anxiety and ensure that stressors on staff do not affect their attitude may alleviate this problem. Other indicators of staff attitudes were very positive with a high satisfaction recorded regarding enquiries prior to the test and the manner in which the results were given.

While they did not appear as predictors of re-attendance it should be noted that a private environment and the expedient delivery of results were factors which rated highly with families.

Finally, the offer of anaesthetic cream prior to venipuncture was accepted by three-quarters of the families and could be considered a predictor of re-attendance at school testing. It was noted that only one family attending the EHC requested the cream, with 98% of children using the cream being tested at school in the absence of their parents. While the families appreciated that the offer was made, not all thought it was necessary. The most common reasons given were that the child did not need the cream ("she's brave") and that families felt this increased the waiting time for the child.

It may be that to increase the number of children tested, an alternate method of collection could be employed, such as fingerprick or capillary testing. In America, there has been increased research into the capillary method of blood collection and researchers report that this method is "less traumatic" to parent and child as well as easier than venipuncture to collect (Johnson et al. 1997). Further discussion needs to be held with those Centres who use capillary testing. Staff will need to be trained in this procedure as well as educated on infection control issues to ensure that the difficulties with contamination can be overcome.

Conclusion

The results show that the blood lead testing program conducted through the schools is well accepted by the families participating in the survey. The low response rate from families of the under 5 year-old group could be considered indicative of the general lack of knowledge in the community regarding the importance of blood lead testing this group and highlights the need for targeted recruitment of this age group. Factors that appear to encourage families to return for follow-up testing include the offer of anaesthetic cream prior to venipuncture and positive staff attitudes that made both child and parents feel comfortable and welcome. While a few people expressed some dissatisfaction with surroundings, results and privacy of the blood lead testing program, overall there was an increase in satisfaction of the factors in the current round of testing compared to those in previous years.

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Childhood Obesity and the Importance of Rights Discourse: A Way Forward for Public Health Practitioners

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Childhood obesity is a matter of ongoing concern and one that urgently needs to be addressed. Human rights discourse can be a powerful tool in the hands of public health practitioners and can provide another way forward to address this public health concern. The integration of discourses on human rights and children's rights provides a mechanism to construct public health problems - such as childhood obesity - as a legal problem. The importance of human rights discourse in the context of public health issues is in the manner in which it can be utilised outside formal legal structures. Recourse to principles of human rights and children's rights must inform practice and in doing so affect how society at large sees the need to address various public health matters.

Key words: *Childhood Obesity; Human Rights; Legal Framework*

The World Health Organization (WHO) has described obesity as "one of today's most blatantly visible - yet most neglected - public health problems" (WHO 2003). The causes of obesity are considered to be a combination of "sedentary lifestyles and high-fat, energy-dense diets" (WHO 1997). But it is the rate of childhood obesity in particular that has sparked more recent concern. In an analysis of 79 developing countries WHO has identified a rate of 3.3% of children under five years being overweight, or 17.6 million children (WHO 2002a). But the problem is no less prevalent in other countries. The number of Australian children who are overweight or obese is increasing (Age 13 Feb. 2002, 11 Sept. 2002; Goodman et al. pp. 400-01; National Health and Medical Research Council 1997, p. 75).

While the reasons for this increase in childhood obesity are complex, it appears to be accepted that children spend much of their time engaged in sedentary activities such as watching television, surfing the internet, and playing video games which leaves little time for exercise (National Health and Medical Research Council 1997. It is also the case that fewer children are walking to school as parents' fears for their safety lead them to drive their children to school and other engagements rather than encouraging them to walk. In the United States the counter to this phenomenon has been a 'walk-to-school' movement to promote this physical activity as part of a public health initiative (e.g. Centers for Disease Control and Prevention 2003). This has also spread to Australia (Pedestrian Council of Australia 2003).

If there is a clear need to address the risk to public health from a lack of physical activity, then there is an equal lack of clarity about how this should be achieved. As Davis and Jones (1996) point out:

> *Health educators exhort children to be healthy, but in relation to exercise, for example, the hostility of city streets make cycling and walking unattractive and potentially dangerous and the opportunities for independent play and mobility have dramatically declined over the past 20 years* (Davis & Jones 1996, p.109).

Clearly, it is not sufficient simply to educate the public about the need to exercise and eat more carefully. Calls for "multidisciplinary responses" can soon look to be mere rhetoric rather than presenting effective strategies for addressing obesity. Even WHO documents can appear vague in this regard. As one WHO report on obesity in the Pacific states:

> *Traditional approaches to the treatment and prevention of obesity aimed at persuading individuals to eat less and exercise more, have had limited success despite great efforts by both patients and health staff. This has led, in recent years, to a more articulate, 'ecological' approach to the obesity pandemic, which regards obesity as a normal response to an abnormal environment, rather than vice versa. To successfully prevent and reduce the rate of obesity in societies, a multisectoral approach is needed to identify and change the main obesogenic factors in the environment, which contribute to determine high-energy diets and sedentary lifestyles. Obesity prevention and control strategies will then be focused on increasing awareness of these factors among decision-makers, health professionals and the general public, and lead them to plan/implement interventions that will create more favourable environments for healthier diets and lifestyles. These strategies will become part of existing national plans of action for nutrition and healthy island initiatives* (World Health Organization 2002b, p. 5).

But what does this all mean? What process will ensure that such strategies do form part of "national plans of action"? It is also important in this regard to consider how this public health issue is often presented as being about *childhood* obesity. As a group, children are not very powerful. The success of strategies to counteract obesity requires the shifting of power and resources in society. It is thus important to consider whether it is necessary for those concerned with childhood obesity to enlist institutions in society that can challenge the powerful and compel the reallocation of resources towards the health needs of children.

Law is the obvious institution to achieve this aim, but it is how the role of law is perceived that may make a significant difference to its overall effectiveness in addressing childhood obesity. For the "traditional" or "black letter" lawyer the notion that law merely determines the parameters within which others act seems anathema. For them law is the result of a consensus achieved by way of public debate and electoral politics. This narrow and essentially positivist conception of law relegates the role of other professionals, such as public health practitioners, to that of simply enforcing the will of Parliament and the aims of government policy.

But there are alternative ways of understanding the manner in which law is formed and the role it performs in society. In particular, critical legal theorists such as David Kairys (Kairys 1998) question the extent to which the processes of law are rational and judicial decisions divorced from politics. For others such as Foucault, law is not so central in the regulation of society. For him the subtle form of social control exercised by various professions is more important (Foucault 1979). A more critical approach to understanding law, therefore, focuses not merely on the "formal" body of law, but also on the practices, values, conventions and discourses that combine to generate various interpretations and understandings of law. Thus what constitutes "law" is not a simple product of "legal" institutions and "legal" processes. Law is the product of a broad range of social relations.

Childhood Obesity as a Legal Problem

Our aim is to demonstrate how this occurs through an examination of the problem of childhood obesity and how it can be constructed in legal discourse. While this phenomenon has been cast as a social problem, it is not so commonly understood as a legal problem. We suggest that it can be so understood and that the agents who may play the largest part in so shaping it can be public health practitioners given their specialised knowledge relevant to the area. However, in order for this problem to be

translated into legal discourse it is necessary for those practitioners to connect with certain legal discourses, in particular those which surround children's rights. In addition, it is necessary for the discourses on children's rights to be connected with further discourses that connect human rights, transport and public health.

For many public health professionals, law is presented to them as a reactive device that responds to public health issues through such mechanisms as the enforcement of health legislation or by way of individuals taking civil action for breaches of their civil rights. Their role is said to be the enforcement of legislation consistent with guidelines determined by government. In this approach, childhood obesity will only become a legal problem when it is stated to be so by those with power, that is, their political masters. But this analysis ignores completely the expertise that public health and other professionals possess with respect to public health concerns such as obesity. It also denies the manner in which this knowledge can be translated into legal discourse and shape understandings of the law. This is not about public health practitioners lobbying for changes to the law. It is instead about how within current legal discourse there is the potential to argue for changes, which are consistent with public health objectives *and* law. Importantly, what is being referred to here is not the law often identified as "public health law", but those laws which relate to human rights and children's rights, for example, which have an important role to play in creating a framework within which the problem of childhood obesity can be addressed.

Public health practitioners thus need to think laterally when confronted with the problem of childhood obesity and how to address it. Beyond calls for education and increased physical activity there also needs to be consideration given as to how that area of law and legal discourse which speaks to the rights of citizens, may be relevant. As Donnison says, rights are effective tools when challenging the powerful (Donnison 1989). The assertion of legal rights may carry with them the possibility of court orders and compulsion, but even simply to articulate the problem as one which involves issues of human rights might shift thinking to such an extent that behaviour will change. Thus the public health practitioner who can articulate health issues in human rights terms may cause social change, not because of the intervention of lawyers and courts, but because the connection of health issues with human rights affects attitudes and the consequent behaviour of those with the power to bring about fundamental shifts in how things are done.

The recent attempt to sue McDonalds for causing the obesity of the plaintiffs by failing to disclose the contents and effects of the food it sells (*Pelman & Bradley v. McDonald's Restaurants of New York*) is perhaps one example of how legal discourse can be used to transform a public health issue into a legal problem and so aim to shift thinking. While the outcome of this case remains in abeyance, through invoking legal discourse to address childhood obesity it may have already succeeded in not only raising the profile of the problem of childhood obesity, but initiated much thought around the responsibility of fast food chains, advertisers and other powerful groups for childhood obesity. It is from such beginnings that much legal change occurs, no matter any initial failure. Law is simply a tool, not an end in itself.

Thus law can be used as a *proactive* device and set the parameters within which social issues are debated and determined. What we seek to highlight is the manner in which public health practitioners can promote certain objectives in public health by using human rights discourse.

Human Rights and Public Health Practice

It is now accepted that there are various universal human rights that go to the quality

of our lives. For example, the right to a standard of living that protects our health can be regarded as a basic human right (*Universal Declaration of Human Rights*, article 25). So too is freedom of movement, which clearly makes it possible to participate in and enjoy other human rights (Universal *Declaration of Human Rights*, article 13). But there has been little attention paid to how some of these rights sit together. Thus while the right to move freely necessitates the provision of transport infrastructure in order to facilitate the exercise of that right, the manner in which decisions in that regard impact on the right to a healthy environment rarely receives formal consideration. In the main the various state organs and departments that preside over say, decisions in transport planning, do so at some distance from those which have the responsibility for health matters.

These are points which Davis and Jones (1996) also make in relation to the need to consider the effect of the *United Nations Convention on the Rights of the Child* in planning cities around the health needs of children. Their main concern is that children should be included in the decisions that determine how cities are planned so that children's needs with respect to mobility and space are incorporated into city design (see also Simpson 1997). The important point to note is that their argument relies not simply on a policy which notes the benefit of the child's perspective, but on the existence of children's rights - such as the right of children to express their views in all matters that affect them (*United Nations Convention on the Rights of the Child*, article 12), which have been set out in the *United Nations Convention* and ratified by governments. They describe the *Convention* as "a major challenge for the new public health" (Davis & Jones 1996, p. 111). Other articles in the *Convention* also underpin the rights of children to a healthy environment, such as article 24 (right to the enjoyment of the highest attainable standard of health), article 27 (right to an adequate standard of living) and article 31 (the right to leisure and to engage in play). Other rights that children possess under the *Convention* can, it might be argued, be meaningless without a right to a healthy environment. For example, the right to education contained in article 28 would be seriously affected by a lack of commitment to public health. In other words, the right to health can be implied in many of the rights expressed in the *Convention*.

Thus the role of human rights law in this context is that it creates a discourse that begins to draw together disparate threads and make connections that have not always been readily made. It is the articulation of a *right* to a healthy environment that converts the issue of childhood obesity from one that focuses on individual lifestyle choices into the *legal* responsibility of the state. As stated above, factors in the creation of childhood obesity have been said to be a sedentary lifestyle and a decline in walking as a transport option by children. Rights discourse suggests that the right to a healthy environment might require an examination of the manner in which transport options are planned as part of any consideration of the extent to which such planning conforms with - in the case of children - the rights of the child to a healthy environment. In other words, are the human rights of the child to good health protected by decisions made in transport planning? Such linkages have begun to be made in Europe.

Charter on Transport, Environment and Health

Human rights discourse has led to the European Member States of the World Health Organization producing a *Charter on Transport, Environment and Health* that was signed on 16 June 1999 in London. It may be said that the *Charter* is not legally binding on Australia. But such a standpoint would fail to recognise how as part of a legal discourse on human rights it can influence legal and social thought in Australia. Nor

does such a stance fully appreciate the manner in which legal discourse evolves. The foundations of this *Charter* are the same as those upon which human rights recognised in Australian law rest. It is thus important to consider whether the *Charter* represents the first step in a global movement towards regarding obesity as a human rights matter. It also represents a move towards greater detail in explaining how human rights are to be achieved. It is therefore an important document to examine for the manner in which it provides an articulation of the connection between the rights of individuals to health and transport planning as well as strategies to achieve recognition of those rights.

The Charter

The *Charter* states at the outset that its concern is with a broad range of issues that are of ongoing concern for all those who work in the field of public health. The preamble acknowledges the important role that transport plays with respect to "access to goods and services, opportunities for individual mobility and better quality of life, and [that it] plays an important role in the economic and social development of our communities" (WHO 1999, *Charter on Transport, Environment and Health*, preamble, para. 1). But the document then states the concern that "the impacts which decisions about transport have on health and the environment have so far not been fully recognized" (WHO 1999, preamble, para. 2) It then states that "we must ensure that the wellbeing of our communities is put first when preparing and making decisions regarding transport and infrastructure policies" (WHO 1999, preamble, para. 1).

Such statements of intent are fundamental if there is to be a shift away from thinking about transport planning as a matter primarily to do with personal mobility. It is clear that the *Charter* aims to place the health of the community as the paramount consideration in such decision making. This is further reinforced in the rest of the preamble as it recognises that:

1. *Reliance on motorized transport, in particular road transport, continues to increase, resulting in adverse environmental and health effects. These effects may increase in the future if no effective preventive and structural actions are taken;*
2. *Increasing the safety of transport and reducing the health consequences of accidents need to be given high priority;*
3. *Policies on transport, environment and health need to be better coordinated, with a view to integrating them. The potential conflicts between transport and environment health policies will increase at all levels unless effective action is taken now. There is a need to enhance cooperation and coordination between different sectors in central and local governments, as well as between governments, the public and private sector.*
4. *Until now, the health effects of transport have been dealt with separately and without regard for their cumulative effect. Further coordination with and within the health sector is needed;*
5. *Consideration of the health impacts of policies has to be better integrated into approval procedures, impact assessments, and evaluations of the costs and benefits of transport plans, land use planning, and infrastructure programmes and investments;*
6. *Motorized transport, and especially road and air transport users, usually do not face the full environmental and health-related costs, which can create adverse incentives and distortions in the transport market;*
7. *The public is generally not sufficiently informed of the adverse environmental and health effects from motorized transport and the importance of taking individual action to alleviate the problems (*WHO 1999, *Charter on Transport, Environment and Health, preamble,* para. 3(1) - 7*).*

It is evident in these statements that a key focus of the *Charter* is the need for a

multidisciplinary approach to transport planning as it impacts on public health. But it is also a document that rests on fundamental assumptions about the connection between transport policy and its impact on the public health. It evolves from recognition that all citizens can claim a right to a healthy environment and that this places many obligations on the state as a consequence.

The basis of the Charter

The *Charter* details various pieces of evidence to show how transport policy impacts on health. This is annexed to the *Charter*. The document cites the high rate of road accidents within Europe - 2 million accidents with injuries leading to 120,000 deaths and 2.5 million injured people per year. In addition, while road transport accidents lead to most fatalities, 30 to 35% of those deaths are of pedestrians and cyclists. Pedestrians die at twice the rate of car occupants from road accidents (WHO 1999, Annex 1) In other words, certain groups in the community are more vulnerable to injury from road transport and these groups are not necessarily those who are making use of that form of transport when they are affected.

The annex to the *Charter* also notes that about 80,000 adults die in Europe each year from "long-term exposure to traffic-related air pollution". It refers to claims that children who live near roads with heavy vehicle traffic have a 50% higher risk of suffering from respiratory problems than children living in areas with low traffic volumes do. It also refers to research, which suggests that both diesel exhaust exposure and gasoline exhaust exposure may be carcinogenic to humans (WHO 1999, Annex 1).

Traffic noise is also noted as a health problem in the document. Such noise may cause "serious annoyance, speech interference and sleep disturbance". It is also connected with learning disabilities in children, interference with the concentration of people and increased stress and blood pressure. It also notes that "there is emerging evidence of an association between hypertension and ischaemic heart diseases and high levels of noise" (WHO 1999, Annex 1).

Dependence on road transport clearly deters people from engaging in other forms of physical activity to get around, such as walking and cycling. The annex to the *Charter* notes the benefits of walking and cycling for general health as well as its role in reducing the risk of heart disease, diabetes, obesity, hypertension, and high blood pressure. Such exercise also reduces the likelihood of osteoporosis, provides relief from depression and anxiety and assists in the prevention of falls in the elderly (WHO 1999, Annex 1).

The psychosocial effects of traffic are also referred to. The *Charter* notes that people can be socially isolated by high volumes of traffic. This may particularly impact on the elderly where there is evidence of such isolation leading to higher rates of mortality and morbidity. Children also suffer from dependence on road transport:

> *Children who have the opportunity of playing unhindered by street traffic and without the presence of adults have been found to have twice as many social contacts with playmates in the immediate neighbourhood as those who could not leave their residence unaccompanied by adults due to heavy traffic*.
>
> *The fear of accidents is reported by parents as being the main reason for taking children to school by car. This hinders the development of children's independence and reduces their opportunities for social contact. It also has an influence on children's attitudes towards car use and personal mobility in adulthood (*WHO 1999, *Charter on Transport, Environment and Health,* Annex 1*)*.

Road traffic accidents may also lead to water and soil pollution where dangerous goods being transported are involved. Transport infrastructure itself generates various noxious substances - exhaust, de-

icing substances, waste (old cars, tyres, batteries), fuel spillage can lead to contamination of soil and ground water and in turn affect the quality of drinking water and agricultural products (WHO 1999, *Charter on Transport, Environment and Health,* Annex 1).

Finally, the *Charter* acknowledges that the various adverse impacts of transport do not fall evenly across society:

> *The impacts of transport on health fall disproportionately on certain groups of the population. Some are more vulnerable to traffic risks, due to old or young age, to illness or disability. Others use modes of transport associated with greater risks (e.g. motorcycles). Some are more exposed because the areas they live, work or move in have higher levels of pollutants and noise (e.g. due to the intensifying effect of specific geographical and topographical conditions and settlement characteristics) or other risks, or restrict cycling and walking. Many disbenefits of transport can accumulate in the same communities, often those that already have the poorest socioeconomic and health status (*WHO 1999, *Charter on Transport, Environment and Health,* Annex 1*).*

While much of this evidence does not directly address the issue of connections between childhood obesity and transport, such linkages are perhaps self-evident. The *Charter* provides many reasons for changing attitudes towards transport in terms of public health, but we would suggest that it creates a context within which arguments for reducing car dependence, and increasing opportunities for children to travel by public transport, cycling or walking can be more readily put. Importantly, these arguments are not put simply in terms of good public health policy, but because the *Charter* flows from a commitment to creating a healthy environment based on human rights.

Thus the *Charter* sets out principles for the development of strategies to address the health implications of transport planning. Essentially these are the principles of sustainable development:

1. *reducing the need for motorized transport by adaptation of land use policies and of urban and regional planning;*
2. *shifting transport to environmentally sound and health-promoting modes;*
3. *implementing best available technologies and best environmental and health standards;*
4. *applying strategic health and environmental indicators and impact assessments, with the involvement of environmental and health authorities;*
5. *relating the costs of transport more closely to mileage travelled and internalizing transport-related environmental and health costs and benefits;*
6. *raising awareness of transport and mobility sustainable for health and the environment. Including efficient driving behaviour;*
7. *applying innovative methodologies and monitoring tools;*
8. *establishing partnerships at international, national, subnational and local levels;*
9. *promoting pilot projects and research programmes on transport sustainable for health and the environment;*
10. *providing information to the public and involving them in relevant decision-making processes (*WHO 1999, *Charter on Transport, Environment and Health,* Part III*).*

The document then details a "plan of action" to implement these strategies. The plan of action includes requirements on the parties to the *Charter* to integrate environment and health considerations into transport and land use policies and plans through such means as the pursuit of:

> *multi-sectoral cooperation and ensure that environment and health requirements are integrated and* [that] *their authorities are both involved in transport-related decision-making processes, such as those on transport, water and land use planning, infrastructure investment programmes and policy decisions* [and also to] *review and where necessary develop further strategies or introduce national action plans to ensure the*

*proper integration of health and environment concerns into transport and land use strategies, in particular, through the further development of National Environmental Health Action Plans, and to promote similar actions at the sub-national and local levels (*WHO 1999, *Charter on Transport, Environment and Health,* Part IVA*)*.

The *Charter* supports transport and land use planning which is geared towards the promotion of public health and which will not give private motor transport such pre-eminence. Thus it proposes that government:

- *reduce the need for motorized transport by adapting land use policies and urban and regional development plans to enable people to have easy access to settlements, housing and working areas, and shopping and leisure facilities by cycling, walking and public transport.*
- *raise the attractiveness of public transport, walking and cycling, and promote intermodality between them, not least by prioritizing public transport, walking and cycling in connection with the extension of infrastructure (*WHO 1999, *Charter on Transport, Environment and Health,* Part IVB*)*.

With respect to land use planning the *Charter* clearly suggests that public health professionals must be more concerned with the nature of land use planning which occurs in cities. Development plans set the agenda for urban planning and a large part of that process revolves around concerns with traffic flows, traffic noise and creating space for cars. Health issues must be more carefully articulated in such documents and the extent to which they are currently shaped by a meek acceptance of current patterns of motor car use should be of concern to public health officials.

Human rights, children s rights, transport and public health

While the *Charter on Transport, Environment and Health* is clearly not concerned solely with the health needs of children, it nevertheless does provide a framework within which to integrate concern with childhood obesity into the discussion of public health and human rights. It indicates how public health issues, including childhood health matters such as childhood obesity, can be constructed as matters that go to human rights and the legal obligations that should be imposed on the state to recognise those rights. It is a document that provides public health practitioners with another means of articulating the need for better designed cities that promote public health and which, amongst other objectives, aid in the reduction of childhood obesity. The *Charter* examined here, provides an example of how this leads to a detailed exposition of how those rights should be recognised through its articulation of specific policies which require implementation if such rights are to have effect.

Conclusion

The integration of discourses on human rights and children's rights provides a mechanism to construct public health problems - such as childhood obesity - as a legal problem. The significance of this approach is that it is public health practitioners who are able to play a lead role in utilising these discourses to effect change in how public health concerns are addressed. The importance of human rights discourse in the context of public health issues is in the manner in which it can be utilised outside formal legal structures. Recourse to principles of human rights and children's rights must inform practice and in doing so affect how society at large sees the need to address various public health matters. Childhood obesity is a matter of ongoing concern and one that urgently needs to be addressed. Human rights discourse can be a powerful tool in the hands of public health practitioners and can provide another way forward to address this public health concern.

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Outbreak of Norovirus at a Wedding Reception

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After attending a buffet-style wedding reception, 14 people reported becoming ill. As the guests had dispersed rapidly after the event, most were difficult to contact. Nine of the cases were eventually contacted and questionnaires were completed, but no particular food could be identified as a likely source. Investigation revealed that a child had vomited at one of the tables during the meal, and the cases were clustered at this table. Norovirus (formerly known as Norwalk-like virus) was isolated from the only clinical (faecal) sample available, and this was consistent with the predominant symptoms and median incubation period. As inspection of the kitchen revealed no likely source of infection, and as the comprehensive use of questionnaires was impracticable, the investigation was based on mapping of the tables and on the sequence of food serving. This led to identification of the most likely source (the vomiting child), and provided evidence for the caterers and guests that the illness was not foodborne. This investigation highlights the benefits of epidemiological mapping.

Key words: *Epidemiological mapping; Norovirus*

The mass catering at wedding receptions provides an opportunity for outbreaks of foodborne disease. This investigation highlights the importance of spatial and temporal mapping in a situation where allegations of food poisoning are made and analytical epidemiological study is not practicable.

Late on a Monday afternoon the Public Health Unit received a call from a bridegroom stating that 12 of the 91 guests who attended his buffet-style wedding reception the previous Saturday evening had subsequently become ill with vomiting and diarrhoea. Follow-up of the situation was hampered by the fact that the groom was calling from his honeymoon on an island resort and was receiving sporadic information about who had become ill. A number of the guests, including some who had been ill, were continuing on holiday or returning overseas. However, by the following day the names of 14 people reported to have been ill, and limited contact details, had been obtained. A questionnaire was developed and telephone interviews were conducted with nine of the 14 suspected cases as they could be contacted over the following two days. Some were reluctant to give details, and one supplied limited second-hand information about another guest. Thus there were data for ten cases. One man had been admitted to hospital. He had an ileostomy and had quickly become dehydrated.

Investigation

Environmental assessment

Environmental health officers inspected the kitchen facilities at the venue and found the general quality and maintenance of the kitchen to be of a high standard. A complete review of the function menu was made, and

individual steps in the preparation of each menu item determined. Suppliers of several potentially hazardous raw materials were also identified.

During this menu review and inspection, no food handling or storage procedures were identified that would contribute to food spoilage or cross contamination. Short holding times (due to immediate serving after cooking) of many of the potentially hazardous foods also minimised the likelihood of pathogen growth. No food remainders were available for sampling.

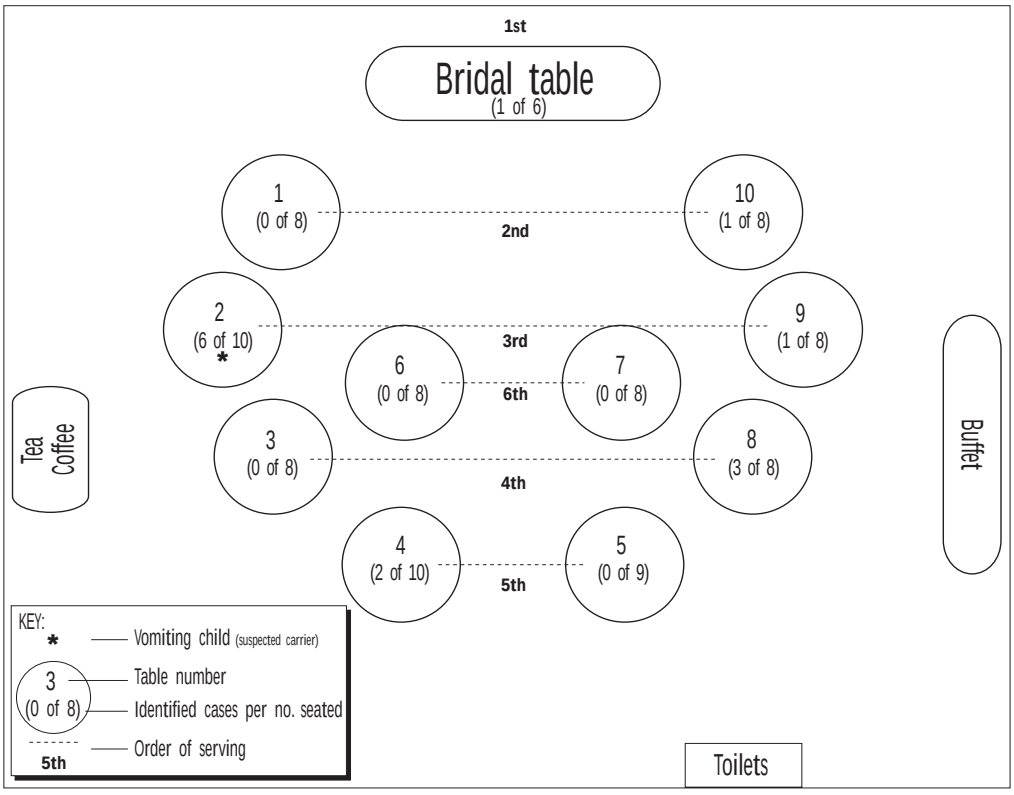
Epidemiology

A case was defined as a guest who developed vomiting and/or diarrhoea within 60 hours after the meal. No secondary cases were identified. A descriptive study of ten cases showed that a wide variety of foods was consumed, but no specific food, serving or course could be implicated. An analytical study was not possible, as only one guest who did not become ill was available for interview.

Cases were clustered particularly at Table 2, at which a 3-year-old child, who had been unwell for 24 hours, had vomited during the reception. A map of the table layout (Figure 1) shows the distribution of cases and the order in which the tables accessed the buffet. After the bridal table (1 case) was served, Tables 1 (0 cases) and 10 (1 case) went to the buffet together, followed by Tables 2 (6 cases) and 9 (1 case), 3 (0 cases) and 8 (3 cases), 4 (2 cases) and 5 (0 cases), and finally 6 and 7 (0 cases). The buffet was restocked while guests at Tables 3 and 8 were accessing it.

Seven males and seven females became ill, with symptom history available from ten

Figure 1: Map of location of identified cases and order of accessing buffet



cases. The main symptoms were nausea (70%), vomiting (60%) and diarrhoea (60%), with a median duration of symptoms of 21 hours (n=4) and a median incubation period of 29 hours (n=8). Following the function, kitchen staff and waiters ate leftovers from the buffet. None of these staff had reported being ill.

It appeared that transmission was not foodborne. The likely routes of transmission were person-to-person or environmental contamination originating from the sick child. There was no conclusive link between the child and the cases from other tables, except for the best man at the bridal table, who was her father. However, most of the other tables with cases were those which were at the buffet at the same time or immediately before or after Table 2. In addition, Table 2 was immediately adjacent to the dance floor, and people from Table 2 may have come into contact with people from other tables while at the tea/coffee table or at the toilets. Transmission could also have occurred via waiters.

It was impossible to investigate the potential environmental contamination, as details of the clean-up, where the child was taken, and whether she moved around the reception area afterwards, were not elicited at the time of the initial inspection, and the opportunity to do so was lost. Thus environmental contamination, fomites and aerosol could not be ruled out as possible mechanisms of spread.

Laboratory

The only laboratory sample available was faeces from the man admitted to hospital. Norovirus (formerly known as Norwalk-like virus) RNA was detected by reverse transcriptase polymerase chain reaction from this specimen, which was negative for ova, cysts, parasites, *Cryptosporidium*, *Salmonella*, *Shigella*, *Campylobacter* and *Yersinia*.

Discussion

The clustering of cases was associated with table seating arrangements, although the absence of cases at tables adjacent to Table 2 weakens the association. With a buffet style meal where two or more tables were at the buffet at the same time, and ten tables eventually ate from a single food source, a more even distribution of cases would have been expected if the outbreak was foodborne. Further to this, as indicated by the completed questionnaires, no single food could be implicated.

The features of the outbreak fit Kaplan's criteria for identifying Norwalk-like virus outbreaks, namely stool cultures negative for bacterial pathogens, vomiting in at least half of the cases, mean or median duration of illness 12-60 hours and incubation period 24-48 hours (Kaplan et al. 1982).

Norovirus may be transmitted via food, water, fomites, air or direct contact, and can persist in the environment for days (Anderson et al. 2003; Boccia et al. 2002; Cheesbrough et al. 2000; Evans et al. 2002; McAnulty et al 1993; McEvoy et al. 1996; Marks et al. 2000; Stafford et al. 1997; Stevenson et al. 1994). There have been several previous reports of spread via vomitus (Chadwick & McCann 1994; Marks et al. 2000; Patterson et al. 1997). A restaurant outbreak occurred after a food handler vomited in a kitchen sink. Salad prepared in the sink the following morning became contaminated, despite the sink having been cleaned with chlorine bleach (Patterson et al. 1997). Norovirus is highly contagious and outbreaks in a restaurant and a concert hall showed an inverse relationship between infection and the distance from the person who vomited (Anderson et al. 2003; Marks et al. 2000).

Conclusion

This report highlights some of the difficulties that are regularly faced by health authorities when investigating disease outbreaks, particularly from catered functions. In this case, limited information from cases was available due to significant

dispersal of those who had attended the function and difficulties experienced in eliciting information. From the information obtained, however, the incubation period and the predominance of vomiting pointed to the likelihood of Norovirus infection, and this was supported by the finding of Norovirus in the faecal sample.

The mapping suggests that the outbreak was not foodborne, but was transmitted from the vomiting child at Table 2. We were able to indicate to the caterers that there was no evidence to support any allegation of negligence on their part.

However, the investigation failed to demonstrate the precise mechanism of spread. Person-to-person was assumed to be most likely. This investigation demonstrates that mapping the location of cases and establishing the sequence of food serving can be a useful tool, enabling "mapping epidemiology" to be undertaken. It also highlights the need to ensure that when the initial site inspection is made, as much information as possible is gathered to support hypotheses developed by the epidemiological investigation.

Acknowledgments

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Amendment

There is an error in an the article in EHJ 3(4), page 39 in the "Review of the Environmental and health Effects of Termiticides under Australian Conditions".

The NOHSC guideline is 0.2 mg/m^3 (200 $\mu g/m^3$)

This would render the relevant statement in the original paper as incorrect.

Preventing Eye Damage Related to a Solar Eclipse

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A solar eclipse occurred in South Australia on the 4 December 2002. Such an event presented the potential for eye damage among people who viewed the eclipse inappropriately. Estimates of numbers of spectators for the path of totality (from Ceduna through to Cameron Corner) were between 25,000 and 28,000. The remainder of South Australia experienced a partial eclipse. In the lead up to the eclipse a public health campaign was developed by the South Australian Department of Human Services in collaboration with the Royal Australian and New Zealand College of Ophthalmologists (RANZCO) and the Optometrists Association Australia (OAA), who provided additional funding. The aim of the campaign was to use public education (in the form of brochures, posters, website information, print media, television and radio) to help prevent solar eye injuries. Evaluation of the public health campaign was in the form of a three-month surveillance activity designed to identify patients with solar eye damage presenting to South Australian optometrists and/or ophthalmologists after the eclipse. Five notifications were received in South Australia at the central registry, four of which occurred in people located in metropolitan Adelaide at the time of the eclipse. None of these five patients had evidence of significant eye injury. Personal contact with all ophthalmologists was made by a Fellow of RANZCO at the completion of the surveillance period to ensure that all known cases had been reported. Results of the surveillance activity therefore indicated a most successful outcome in terms of prevention of solar eye injuries.

Key words: *Solar Eclipse; Surveillance; Public Health Campaign; Eye Injury; Eclipse Viewer*

A solar eclipse occurred in South Australia on 4 December 2002. In South Australia, the eclipse was "total" in a path 36 km wide stretching north-east from Ceduna, past Lyndhurst to Cameron Corner, where the state borders of Queensland, New South Wales and South Australia intersect. In the "path of totality" the moon covered the sun completely. A partial eclipse was experienced in the remainder of South Australia (SA), as well as in most other areas of Australia.

Viewing the sun directly can cause focal damage to the central retina and subsequent visual symptoms, including loss of central visual acuity. Unlike external thermal burns, solar retinal "burns" do not cause pain. During an eclipse, the visible brightness of the sun is diminished and thus viewing the sun can feel comfortable, although the hazard remains. The 4 December 2002 event presented an increased risk of potential solar eye damage from inappropriate viewing of the sun. The hazard was relevant to the South Australian population generally and to the tourists visiting the path of the total eclipse for the event itself.

A public awareness campaign, aimed at the prevention of solar eye damage by public education regarding the potential danger to the eye, was developed and implemented by the Environmental Health Service and

Health Promotion SA (Population Health, Department of Human Services, SA). Financial and advocacy support by the Royal Australian and New Zealand College of Ophthalmologists (RANZCO), Optometrists Association Australia (OAA) and the South Australian Tourism Commission (SATC), assisted the campaign. Eye safety information was distributed throughout South Australia using a variety of media, focusing upon certain geographical regions and population groups. Short-term surveillance for eclipse-related eye damage was also implemented for three months following the eclipse.

Potential Eye Injury from Inappropriate Viewing of an Eclipse

Solar radiation is thought to cause retinal damage by predominantly thermal, or photochemical mechanisms. (Ham 1983; Mainster, Ham & Delori 1983). The damage is dependent upon the individual eye's defence mechanisms and characteristics of the radiation, in particular the wavelength, intensity and duration of exposure (Ham 1983). Ultraviolet and short-wavelength visible light are reported to be more dangerous than longer wavelength light (Azzolini et al. 1994). The clearer lenses of children and younger people filter less UV light than those of the older population, putting younger people at more risk from unsafe viewing practices, during an eclipse.

Retinal damage from sun gazing is, of course, possible under normal daylight conditions. However, the special conditions occurring at the time of a solar eclipse, near totality, including low levels of visible light combined with sufficient harmful ultraviolet and short wavelength radiation, are associated with an increased risk. During an eclipse, the visible brightness of the sun is diminished due to the moon's shadow, making viewing more comfortable, but the hazard from phototoxic short wavelengths remains. Direct sun gazing, or sun gazing with an inadequate filter, can cause permanent visual changes and patients may present with bilateral eye complaints. Clinical features may include reduced visual acuity, central blindspots and altered colour or shape perception and/or photophobia (Keightley 1999). A thermally enhanced photochemical process is considered to cause this solar retinopathy, but the exact mechanisms are not completely understood (Istock 1985). Solar retinopathy occurs painlessly and may not be evident for days or weeks after viewing a partial or total eclipse.

The risk posed by the 4 December 2002 total eclipse was not quantifiable as information about the incidence of solar retinopathy associated with a solar eclipse is poor. The relevant literature tends to focus upon case series. For example, the Royal College of Ophthalmology recorded 60 cases of solar eclipse burns in the 6 months after the 11 August 1999, total eclipse in Britain (BOSU 2000). A total eclipse occurred in India on 24 October 1995 and subsequently 21 patients were referred to the Dr Rajendra Prasad Centre for Ophthalmic Sciences with visual damage attributable to inappropriate eclipse viewing (Verma 1996). In 1980, a partial solar eclipse over Chandigarh, India, resulted in 30 patients presenting to the local Eye Department and of these 10 patients were found to have clinical evidence of solar retinopathy (Dhir 1981).

Development of Eye Health Messages

Available evidence on the technical and medical aspects of solar retinopathy was analysed, to form the scientific basis for a series of public health messages to be delivered to the community in the months leading up to the eclipse. This eye safety information for the South Australian public awareness campaign was coordinated by the Environmental Health Service (EHS) in collaboration with the Royal Australian and New Zealand College of Ophthalmologists (RANZCO) and Optometrists Association Australia (OAA). Development of this information into brochures, posters and key messages for the public was undertaken by Health Promotion SA (HPSA).

Eclipse Viewers

A difficult issue to be addressed was the safety or otherwise of "eclipse viewers" (otherwise referred to as "eclipse shades"). During the lead up to 4 December 2002, various groups, including the Astronomical Society of South Australia, were marketing eclipse viewers as "safe" for viewing the eclipse. However, as evidence of their safety is lacking, the Department of Human Services (DHS), RANZCO & OAA did not endorse their use.

The EHS and HPSA considered that it was important to include reference to these viewers in public health information, and an alert to this effect comprised part of the health messages developed (brochures, website information, media releases). Warnings included advice to those who chose to use eclipse viewers that they did so "at their own risk" and to "ensure the filters are both undamaged and fully cover the eyes". The safety or otherwise of eclipse viewers continues to be an issue of debate worldwide. Future Australian health promotion activities around eye protection during a solar eclipse would be greatly assisted if a suitable standard for eclipse viewers was accepted nationally. The National Public Health Partnership Group has requested that Standards Australia consider developing a relevant standard.

Posters, Brochures and Targeted Information

The general public and several target groups were the focus of the information developed by Population Health. The target groups included school children (because children are more susceptible to eye damage from solar radiation), tourists (particularly those along the path of totality), and residents of detention centres and remote Indigenous communities, who were located close to the path of totality and have a poor level of English literacy.

Attractive solar eclipse eye safety posters and brochures were developed by Health Promotion SA (HPSA) and the Environmental Health Service sections of Population Health and these were endorsed by RANZCO & OAA (See Poster available from the author). The key message was "Don't ever look directly at the sun", but the posters and brochures also provided information about unsafe methods of viewing the eclipse and safe, indirect methods to be used as an alternative. A more diagrammatic version of the poster was developed for those communities with less command of the English language. These were distributed to the Detention Centres and Aboriginal Health Workers.

The posters and brochures were distributed by the Environmental Health Branch, the South Australian Tourism Commission (SATC), RANZCO and OAA to all South Australian primary and secondary schools, local councils, health centres and hospitals, detention centres, optometrists, ophthalmologists and general practitioners. The eye safety information was also distributed widely throughout each of the communities along the path of totality, particularly focusing upon the township of Ceduna.

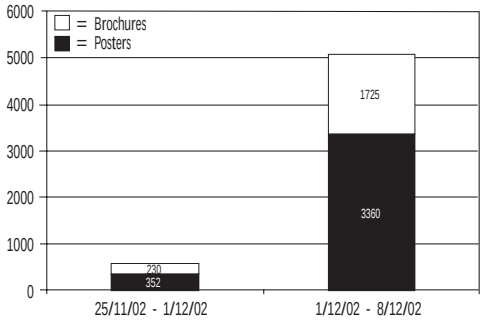
All primary and secondary schools in South Australia were sent an information pack in addition to the posters and brochures. The educational material about the solar eclipse included instructions on how to construct a "safe" solar viewer. This educational material was developed in collaboration with the Department of Education Training and Employment. In addition, an article was developed for "X-Press", the fortnightly newsletter for teachers.

Distribution of the message also occurred within various South Australian health industry networks including the Australian Institute of Environmental Health, the Australian Medical Association (SA Branch), the Divisions of General Practice and the SA Public and Environmental Health Council. Information was provided in various forms including presentations at conferences, newsletter items, e-mail alerts

and hard copies of the promotional materials. A specific questionnaire survey protocol to detect cases of solar eclipse-induced eye damage was prepared by the Environmental Health Service and distributed to ophthalmologists and optometrists by RANZCO and OAA respectively.

An eye safety health alert was first placed on the DHS website five months prior to the eclipse, and was regularly updated in the lead up to the eclipse. During the three days up to and including the day of the eclipse, 666 hits were registered for the solar eclipse health alert. Links from this "health alert" included educational material regarding the solar eclipse developed by the CSIRO as well as instructions detailing how to construct a safe solar eclipse projector. In addition links were arranged to allow visitors to the CSIRO's "Eclipse Science" website to download the poster and brochure developed by Population Health. This proved a most successful tool in that 3712 posters and 1955 brochures were downloaded from the site during the two weeks around the eclipse (Figure 1). The CSIRO live webcast (www.csiro.au/eclipse/) was also promoted on the DHS Health Alert as a safe method of viewing the eclipse.

Figure 1: Downloads of DHS solar eclipse eye safety material from the CSIRO website during the two weeks around the 4 December 2002 eclipse



Prepared information regarding eye safety was provided to the South Australian Tourism Commission (SATC) for inclusion in promotional material including a detailed booklet "Eclipse in the Outback", the relevant SATC website at http://www.eclipse2002.com.au and features in South Australian newspapers. SATC also assisted in distributing brochures at various tourist destinations including the public sites set up along the path of totality.

Media releases were developed and managed by Health Promotion SA (HPSA) including medical advice provided by the Environmental Health Service, RANZCO and OAA. On 13 November 2002, DHS released the first eye safety media release, which also contained the HPSA diagram of viewing the eclipse safely using pinhole projection. This information was used on television news items, appeared in numerous regional papers, and on metropolitan and rural radio in the lead up to the eclipse.

On 20 November 2002, the Director of the Environmental Health Service presented at a media briefing held by the South Australian Tourism Commission. The briefing was attended by television stations, ABC radio and print journalists, and was followed by the Advertiser's 30 November (Saturday) front-page headline stating "Don't Look". The story warned of the dangers of the solar viewers and included information from Western Australia where the sale of the eclipse viewers had been banned. A prominent story on eye safety followed the next day in the Sunday Mail.

A final media release was sent out to all media outlets on 3 December 2002, the day before the eclipse. This resulted in heavy radio and television coverage throughout the day. Media interest was intense and four of the five TV stations carried live pictures of the eclipse from Ceduna.

Path of Totality

Estimates of numbers of spectators for the event were between 25,000 and 28,000 with an additional 10,000 distributed between Laura, Denial and Nadia Bays and Davenport Creek. Anecdotal reports from

Environmental Health Officers located along the path of totality at the time of the eclipse indicated that many people used eclipse viewers and in some cases welders masks, in order to view the eclipse. Many who chose to use eclipse viewers looked towards the sun in short bursts rather than taking a prolonged view. There was much sharing of the eclipse viewers among the spectators. The experience of a total eclipse was generally considered well worth the effort many had gone to in terms of time and travel expense in order to be within the path of totality.

Surveillance for Solar Eclipse Eye Injuries

A survey form was developed and distributed to all optometrists and ophthalmologists in South Australia. Reports of patients presenting with suspected solar eclipse eye damage identified between 4 December 2002 and 4 March 2003 were sent to a central registry located within Population Health of the DHS (the Injury Surveillance and Control Unit).

In the 3-month surveillance period after the eclipse, five adult patients (four males and one female) were referred to ophthalmologists with suspected eye damage as a result of the solar eclipse. All patients lived in South Australia. Four of the reported patients were in the Adelaide metropolitan area at the time of the eclipse and none were in the path of totality. Examination by ophthalmologists revealed no evidence of solar eye damage in any of these cases. There were no reports of children with eye symptoms related to the event.

Four of the five patients were aware that viewing the eclipse could damage vision at the time of the eclipse. All four had learnt of the potential danger from television items, with additional information being gathered from the radio (2/4) and newspapers (1/4). Personal contact with all South Australian ophthalmologists was made at the completion of the surveillance period to ensure that all cases had been reported. The surveillance network in South Australia did not receive any reports relating to tourists visiting South Australia at the time of the eclipse.

Conclusion

The public health campaign provided essential advice to the community (through brochures, posters, websites, newspapers, radio and television) regarding the danger of directly viewing the sun in the lead up to the 4 December 2002 eclipse. Due to lack of conclusive evidence regarding their safety, the DHS did not endorse the use of "eclipse viewers", but did warn those who chose to use them to "ensure the filters are both undamaged and fully cover the eyes". The experience gained from this event highlighted the need for an Australian standard for eclipse viewers. The National Public Health Partnership has forwarded a letter to the CEO of Standards Australia to this effect, however, the development of such a standard can be expected to take many years, should this be the chosen course of action.

The eye health outcomes from the 4 December eclipse were excellent for South Australians, with no confirmed cases of solar eye damage from only five suspected cases. Possible reasons for this include the combination of a comprehensive public health campaign, significant cloud cover in many parts of South Australia, together with a relatively short eclipse occurring when the sun was low in the sky (7.40pm). It is also plausible that protection was provided through the use of "eclipse viewers". Anecdotal reports indicate these viewers were used by many people who were on, or near to, the line of totality at the time of the eclipse. Further investigation to determine the safety and effectiveness of eclipse viewers when used in a community setting is, however, required. Although an uncommon event, the materials developed for this public education campaign will be useful for future solar eclipses in Australia.

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Application of Economic Evaluation in Environmental Health

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This report seeks to provide an overview of the development and content of the recently released enHealth Council's Guidelines for Economic Evaluation of Environmental Health Planning and Assessment. The overview is from the perspective of an environmental health practitioner and its purpose is to provide other practitioners with an introduction to this area of relevance. It describes a range of economic evaluation principles and methods and how they can be applied to environmental health practice. A case study of these principles as applied to an environmental health issue is then presented.

In our modern system of health care there is constant competition between treatment and prevention services. The "public health" and "environmental health" elements of prevention services are major components of this system that compete for funding. There is also competition for funding between different government agencies that are involved in protecting the health and environment of citizens. As such, the development of economic arguments supporting environmental health activities are increasingly required to secure both current and future environmental health management programs.

In order to develop an appropriate methodology for use in the environmental health area, there seemed to be a need for an approach that combined the strengths of health economics and environmental economics to enable the appropriate assessment of both marginal (intangible or uncertain) and absolute costs that result from environmental health programs. The implementation of such a methodology might also foster improved collaboration between environment and health agencies as well as the many other government agencies involved in environmental health activities.

Development of the Economic Evaluation Guidelines

Launched in 1999, the National Environmental Health Strategy established the enHealth Council as the peak environmental health advisory group for Australia. The National Environmental Health Strategy and its Implementation Plan (NEHSIP), identified the need for environmental health economic evaluation methodology that provided a link between techniques used in environmental economics and health economics. Under the NEHSIP, a national workshop was convened in April 2000 to investigate and discuss the application of economic evaluation methodologies for environmental health planning. This workshop identified a range of issues to consider when applying economic evaluation methodologies to environmental health activities and recommended to the enHealth Council that guidelines be developed. The enHealth Council agreed that the development of guidelines for environmental health economic evaluation was a priority and agreed to allocate project funding for this purpose. The project was overseen by a steering committee and managed by Queensland Health. During 2001 and 2002, a consultant was engaged to develop the guidelines. The project included the following stages:

1. The production of a Scoping Paper that: (a) reviewed and assessed the available economic evaluation methodologies relevant to environmental health, (b) discussed resources currently available for use in economic evaluation, and (c) provided details of possible case studies that demonstrate the application of these methodologies.

2. The development of a draft of the guidelines, which was then released for public consultation. This included a national workshop to initiate discussion on the guidelines and the key issues/barriers for application of the guidelines into environmental health practice; and

3 The release of a final version of the guidelines, which incorporated comments from a wide range of stakeholders.

The Guidelines

The *Guidelines for Economic Evaluation of Environmental Health Planning and Assessment* describe the process of economic evaluation and how it can be applied to environmental health policy issues. The *Guidelines* consists of two volumes: volume 1, the *Guidelines* and volume 2, the *Case Studies*.

The *Guidelines* outline what economic evaluation is, what the steps are in the standard approach to undertaking an economic evaluation, and then discusses each of these steps in some detail. The major principles and practices of economic evaluation are described, with guidance being provided to non-economists on how these methods can be used to inform decision making and aid in policy development.

Definitions

Benefit - anything that makes someone better off than the base case (status quo).

Cost - anything that makes someone less well off than the base case - a measure of what must be given up to acquire or produce something.

Discounting - a method for adjusting the value of future costs and benefits to an equivalent value today to account for time preference and opportunity cost, i.e. a dollar today is worth more than a dollar a year from now (even if inflation is not considered).

Distributional analysis - a general analysis of the distributional impacts of a policy, where the distributional impacts describe the costs and benefits a policy has on different groups of people in terms of demographics, geographic location and other descriptive factors.

Incremental costs - the additional cost of producing one more unit of output by an alternative intervention/policy.

Marginal cost - the additional cost of an intervention/policy to produce one additional unit of output.

Market value - the price at which a unit of a good or service can be purchased in the current market. The market price may not necessarily be a competitive price.

Net Present Value - the sum that results when the discounted value of the costs is deducted from the discounted value of the benefits.

Net Social Benefit - the overall value of a policy and is the difference between total benefit and total cost.

Opportunity cost - the value foregone by using a resource (or acting) in one way rather than another.

Sensitivity analysis - calculations undertaken to indicate the degree of influence each factor has on the outcome of an analysis.

Willingness to pay - a method of measuring the value an individual places on reducing the risk of death or illness and on environmental impacts or improvements, by estimating the maximum dollar amount an individual would pay to achieve a given outcome.

What is economic evaluation?

Because resources are scarce and there are often choices that need to be made regarding their use, economic evaluation is a method or process that allows comparison of the costs and benefits of using resources in a particular way. The costs to be considered also include the benefits of other choices that are forgone when making a particular choice. An economic evaluation has the following core components:

- identifying the issues to be resolved
- identifying major options
- expressing costs and benefits as far as possible in monetary units

- weighing these costs and benefits to allow for their timing (known as discounting)
- estimating an overall net social benefit (this may be positive or negative).

Steps in the economic evaluation process

The *Guidelines* describe the following key steps in undertaking a full economic evaluation: (i) identify the issues and objectives, (ii) establish the baseline scenario (i.e. the status quo), (iii) develop policy, program and/or project options, (iv) identify incremental impacts: costs and benefits of the particular options as compared with the baseline scenario, (v) quantify/value the costs and benefits, (vi) estimate the overall value of the policy or project, (vii) test the effects of the policy/program risks, (viii) consider equity and distributional issues, and (ix) prepare a report.

Economic evaluation frameworks

The *Guidelines* discuss the use of a number of methods or frameworks of economic evaluation.

Cost-benefit analysis

Cost-benefit analysis (CBA) is regarded as the "gold standard" of economic evaluation and is the method recommended for use by the *Guidelines*. CBA seeks to determine if the estimated total benefit of a policy or intervention (in dollar terms) exceeds the total costs and therefore has a "net social benefit".

Benefits and costs are assigned values based on the preferences of the individuals gaining the benefits or bearing the costs. To determine these values, analysts estimate what people are "willing-to-pay" for goods, including non-market goods and health (e.g. pain and suffering, improvements in visual amenity), and what firms are "willing-to-pay" for resources that produce these goods.

As most people place a higher value on present compared with future consumption and as capital spent for one purpose means that the return on an alternative use is foregone, a key element of CBA is "discounting". This also takes into account the timing of policy impacts, where costs are generally incurred before benefits are gained. Discounting therefore provides a technique for adjusting the value of future costs and benefits to an equivalent value today to account for time preference and opportunity cost, that is, a dollar today is worth more than a dollar a year from now (even if inflation is not considered). There is, however, much debate on what is an appropriate discount rate. This is due to differing opinions on whether the discount rate should be based on the consumer rate of discount or the producer rate of discount. Currently, discount rates recommended by various government agencies seem to range between 5% and 7%. As such, the *Guidelines* propose the use of a 5% discount rate with sensitivity rates ranging from 3% to 7%.

In addition, many costs and benefits are uncertain or intangible (i.e. no obvious market price can be assigned), and as such, economic evaluations should include sensitivity tests that show how the estimated net social benefit changes with key assumptions. When cost or benefits cannot be quantified, it is good practice to include a qualitative assessment of these factors to allow for adequate consideration of their impact. When it is difficult to quantify a major benefit or when a full CBA is too difficult or expensive, other methods of economic evaluation might be useful.

Cost-effectiveness analysis

Cost-effectiveness analysis (CEA) is an economic analysis in which all costs are related to a single, common effect and can be used to determine the minimum cost of achieving a given output. It is therefore used to assess the cost effectiveness of various approaches to delivering an output once the

output has been decided on (in comparison to CBA that is used to help decide which outcomes/outputs are worthwhile). In this case, the output is measured in a physical unit (e.g. lives saved, disability avoided, incidence of disease reduced), and costs are shown in dollars. Therefore, the cost of the intervention is described in terms of cost per unit of output (e.g. cost per life saved). A CEA is easier to perform than a CBA in that it does not need to value benefits in monetary terms. However, CEA does not show whether the output justifies the costs and can not deal with a policy that produces multiple outputs.

Cost-utility analysis

Cost-utility analysis (CUA) is a type of CEA and can be viewed as a compromise between CBA and CEA. CUA is more able to deal with multiple outputs through applying an index measure of health benefits, such as a Quality of Life (QoL) index. Therefore, the cost of an intervention is described in terms of cost per unit of health benefit. Typically, a QoL value of 1.0 represents a state of perfect health, and a QoL of zero corresponds to an impaired state of health that is judged to be equivalent to death. Often, the index measure used is a "quality adjusted life year" or QALY. This is equivalent to a year in full health. A CUA does not attempt to estimate the monetary value of QALYs or other health indices. This avoids the difficulties associated with putting money values directly on health. As QALYs incorporate factors associated with the length and quality of life, they allow the various outcomes to be compared and ranked according to the costs per QALY gained. However, CUA does not help policy makers when they have to trade off various costs and benefits.

Financial analysis

As the name implies, financial analysis deals with the revenues and expenditures anticipated by a specific party or proponent (e.g. a developer) and associated with undertaking a particular project. It does not consider social welfare costs and benefits and is only concerned with financial flows.

As this method does not account for non-financial impacts on the proponent and excludes all impacts on other parties, it can be considered as a complement to a full economic evaluation, but it is not a substitute method of evaluation when the "net social benefit" is to be considered.

Which method to choose?

The *Guidelines* provide the following advice on how to choose the right economic evaluation method for a particular situation:

- always start by considering a full CBA
- if a full CBA is not practical, prepare a simplified CBA
- if a CBA is not practical because the output cannot be valued in dollars, or because the required data is inadequate or too costly to collect, consider undertaking a CEA
- where the outputs are mainly health benefits, a CUA may be preferred to a CEA
- consider if a financial analysis is required to complement a CBA or CEA/CUA.

Estimating benefits

Most environmental health interventions produce a range of benefits. While these benefits may be valued as a whole, it is common to value them separately and then aggregate the benefits. Assessment of the benefits of a policy involves:

- identifying potentially affected benefit categories (i.e. developing an inventory of the physical effects that might be averted by the policies)

- quantifying significant physical effects on the environment
- quantifying the health impacts of these environmental changes
- estimating how the physical changes affect human production and consumption
- estimating the values of the effects on people.

Because it is often not feasible to conduct primary research to develop valuations for the specific health and environmental benefits under study, analysts often have to modify and adopt benefit values found in other studies; this process is known as benefit transfer. It is common practice to adopt mean estimated values from studies that are considered to be broadly similar, but in some situations it may be appropriate to adopt a higher or lower value to reflect local conditions.

Health benefits

Where the government is the main supplier of health services, an environmental improvement provides benefits to four main groups:

- persons who would have been ill in the absence of the improvement
- government, which saves health treatment costs
- third parties, including family and carers of patients
- third party payers, which are mainly insurance companies whose payouts are reduced.

Overall, the types of health benefits resulting from environmental health interventions can be categorised as:

- savings in health treatment costs - despite being reasonably straightforward to calculate, there are a number of difficulties in making accurate estimates of these benefits. Fortunately, the Australian Institute of Health and Welfare has made detailed estimates of the costs for a wide range of medical and hospital services
- gains in productivity in the marketplace and the household - these are generally measured through an increase in wages or salaries
- personal health gains - these consist of longer life expectancy and improved health-related quality of life. Reduced mortality risks are generally measured in terms of statistical lives saved, which can be converted to statistical life years saved by multiplying expected lives saved by the average number of years saved. As mentioned previously, quality of life indices (such as QALYs) have been developed to describe the multiple dimensions of health (pain, morbidity, need for care, and so on) in a single index number
- quality of life gains for third parties - it is generally difficult to measure the grief and pain experienced (or the relief of suffering) by family and friends. One approach is to add an amount (say 20 or 30%) to the estimated cost of an individual's illness. Another approach is to acknowledge that the suffering of friends and family is important but not to quantify it in the analysis.

Valuing health and life

The basic measures for estimating monetary values for health and life are: the value of a statistical life (VOSL), the value of a healthy life year (VOLY), and the value of a partly healthy life year or the value of a symptom day.

The VOSL and VOLY are related, with the VOLY generally derived from an estimated VOSL. For example, if the value of a statistical life is deemed to be $1.0 million and this is based on a life expectancy of 39 years (as is the case for road accidents), the value of a life year will be approximately $60,000 if the discount rate is 5%. Therefore, if an environmental intervention increased the lives of potential cancer patients by 10 years, the value of life saved would be $463,000 - the present value of $60,000 for 10 years and discounted by 5%. If that same environmental intervention prevented the loss of 10 years of life for someone who is suffering from impaired health with a QoL value of 0.8 (where 1.0 corresponds to perfect health), the value of each life year gained would be $48,000 (i.e. 0.8 x $60,000) and the present value of life saved would be $370,000.

There is, however, much debate on what is an accurate estimate of the VOSL. In the USA, the US EPA found that reported VOSLs ranged from US$0.7 million to US$16.3 million and therefore they recommend a central tendency figure for VOSL of US$6.1 million (in 1999 prices). This figure is significantly higher than the VOSL used by the UK Department of Environment and Transport which is £850,000 (in 1996 prices). Based on the various overseas studies, the *Guidelines* use an average value of A$2.5 million as a realistic figure for VOSL in Australia.

There is a range of methods that can be used to value health. The traditional method is the cost of illness (COI) method (also known as the Human Capital approach) in which loss of health status is measured by estimating the loss of an individual's earnings and where the loss of life is valued at the present value of earnings foregone. As it does not measure factors such as pain and suffering and loss of leisure time, the COI approach is generally regarded as providing the lower bound estimate of the true cost of illness. In addition, the COI method does not measure what people are willing to pay to avoid an illness or reduce risk of illness or death. As such, a range of willingness-to-pay methods have been developed. There are two main categories of these methods: revealed preference methods derive values from observing the actions of people (e.g. hedonic wage method and averted expenditure method); and stated preference methods which elicit valuations by asking people what they would be willing to pay for things such as improvements in health status and improved environmental conditions (e.g. contingent valuation method and stated choice method).

Environmental benefits

Benefits from environmental policies can be broadly classified into those that directly affect people, their health and welfare, and those that affect human welfare through systems or processes. Direct effects include human health improvements or a reduction in adverse effects, with these being described in the previous sections. Another direct benefit is improvement in amenities (e.g. aesthetic attributes associated with environmental attributes), with improvements in taste, odour and appearance of drinking water as an example.

Environmental benefits that affect human welfare through systems or processes include reduced materials damage and ecological benefits. Ecological benefits include improved productivity of natural resources (e.g. improvements in commercial fishing catches, improved agricultural yields) and improved non-market benefits in recreational opportunities (e.g. fishing, boating) and aesthetics (e.g. scenic vistas). There might also be indirect ecosystem benefits such as flood mitigation, groundwater recharge and soil retention. Similar to the valuation of health benefits, both market methods (e.g. benefits are estimated using data on market transactions) and willingness to pay methods are used to value environmental benefits. Unfortunately, few direct markets

for environmental goods and services exist, and so the willingness to pay methods are widely used to value environmental benefits.

Estimating costs

Costs and benefits are essentially symmetrical, with the cost of a resource being the value of goods that society foregoes. The cost of using a resource is known as its opportunity cost. Environmental regulations might impose costs on the following parties:

- business - generally a new regulation will require a firm to comply with an environmental standard and they may adopt a range of strategies to achieve this. These include the installation and operation of new pollution control equipment, changes to production processes, a reduction in production, or relocation of operations. The cost to a firm of reduced output or relocated production is a loss of net revenue and in addition, workers may lose wages

- governments - might incur resource costs in providing public infrastructure or environmental protection services (e.g. water treatment). They might also incur regulatory costs in monitoring, administering and enforcing new regulations

- consumers - might bear costs due to higher prices for services or goods (that are passed on by business or government) or a loss of consumer surplus when the output of services falls or is restricted. They might also incur direct costs due to required behaviour changes

- third parties - parties who are not directly involved in the production or consumption of a regulated activity might also be affected. These might be businesses who lose some producer surplus or individuals who lose some consumer surplus.

Economic analysis in policy making

Economic evaluation assists policy makers through the presentation and analysis of information. To be effective, economic analysis should be part of the overall policy development process. Although economic evaluations focus on single number results (e.g. net present value), to be credible, they should fully describe the data sources used, assumptions made and their justifications. As far as possible, an economic evaluation should assign dollar values (i.e. monetise) on policy effects and should describe the major components of costs and benefit. This helps policy makers to compare the various elements of cost and benefit.

The main aim of cost benefit analysis is to determine the policy that maximises net social benefit. This maximises the value of goods available to the community, including the value of non-marketed goods. When the benefits exceed the costs, any losers from a policy can be compensated, so that at least some people gain and no one loses. It is a reality that most policy changes have an adverse effect on some people, which is of concern to policy makers. Economic evaluations should therefore provide an analysis of the distributional effects of policy changes, or at least show that the policy change does not have an adverse impact on poorer groups in the community.

The Case Studies

Through the use of four case studies, the *Guidelines* illustrate the application of economic evaluation methods to the following environmental health issues:

- mandatory fencing for backyard swimming pools in NSW

- policies to ensure public health by improving water quality in Wallis Lake, NSW

- risk reduction policies for Legionnaires' disease in Victoria
- policies for sulphur dioxide emission from Mount Isa Mines, Queenland.

The first two case studies are full evaluations undertaken by the consultant, with the other two case studies being critiques of evaluations produced by the Victorian Department of Human Services and the MIM Panel Assessment Study, respectively. A summary of the Wallis Lake case study is presented in the following section. This case study represents a full evaluation undertaken from "scratch" by the consultant and illustrates a "classic" environmental health scenario. It also provides a good example of the methodological and technical issues that may be encountered when undertaking an economic evaluation of an environmental health intervention.

The Wallis Lake Case Study

In 1997, the consumption of oysters from Wallis Lake, NSW was associated with a large foodborne illness outbreak. Following this incident, the State and local governments initiated policies to improve water quality and ensure safer oyster production. These included:

- policies to prevent human waste entering Wallis Lake
- increased monitoring of water quality in Wallis Lake
- stronger measures to ensure safer oysters
- stronger measures to deal with animal waste
- a range of improvements in catchment management.

This case study evaluated the first three of these policies, with the costs and benefits assessed relative to a baseline scenario of the policies for human waste disposal, oyster production and water quality in place at the end of 1996. Costs and benefits of policy changes were assessed over the period 1997 to 2020 in 2000 prices (see Table 1).

Policy/Program costs

This case study identified the costs of policies to improve water quality included:

- a substantially augmented district sewerage system
- improved on-site sewerage systems for existing and new homes
- improved maintenance and increased Council monitoring of on-site systems
- improved public toilets on islands in the lake
- increased testing of oysters
- increased monitoring of water quality in Wallis Lake.

With a 5% discount rate, the estimated present value (PV) of costs = $13.9 million.

Policy/Program benefits

The evaluation also identified the following benefits:

- consumers of oysters who avoid ill health
- oyster producers who gain income from increased output
- local property owners who have increased residential amenity
- local landowners who can subdivide and develop their property
- visitors to the area who do not have to switch to a less preferred holiday location
- owners of caravan parks whose risk of a major adverse incident is reduced.

Table 1: Economic evaluation of selected policies to improve water quality in Wallis Lake ($s 000, 2000 prices)

Policy Options	1997	1998	1999	2000	2001	2002	2003	2004	2005	2006 to 2020#	PV@5%
Costs											
Human waste disposal											
District sewerage system		1000	2000	2000							4,494
Extra operating costs				10	10	10	10	10	10	10	128
New houses on-site system		60	60	60	60	60	60	60	60	60*	701
Existing houses on-site costs	120	540	620	500	500	500	500	500			3010
Property owner maintenance			248	248	248	248	248	248	248	248	3264
Council sewerage monitoring		80	80	80	80	80	80	80	80	80	1079
Public toilets		60	20	20	20	20	20	20	20	20	308
Communications		20	20	20	20	20	20	20	20	20	270
Total	120	1760	3048	2938	938	938	938	938	438		12607
Oyster testing		80	80	80	80	80	80	80	80	80	1079
Water quality monitoring		22	22	22	22	22	22	22	22	22	297
Total	120	1862	3150	3040	1040	1040	1040	1040	540		13918
Benefits to											
Oyster consumers		266	266	266	266	266	266	266	266	266	3588
Oyster producers		200	200	200	400	400	400	400	400	400	4851
Existing Nabiac residents				1920							1829
District landowners				800	800	800	800	800			3464
Visitors to Great Lakes				26	26	26	26	26	26	26	333
Caravan parks				8	8	8	8	8	8	8	103
Total	0	466	466	3220	1500	1500	1500	1500	700	700	12985
Benefits less Costs	-120	-1396	-2684	180	460	460	460	460	160		-933

*# Costs/benefits per year 2006 to 2020 * Costs to 2015*

In addition, local businesses benefit from avoiding revenue loss in a crisis. However, this would be at the expense of businesses in other areas and was not included in the basic economic evaluation.

With a 5% discount rate, the estimated present value of benefits = $13.0 million.

Costs and benefits compared

Therefore, when the costs and benefits were compared, the costs were found to be larger than the benefits with a net present value of -$0.9 million. The range of values produced by the sensitivity analysis is shown in Table 2. These indicate that depending on the choice of discount rate and length of evaluation period, the NPV could range between $29,000 and -$1.2million.

As with all evaluations, there were a number of uncertainties in this case study.

Table 2: Sensitivity analysis ($s 000, 2000 prices)

Overall results 1997-2020		Results 1997-2025	
NPV @ 7 per cent	-1,249	NPV @ 7 per cent	-1070
NPV @ 5 per cent	-933	NPV @ 5 per cent	-637
NPV @ 3 per cent	-466	NPV @ 3 per cent	29

These included:

- incremental cost of Nabiac District sewerage scheme
- incremental capital and maintenance costs of the on-site sewerage requirements
- benefits of improved sewerage systems to various property owners

- costs of illness (value of a healthy year used was $150,000)
- probability of hepatitis and Norwalk viruses without, and with, the new policies.

One could then ask, "among the local residents, who were the winners and losers?" Winners included local oyster producers whose gains exceeded their incremental expenditures, local oyster consumers, local landowners who can subdivide their land after reticulated sewer services are provided, and local businesses. The main losers were those residents required to invest in and maintain improved on-site sewerage systems.

Key points from the case study

Overall, this case study illustrates a number of issues that impact on the economic evaluation of environmental health issues:

- there can be significant uncertainty in the accurate determination of costs and benefits. For example, impacts such as pain and suffering are difficult to quantify
- it is important to identify the problems to be addressed and the options for solving them. For example, in this case study, a range of policies that involved a large expenditure were implemented partly because it was difficult to identify the cause of the outbreak
- policies that address environmental health issues have a wider impact than just health and environment. These may include: tourism, land values, use of public space, productivity and employment.

Conclusion

The *Guidelines* provide an overview of what economic evaluation is and how it can be applied to environmental health policy issues. As there are a large number of general resources available, the *Guidelines* attempt to synthesise this information and provide direct examples (through the case studies) of the benefits of using such a process in addressing environmental health issues. The overall aim of the *Guidelines* is therefore to provide environmental health policy makers with a "ready reference" that will assist in the decision making process and in providing sound economic arguments for resource allocation in environmental health.

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Study of Nitrate and Nitrite Concentration in Drinking Water Wells

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Ground water is the major source in the provision of the water supply for industrial areas and cities. Nitrate and nitrite are ions which exist in the natural cycle of nitrogen and are the most important chemical elements which when mixed in the water might have a harmful effect on health. The current study was carried out to assess the concentration of nitrate and nitrite in potable ground water in Urmia city, West Azarbyjan Iran. The method in this research is a descriptive cross - sectional study. A total of 156 samples of water was taken from 39 deep wells within one year (4 seasons). The collected samples were examined by colorimetric and ultraviolet spectrophotometric standard methods and the results compared with WHO standard levels. Findings indicated that the average yearly concentration of nitrate and nitrite in the samples was less than the standard levels of 17.66 mg/l and 0.0005 mg respectively. The maximum concentration of nitrate was in the winter season. T-test analysis was used for comparing nitrate in different seasons. There was a significant difference between the concentration of nitrate in the winter season with the concentrations found in the other seasons (p<0/05). However, it was concluded that there was no observed pollution of drinking well water in Urmia city. It is recommended that continous control and measuring of nitrate and nitrite is necessary to prevent the pollution of drinking water.

Key words: *Nitrate; Nitrite; Concentrations; Drinking Water*

Nitrate and nitrite are considered together because conversion from one to the other occurs in the environment (World Health Organization (WHO) 1984). Sources of nitrate are everywhere: "Nitrate is produced naturally in our bodies and is found in our diet and drinking water" (Tevis 2001). Nitrates are widely present in substanial quantities in soil, in most waters, and in plants, including vegetables (World Health Organization (1978). A study was carried out in Wisconsin by Schubert (Schubert et al. 1999) and he pointed out that nitrate is one of the most common contaminants in ground water. Although small amounts of nitrate might be present in ground water from natural degradation of plant materials, most nitrate contamination probably results from human activities, including agricultural fertilisers, animal wastes, or seepage from septic tanks or municipal sewage facilities, which are all possible sources of nitrate contaminants (Schubert et al. 1999; Weyer et al. 2001).

Nitrate contamination is more likely to occur in shallow wells and in wells which are poorly located, constructed or maintained (Weyer et al. 2001). A study in Iowa showed an increasing contamination of municipal wells and private well water and (surface water supplies) by nitrate, primarily from the widespread use of commercial fertiliser as well as from human and animal waste. This has been documented in many areas of the

USA (World Health Organization [WHO] 1984; Hallberg 1996; L'hirondel & L'hirondel 2002).

Ground water is a vital national resource in Iran, and it is used for many purposes, including public and domestic water supply systems, unfortunately this source is vulnerable to contamination. A study was carried out in several parts of Iran, including Arak and Mashad townships and in the North, Gilan and Mazandran provinces. Results showed that nitrate concentrations in ground water supplies have steadily increased well past the guidelines established by WHO in 1997 (11.3 mg/l NO_2 or 50mg/l NO_3), and are considered to be unsuitable for human consumption for this reason alone (Imandel, Farshad & Mir-abdollah 2000).

Nitrate in the environment is a risk factor for human health. Specifically, the contribution of nitrogen-containing fertiliser to high levels of nitrate in food and drinking water has been identified as an environmental health concern (Weyer et al. 2001). Excessive nitrate in drinking water causes methemoglobinemia in infants up to 6 month of age (Environmental Protection Agency 1977; Tevis 2001; Weyer et al. 2001). Nitrates are reduced to nitrites by bacterial action in the intestine and following absorption, they react with hemoglobin and oxidise it to methemoglobin. The health risks from exposure to nitrates are, therefore, related not only to their concentration in drinking water and food, but also to the prevailing conditions that allow their reduction to nitrites (Gupta et al. 2001). More recently, nitrate has been the focus of cancer research. The University of Iowa study found that women who drank nitrate polluted water over a long period of time had an almost three-fold risk of bladder cancer (Tevis 2001).

The main objective of the current research was to assess nitrate and nitrite occurrence in drinking water wells of Urmia city and to compare them with the standard levels.

Materials and Methods

The method of study in this research is descriptive cross-sectional. The drinking water of Urmia city is provided mainly from ground water sources (39 deep wells providing 80%) and the Sharchaie River providing 20%. A total of 156 samples of water was taken from 39 deep wells within one year, that is for four seasons. Samples taken from wells were collected in polyethylene containers (preserved by adding H_2SO_4 to bring the pH below 2, refrigerated for more than 48 hours storage, and analysed as soon as possible for nitrate and nitrite by colorimetric and ultraviolet spectrophotometric screening standard methods respectively (American Public Health Association [APHA], American Water Works Association [AWWA], Water Environment Federation [WEF] 1998). Collected data were entered into a computer and SPSS software was used for the analysis of the data. The mean, standard deviation, range, and T-test, were used for comparing data with the recommended World Health Organization Standand (1984).

Results

The results obtained from the examinations of drinking water samples (from deep wells) within one year in different seasons have been illustrated in Tables 1 and 2 and Figures 1 and 2. As Table 1 and Figure 1 show, the yearly average of nitrate was 17.66 mg/l. The seasonal average of nitrate in different seasons was: autumn 14.52 mg/l, winter 22.66 mg/l, spring 20.59 mg/l and summer 12.83 mg/l.

Table 1: Nitrate concentation in drinking well water in different seasons

Parameter/ Season	Mean	SD	Mc Mg/l NO_3	Range	
				Max	Min
Autumn	14.58	11.95	50	57.24	0.59
Winter	22.66	13.70	50	56.03	1.93
Spring	20.59	14.85	50	61.73	3.76
Summer	12.83	16.64	50	59.65	0.59
Total year	17.66	14.32	50	58.66	1.23

Figure 1: Seasonal variations average of nitrate concentration in drinking water wells

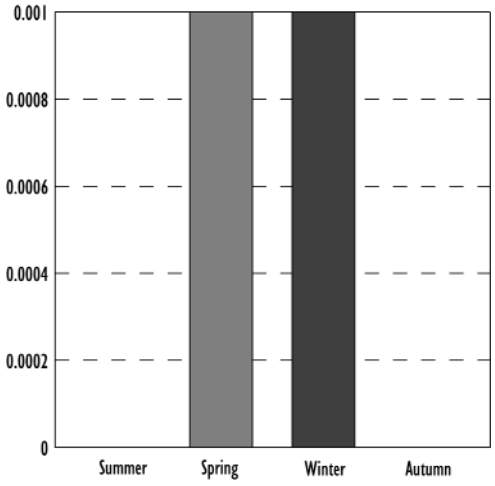
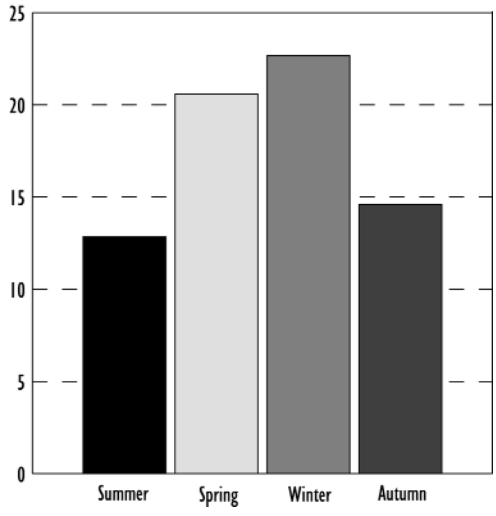


Table 2: Nitrite concentration in drinking well water in different seasons

Parameter/ Season	Mean	SD	Mc Mg/l NO_2	Range	
				Max	Min
Autumn	0.000	0.001	3	0.010	0.000
Winter	0.001	0.003	3	0.015	0.000
Spring	0.001	0.002	3	0.009	0.000
Summer	0.000	0.000	3	0.002	0.000
Total year	0.0005	0.0015	3	0.009	0.000

SD=Standard Deviation Mc=Maximum concentration

Figure 2: Seasonal variations average of nitrite concentration in drinking water wells



As Table 2 and Figure 2 show, the average yearly nitrite concentration was 0.0005 mg/l. The seasonal average of nitrite in different seasons was: autumn and summer (0.0 mg/l), spring and winter 0.001 mg/l). Findings also showed that the average concentration of nitrate and nitrite together in drinking well water was less than one (Table 3).

Table 3: Justification of nitrite and nitrate concentration based on WHO

Parameter/ Season	Mean nitrate	Mean nitrite	WHO formula	Justification
Autumn	14.58	0.000	0.21<1	good
Winter	22.66	0.001	0.453<1	good
Spring	20.59	0.001	0.411<1	good
Summer	12.83	0.000	0.256<1	good
Total year	17.66	0.0005	0.352<1	good

Table 3 is adjusted based on WHO (1994) recommended formula:

$$\frac{\text{C nitrite}}{\text{Cv nitrate}} + \frac{\text{C nitrate}}{\text{CV nitrite}} < 1$$

In this formula:

C=average Concentration of nitrate and or nitrite measured,

CV=WHO respective guideline value.

Based on this formula the sum of the ratio of the average concentration of nitrate and nitrite to its respective guideline value should not exceed one. Results also showed that the concentration of nitrate in 0.3% of water samples exceeds the safe limit. Further, there was a significant difference ($p<0.05$) between nitrate concentration in winter and autumn, but significant difference was not observed regarding nitrite concentration between the seasons ($p>0.05$).

Discussion

While nitrate from food is a main source for human exposure, nitrate from drinking water also plays an important role (Moller et al. 1989). The control of nitrate and nitrite concentration in drinking water is the best

way to prevent diseases and health hazards. Many studies have been carried out about contamination of water with nitrate. In 1988-89, the Iowa statewide rural well water survey collected water samples from about 685 private rural wells across the state. Based on the results of the survey, it was estimated that 18.3% of private rural drinking water wells were contaminated with nitrate in excess of 10ppm (Kross et al. 1993). These data show that residents of Iowa (and potentially, residents of other corn-belt states) have experienced longterm exposure to nitrate in drinking water supplies, both from municipal water systems as well as private wells. Another study was carried out by Schubert in Wisconsin and results showed that 6.5% of the private wells sampled were contaminated with nitrate. Moreover, families most likely to be exposed to high levels of nitrate in drinking water were those who lived on farms that had old and shallow wells. He also concluded that wells located closer to agricultural activity would be at greatest risk for nitrate contamination (Schubert et al. 1999).

Our findings showed that the average nitrate and nitrite concentrations in the drinking water wells of Urmia city were less than the standard level (NO_3, 50 mg/l and NO_2, 3 mg/l). Moreover, the total of the ratio of the average concentration of each to its respective guideline value was less than one, for all sources in different seasons. So, at present, there are no problems regarding the contamination with nitrate of the drinking well water of Urmia city. The results of the analysis of 156 water samples found that the concentration of only six samples was more than the standard level. Excessive levels of nitrate concentration in these samples may be related to seepage from septic tanks or from municipal sewage facilities. Due to mixing the water from these wells with water from the others in the distribution system, the results for justification of nitrate and nitrite concentrations based on the WHO standard level in different seasons were good (Table 3). A similar study was carried out in Hamedan-Iran, in 1999 and the results were nearly the same as our findings (Sadery & Karimpour 1999).

There are no available documented cases concerning cases of methemoglobinemia in Iran. It should be noted that many individuals using water exceeding the nitrate standard for more than 25 years still has no obvious effects on their health (Imandel, Farshad & Mir-abdollah 2000). A revision of the nitrate level guideline and standard in potable water might be recommended.

Conclusion

It is concluded that nitrate contamination in the drinking water wells of Urmia city was not observed, but the results of this study on different well samples in different parts of the city showed that nitrate concentration had increased in recent years and its amount in some areas was more than the standard level of 50 mg/l. It is recommended that quality control of drinking water sources should be carried out continuously, and necessary measures should be taken to prevent the contamination of ground water.

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Food Act 2003 and Food Regulation 2004: An Overview

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Most Australian States and Territories are aiming to implement uniform food safety legislation based on the Model Food Act. *This paper reviews the recently announced* NSW Food Act 2003 *and* Food Regulation 2004. *This summary was developed before the implementation of the* Food Legislation Amendment Act 2004. *This Act formally constituted the NSW Food Authority as well as making amendments to the* Food Act 2003 *not covered in this summary.*

The new *NSW Food Act 2003* has now replaced the *NSW Food Act 1989* as the main legislation relating to the safe handling of food for sale in NSW. The *NSW Food Act 2003* is based on the *Model Food Act*.[2] The Model Food Act has been developed after extensive consultation with all States and Territories to help ensure uniform Food Legislation throughout Australia.

The *Food Act 2003* was formally proclaimed on the 23 February with the Gazetting of supporting *Food Regulation 2004* (20 February 2004). Below is outlined the main sections of this new legislation.

The main aim of the new *Food Act* (Section 3) is:

- to ensure food for sale is both safe and suitable for human consumption,
- to prevent misleading conduct in connection with the sale of food,
- to provide for the application of the Food Standards Code.

It is an offence to sell food, which is "unsafe, unsuitable, or falsely described or not conforming the requirements of the FSC" (refer to *Food Act* cl. 13 to 23).

Food which is spoiled, filthy (e.g. dirt/insect contaminated) or putrid is unfit for human consumption and should never be sold. The food premises and the food handler must also conform to certain minimum standards of hygiene or risk prosecution, considerable fines and even jail.

The new *Food Act* covers all aspects related to the handling of food and the maintenance of hygienic food premises. The *Act* also sets out the role, responsibilities and procedures adopted by the officers appointed to enforce the requirements of the *Act*. These officers are referred to as authorised officers and we will deal with them in more detail below.

Definitions

Some important definitions are listed below:

Food is any substance/ingredient used for human consumption.

Unsafe food food is *unsafe* if it would be likely to cause physical harm to a person who consumes it

Unsuitable food is damaged, deteriorated or perished to an extent that affects its reasonable intended use, or is the product of a diseased animal, or an animal that has died otherwise than by slaughter, or contains a biological or chemical agent, or other matter or substance, that is foreign to the nature of the food.

Sell is a very broad term that includes barter, offer to sell, or, receive for sale, or have in possession for sale, or display for sale, send, or supply food as a meal or part of

a meal to an employee, or dispose of by way of raffle, prize or reward, or supply food under a contract, together with accommodation etc, or supply food in the course of providing services to patients in public hospitals or inmates in correctional centres, or sell for the purpose of resale… .

Food Authority is the ultimate government regulatory body or department responsible for the overall implementation of the *Food Act* (FA) and the Food Standards Code (FSC), which includes the Food Safety Standards (FSS). The FSC cites this authority as the 'relevant authority'. This new Government body combines the roles of SafeFood NSW and the Food Branch of NSW Health.

Enforcement Agency includes the Food Authority as well as any organisation that the Regulatory Authority empowers to enforce specific requirements of the *Food Act* and *Regulations*. This will include local councils.

Appropriate Enforcement Agency It is important to note the difference between the "Appropriate Enforcement Agency" and an "Enforcement Agency" when referring to the new *Act*. Some duties/roles are only undertaken by the "Appropriate Enforcement Agency". Examples of roles undertaken only by the appropriate enforcement agency include receiving notification of food businesses and risk priority classification of food businesses, receiving audit reports and so on.

Authorised Officers are staff of the Food Authority as well as those appointed by each Enforcement Agency for the purposes of the FA or FSSs.

Food Safety Auditor someone approved by each Food Authority to audit a food business' food safety program.

The Act

Who can be an authorised officer under the Food Act?

Section 114 of the *Food Act* details that the enforcement agency, or Food Authority appoints and maintains a list of authorised officers (with appropriate qualification) to administer the Act and regulations.

Local councils can appoint appropriately qualified officers (EHOs) to undertake this role. The enforcement agency must issue certification (including photograph) of authorised officers.

Penalties relating to the legislation

The correct handling and manufacture of food is essential to ensure that the food is safe and will not constitute a risk to the public, that is why severe penalties are laid down in the legislation. These penalties take the form of fines and/or imprisonment. The monetary value of the fine is in the form of penalty units with one penalty unit (PU) valued at $110 in 2003.

Types of food premises covered

The *Food Act* covers all types of food premises that sell food. For the purposes of the *Act*, 'sell' has a wide definition (see Definitions above). The Act covers any food that is sold or offered for sale by any premises (shop, factory, wholesaler, canteen, hotel motel, boarding house, vehicle, stall etc).

It also includes food supplied by employers as part of employees' conditions as well as food supplied together with accommodation as part of the service (Section 4, 5). Even food offered by way of trade where there is no direct payment, such as food offered as a sample, raffle or a prize, is covered by the *Act*.

Sale of unsafe, unsuitable food

This gets down to the very basis of food safety. Section 13 indicates it is an offence to knowingly *handle* food in a way to make it unsafe (1000PU and/or 2 years for individuals; 5000PU for corporations) Section 14 indicates it is an offence to knowingly *sell* unsafe food (1000PU and/or 2 years for individuals; 5000PU for corporations). Section 17 indicates it is an offence to sell unsuitable food (400-2000 PU penalty).

The distinction between unsafe and unsuitable is a fine one. Consumption of *unsafe* food would result in actual harm to the consumer (foodborne illness). On the other hand, *unsuitable* food may be unpleasant or repugnant if consumed, but would not necessarily make you sick. As an example, correctly processed and packaged UHT Milk may taste rancid when out of shelf life and would be considered unsuitable, but not necessarily unsafe. However, if the UHT milk were not correctly processed or packaged, this would mean it is definitely unsafe to consume and would potentially harm the consumer.

It is also an offence to knowingly sell food that is "falsely described" (Section 15, 22), or "not conforming to requirements of the Food Standards Code". (Section 21 -500-2500 PU penalty).

False description, misleading information

Section 15 creates offences of causing food to be falsely described and likely to cause physical harm. Section 18 creates an offence of engaging in conduct that is misleading or deceptive in relation to the advertising, packaging or labelling. Section 19 creates an offence of supplying food that is not of the nature or substance demanded by the purchaser (for example selling a customer carp fish fillets in place of the barramundi fillets requested).

Complying with FSC requirements

Section 21 creates an offence of not complying with any requirement of the Food Standards Code (500-2500 PU penalty).

Defences and due diligence

Section 26 provides a defence if the person concerned proves that they took all reasonable precautions and exercised due diligence in order to prevent the offence. For example, the offence was due to an act or default of another person; the person carried out all such checks of the food concerned as were reasonable in all the circumstances, or the person followed a food safety program required by the regulations.

Emergency orders and recalls

Section 30 and 31 allows an order to be made by the Food Authority if the Authority believes that the making of the order is necessary to prevent or reduce the possibility of a serious danger to public health. Orders may, for example, require the publication of warnings about unsafe food, prohibit the cultivation of food from a particular area, prohibit certain food from being advertised or sold or require particular food to be destroyed or disposed of.

Powers of entry and inspection

Under Section 37 any authorised officer has an absolute right to inspect at any *reasonable time* (subject to their authorisation under Section 114, 115) *any* food premises, vehicle etc they believe to be involved with the preparation, storage or handling of food destined for sale, under the definitions of the Act. The officer is authorised to inspect any part of the premises and open up packages etc. Section 39 enables the authorised officer to apply for a search warrant if necessary.

Authorised Officers must produce evidence of appointment as an authorised officer under the *Food Act* if requested to do so - Section 115 (4).

Power to seize, destroy or take

Officers are authorised to seize and remove, or prevent the sale of, any item if they consider it necessary (Section 37, 38).

If officers feel that the food may pose a danger to public health (e.g. filthy, putrid) they may order destruction of the food (Section 46). Also, Section 49 indicates that the owner is liable for costs associated with this destruction!

Obstruction of officers

Food handlers must not prevent or restrict entry of authorised officers to food premises. They must not obstruct officers, nor should they attempt to intimidate or bribe them (Section 40, 41, 43). To try any of these would be very silly on the part of the food handler or proprietor as it carries penalties of up to 500 to 2500 penalty units.

Improvement notices and prohibition orders

If authorised officers feel that the premises are not hygienic enough, or not conforming to the FSS, they can serve an improvement notice, ordering specific clean up, repairs or improvements that must be carried out within 24 hours (or as specified in the notice - Section 57, 58). Section 58 (1) (c) allows the authorised officer to issue an improvement notice requiring that a food safety program be prepared if required by the regulations. If the improvements are not carried out to the satisfaction of the authorised officer, a prohibition order can be made by an enforcement agency to prevent the manufacture, transport, sale etc of any food (Section 60).

Section 63 enables the proprietor of a food business who has been served with a prohibition order to request (in writing) a re-inspection of the relevant premises or item. A Certificate of clearance must be issued by an authorized officer before recommencement of operations (Section 60 (4)). If this request for re-inspection does not occur within of 48 hours of receipt by the authorized officer, a certificate of clearance is taken to have been given. It would be a serious offence to contravene this and may result in a 500 to 2500 - penalty unit fine.

Taking and analysis of samples

Section 67 requires an authorised officer to inform the proprietor or person in charge of a food business from which a food sample was taken that the sample is to be analysed. Section 68 requires an authorised officer to pay for any food sample taken (either the current market value or amount prescribed by regulations - currently $10 under Food Regulation 2004 cl. 8).

Section 71 sets out the procedure to be followed by an authorised officer when taking samples for analysis i.e.:

- divide the sample into three separate parts
- leave one part with the proprietor of the food business
- submit one of the remaining parts for analysis, and
- retain the other remaining part for future comparison.

If the division of a sample for analysis into three separate parts would affect or impair the composition or quality of the sample as to render it unsuitable for accurate analysis the authorised officer may take as many samples as necessary to enable an accurate analysis (Section 71 (3)).

Section 74 requires that a certificate of analysis must be issued to the person requesting the analysis (i.e. the authorised officer). Section 75 enables the regulatory authority to approve laboratories to carrying out analyses. Section 80 requires the regulatory authority to maintain a list of approved laboratories. Section 81 enables the regulatory authority to approve analysts for the purposes of carrying out analyses under the proposed Act. Section 86 requires the regulatory authority to maintain a list of approved analysts.

Auditing

The *Food Act* includes a section on the requirements related to the Auditing of Food Safety Programs. If a food business is required to have a food safety program, new Regulations will need to be gazetted outlining this requirement. Also note that Section 58(1)(c) allows an 'Improvement Notice' to include a requirement that the food business prepares a food safety program

(within 24 hours) if required by regulations. At the time of printing, these requirements have not yet been implemented, but may be phased in after the establishment of the new NSW Food Authority. However, below is outlined the proposed requirements.

The Food Authority will be responsible for approving (or rejecting) suitably qualified food safety auditors (including any conditions) after they apply and pay the fee prescribed in the regulations (Section 87). To help ensure that there are no conflicts of interests, food safety auditors must notify the Food Authority of any interest in food businesses they will be auditing or they may be liable to a 50 PU penalty (Section 89).

As mentioned above, proclamation by a specific legislation will be required before sections 93, 96, and 102-106 commence. The proprietor of a food business must ensure that any requirements of the regulations in relation to the implementation, auditing or monitoring of a food safety program for the food business are complied with. Section 93 requires the *appropriate* enforcement agency to determine a priority classification system for food businesses and to determine how frequently food safety programs for food businesses are to be audited.

Penalties of 500 to 2500 PUs would apply for not conforming to these Food Safety Program regulatory requirements.

The Auditor must carry out the audits of the food businesses Food Safety Program as required by the regulations, including carrying out any follow-up actions required to remedy deficiencies to the food safety program identified (Section 94). Section 95 (2) requires food safety auditors to report the findings of the audit to the appropriate enforcement agency on the results within 21 days. Any issues considered to constitute an imminent and serious food safety risk (or which makes food significantly unsuitable for sale) must be reported to the enforcement agency within 24 hours (Section 95 (5)).

It is the role of the Food Authority (not enforcement agency) to issue certificates of authority to food safety auditors (Section 97). The certificate of authority will need to include details of the auditor including a photograph and any conditions imposed on the auditor by the regulatory authority (Section 97). The regulatory authority is also responsible for maintaining a list of approved auditors, which is to be revised annually (Section 98). It is also an offence to obstruct a food safety auditor and carries a 500-2500 PU penalty (Section 98). It is also important to note that impersonating a food safety auditor carries a 500 PU fine, so only those certified by the regulatory authority should carry out food safety audits as part of any regulation.

Notifications and registration of food business

As required by the Food Safety Standard 3.2.2 Section 4, the new *Food Act* Section 100 requires food businesses to notify the appropriate enforcement agency before conducting operations or be liable to a 500-1200 PU penalty. Certain Fundraising events will continue to be exempt (FA Section 101 and Food Regulation 2004 cl. 4(2)).

Section 102 also notes that regulations may be introduced requiring the appropriate enforcement agency to levy a fee and register food businesses. It is expected that this requirement will be phased in after the establishment of the new NSW Food Authority.

Proceedings, penalty notices and on-the-spot fines

Section 118 indicates the proceedings for an offence under the *Act* or regulations may be dealt with before the Local Court or Supreme Court. The *Act* allows for the enforcement agency to issue Penalty Notices (Section 120) that may take the form of 'on-the-spot fines' or Infringement Notices. The

Regulations will set the amount of penalty payable, which would vary depending upon the seriousness of the offence. As mentioned above, it is expected that this will be phased in after the establishment of the new NSW Food Authority.

Protection from liability and repeal of the Food Act 1989

Section 123 protects employees from prosecution if under direction or personal supervision of the owner. Section 134 protects authorised officers, enforcement agencies, Food Authorities etc from any liability, civil proceeding, compensation etc resulting from administering or executing requirements of the *Act* (as long as they are acting in 'good faith').

Section 142 officially repeals the NSW *Food Act 1989* and previous regulations by proclamation Gazetted in the new *Food Regulation 2004* officially (Gazette number 42-20 Feb 2004) which is summarised below.

Food Regulation 2004

This Regulation allowed the introduction of the NSW Food Act 2003 to be implemented effectively.

Below are the main sections of the Food Regulation 2004 (including clause number):

- defines the Relevant Authority/ Regulatory Authority (cl. 4). As mentioned above this role will be passed to the new NSW Food Authority, when it is established.
- outlines procedure for 'Demonstration Methods of Alternative Compliance 'under the Food Standards Code i.e.: to the satisfaction of the Food Authority (cl. 4 (1)(d))
- outlines procedure for 'Demonstration Methods of Alternative Compliance' must be done to the satisfaction of the (Director of the Food Authority) (cl. 5)
- provides information on the exempting of fund-raising activities from some requirements of the new Food Safety Standards (cl. 4(2))
- outlines notification requirements and chargeable fees (cl. 5). Local councils may accept responsibility to undertake this roll and levy a $50 fee for individual establishments ($10 per premises for businesses having more that 5 locations). Food businesses may elect to notify by way of the Internet directly to the Regulatory Authority at no charge.
- defines enforcement agencies that can enforce the Act including the Food Authority and local councils. Because of other legislative issues, Kosciusko National Park and Lord Howe Island are considered separate enforcement agencies (cl. 6).
- payment of samples is the current market value or $10 if less than the market value amount (cl. 8).

NSW Food Authority

In December 2003, the NSW State Government announced that a new government body is being formed to regulate the food industry via the 15 December 2003 Media Release. This new organisation, called the NSW Food Authority, commence during 2004 after introduction of the required legislation. The new Government body combined the roles of SafeFood NSW and the Food Branch of NSW Health.

The NSW Food Authority resulted in a single 'through food chain' agency that will encompass all foods from production on farms or at sea through to manufacture, preparation and sale to the consumer.

The main aims of the new Authority will be to:

- Provide and coordinate the regulatory framework that helps industry produce safe food conforming to all Food Standards Code requirements

- Ensure industry compliance to all food legislation through advice, training and enforcement of requirements

- Be the point of contact for industry, local government and consumers about food safety regulation

- Inform and educate consumers about food safety and how to use information on food labels as a resource

- Be the State's lead agency for input into national policy and standards on food labels as a resource.

The new Authority will have a strong regional presence with the Head Office to be located in Silverwater, NSW.3 Until the Authority is established, up to date information can be accessed via the Safe Food NSW Internet Site (www.safefood.nsw.gov.au).

It is expected that the new Authority will be strongly supported by the Local Government sector. Currently, a discussion paper is being circulated to explore further the role of Local Government, and EHOs, in supporting the new Authority. This discussion paper is called "Towards a Strong Regulatory Partnership" and can also be downloaded from the Internet Site above.

Conclusion

Please note that this summary was developed before the introduction of the Food Legislation Amendment Act, 2004. This Act formally constituted the NSW Food Authority as well as making amendments to the Food Act 2003 not included in this summary. The above information is presented only as a guide to the interpretation of the new Food Act 2003 and Food Regulation 2004. For further information, full update copy of the Food Act should be consulted to ensure accuracy of interpretation.

Endnotes

1. Eric Middledorp is a Professional Member of the Australian Institute of Food Science and Technology (AIFST) and a member of the Australian Institute of Environmental Health (AIEH). He is currently Head Teacher of Food Safety with the Open Training and Education Network of TAFE NSW. He can be contacted on (02) 9715 8517 regarding the availability of Food Safety courses available via Distance through OTEN.

2. A copy of the current Acts and Regulations can be obtained from the NSW Government Information Service, Telephone: 02 9743 7200 (Toll free NSW Country 1800 463955).

   Current Acts and Regulations can be downloaded from the Internet:

   http://www.legislation.nsw.gov.au/maintop/scanact/inforce/NONE/0 (click on "F" and scroll down to Food Act).

   A copy of the Food Legislation Amendment Bill 2004 (NSW) can be downloaded on http://www/parliament.nsw.gov.au/prod/web/pheweb.nsf/frames/bills

3. The NSW Food Authority, Head Office will be located at 6 Avenue of the Americas, Newington, NSW, 2127. PO Box 6682, Silverwater, NSW, 1811. Telephone (02) 9741 4777 Fax: (02) 9741 4888.

References

Food Act 2003 No. 43 (NSW)
Food Legislation Amendment Act 2004 No. 16 (NSW)
Food Regulation 2004 (NSW) <http://www.legislation.nsw.gov.au/maintop/scanact/inforce/NONE/0>
Safe Food NSW, <www.safefood.nsw.gov.au>

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Environmental Health in Australia and New Zealand

Nancy Cromar, Scott Cameron and Howard Fallowfield (Eds)

Oxford University Press, 2004, 470pp. ISBN 0 195 510046, $85.00 (paperback)

The release of *Environmental Health in Australia and New Zealand* has been long awaited, but the wait has been worth it. The text has been designed to be a substantial generic but introductory text for undergraduate and postgraduate environmental health students, as well as for environmental health practitioners wanting a general overview of relevant regional issues.

The text contains 26 chapters by 42 authors on a vast range of environmental health topics. It is structured into three parts: Part 1 - Tools of Environmental Health, Part 2 - Management Mechanisms, and Part 3 - Issues in Environmental Health. Part 1 includes chapters on environmental epidemiology, toxicology, ecosystems, demography, and risk assessment. Part 2 includes chapters on environmental health policy, the psychology of risk, environmental reforms, public health law, communicable disease control, and health promotion. Part 3 then covers specific issues such as food safety, water, air, solid and hazardous waste, contaminated land, hazardous chemicals, radiation, noise, Indigenous health, and global issues.

As can be seen from the range of topics covered, the text benefits from a large number of authors contributing their expertise. However, this approach can also lead to some inconsistency. This is particularly noticed in this text when many of the authors (who are from a variety of health-related backgrounds) commence their chapters with their own definition of environmental health. This could be confusing for the main target audience, students who are new to environmental health. As such, the text would have benefited from an introductory chapter on what environmental health is and a discussion on the history of and current issues for environmental health practice in Australia and New Zealand. Despite this, the extensive coverage of issues at a very readable level should ensure that this text is widely used by environmental health students.

From a teaching perspective, a number of well written and highly informative case studies are also available for use with the text (on CD or from the web), and these should prove to be a valuable teaching tool.

Overall, the text is highly recommended for environmental health students and should also be of value to practitioners from a range of disciplines who are looking for a text that is current and covers a wide range of issues in a very understandable and introductory manner. Finally, as an indication of our regard for this text, we have adopted it as required reading for our introductory environmental subjects at the Queensland University of Technology and encourage all students to purchase their own copy of the text - arguably the highest praise that a fellow academic can bestow on a textbook.

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Good Riddance: A History of Waste Management in Manly, Mosman, Pittwater and Warringah

Pauline Curby and Virginia Macleod

Joint Services Committee of Warringah, Manly, Mosman & Pittwater Councils, 2003, 224 pp+vii, ISBN 0 646 42791 1, $30 (paperback)

Improvements in the techniques of waste disposal have been one of the most significant advances in public health during the past hundred years. Statistical evidence suggests that many more lives have been saved by better sanitation than by orthodox medical therapeutics. Yet household garbage tends to be a neglected area for serious research. Much of the existing literature is written from an engineering viewpoint, rather than from a concern about environmental health.

Four adjacent local government areas comprising the coastal northern suburbs of Sydney share their rubbish disposal facilities, and in 2003 they took the enlightened step of commissioning a historical study of the development of these practices over more than a century. Two professional historians were engaged for this task, and the resulting book is a work of serious scholarship, rather than the customary flattering municipal celebration. Curby and Macleod have used careful research into official records as well as conducting interviews with residents and former employees to present a balanced account, beginning with the shell middens left by the original inhabitants.

Local attitudes in earlier times are exemplified by the leaflet distributed by beachside Manly in 1929 advising residents not to "throw slops or scraps out of the windows" (p.35). The undervalued health inspectors of the day had a formidable task, and perhaps their role could have been given greater prominence in *Good Riddance*.

Environmental health officers who have worked for local government will not be surprised to read that public health and amenity were given a low priority by decision makers who were obsessed by the need to minimise costs in order to ensure their political survival. Nor have state government agencies in New South Wales fulfilled their responsibilities. A pusillanimous Health Department issued edicts, but did not enforce them. Since the 1970s there has been a succession of state waste management authorities, which cynics would suggest changed their title and policy direction following each state election.

Changes eventually came about as a result of increased environmental awareness in the community. Residents were better-educated, and became more articulate. If necessary, they were prepared to agitate forcefully. At the same time, of course, waste was expanding exponentially due to the linked factors of increasing affluence, consumerism, and redundant packaging. Recycling now has become fashionable in middle-class suburbs such as those covered by this study. The authors observe that this trend is a revival of the patriotic "salvage" campaigns that were promoted during the Second World War - turning aluminium saucepans and toothpaste tubes into bombers was one of the images used at the time.

Kimbriki was an unspoiled bushland gully when the councils opened an uncontrolled rubbish dump on a 112 hectare site in 1974. Gradually, it has evolved into a model facility managed by the Joint Services Committee. Extensive work has been undertaken to ensure that nearby streams are not polluted. Carefully regulated recycling programs have been introduced, such that in 2002-3, 74% of resources was recovered from the waste stream, with most of this recycled and moved off site. Today,

Kimbriki is "the only remaining council-owned and council-controlled waste depot in Sydney" (p.139).

Good Riddance is attractively presented, with copious illustrations and newspaper cartoons that provide a revealing documentation of changing attitudes towards the environment. The book includes a comprehensive index and a useful bibliography. All quoted sources are cited in the endnotes. It is refreshing to observe in this era of cost-cutting that the text is carefully edited, with negligible typographic or grammatical errors. Minor quibbles include a tendency for the authors to lapse into colloquialisms that may not be understood by a wider readership. Words such as "units" (residential flats), "utes" (small trucks), and "cleanups" (a municipal waste collection day), are typically Australian terms. The nineteenth-century euphemism "nightsoil" (sewage) may be unfamiliar to younger generations, and is not defined in the extensive glossary.

All environmental health practitioners will find much to interest them in this book. I suspect that all too often they will recognise parallel experiences, but they should also be reassured by the solutions that have been devised. Every municipal public library should have a copy.

Note: Available from Kimbriki Recycling & Waste Disposal Centre, Kimbriki Road, Terrey Hills, NSW, 2084.

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Evidenced-based Health Policy: Problems and Possibilities

Vivian Lin and Brendan Gibson (Eds)

Oxford University Press, 2003, 400pp, ISBN 0 195 51551X, $65.00 (paperback)

When research is needed to be undertaken, often the most daunting task is to determine the process and methodology which is to be employed in gathering appropriate, reliable and accurate evidence. *Evidence-based Health Policy: Problems and Possibilities* presents as an authoritative reference on the nexus between the research of evidence and the development of sound public health policy. More than ever it can be argued that policy development is very much reliant, and increasingly dependent, upon the thorough analysis of appropriate and relevant evidence.

There are discussions of the various definitions of, and associated with, policy and its making, which assist the reader to grasp an insight into the fundamental concepts involved in evidence based research. Case studies, including successes and failures, are well documented within the text which also is helpful in providing further assistance in a practical sense to help unravel the intricacies and nuances, which go towards the development of sound, well founded health policy.

For anyone involved, or indeed interested, in learning gathered on the important and complex aspects of health policy formulation and its association with the research of evidence, I would recommend reading this text. Consideration of the practical examples provided ably assist in this goal. As the reader, you gain a valuable insight into the various concepts and the models, which demonstrate well that there can be many pathways utilised in the ultimate quest for improved policy making.

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