

Review of the impact of housing and health-related infrastructure on Indigenous health



Last update: 2008

Peer review: No

Suggested citation:

Australian Indigenous HealthInfoNet (2008) *Review of the impact of housing and health-related infrastructure on Indigenous health*. Retrieved [access date] from <http://www.healthinfonet.ecu.edu.au/determinants/physical-environment/reviews/our-review>

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Introduction

The World Health Organisation (WHO) defines environmental health as encompassing those elements of human health that are influenced by physical, chemical, biological, social and psychological factors in the environment. It also refers to the theory and processes of analysing, managing and preventing those elements in the environment that have the potential to negatively affect the health of present and future generations [1]. This review, which focuses on the role of housing and health-related essential infrastructure and their relevance to the health status of Indigenous peoples in Australia, should be considered in conjunction with the sections providing information on social, cultural and economic aspects.

In addition to housing, the aspects of the physical environment reviewed in this section include the supply of adequate and safe water, access to electricity, sewerage and drainage and rubbish collection. These factors are also known as 'health hardware' [2] [3]. Other factors of the physical environment, not summarised here, include air quality, noise pollution, residues from pesticides, herbicides and other chemicals.

Before considering the evidence about housing and health-related infrastructure, the following section briefly summarises the impact of these aspects on health.

Impact of housing and health-related infrastructure on health

The effect of the physical environment on the health status of a population is well recognised – the absence of functional health hardware can have a negative impact on health, particularly with regard to infectious and parasitic diseases (such as diarrhoeal diseases and rheumatic fever), eye and ear infections, skin conditions, and infections of the respiratory tract [\[4\]](#) [\[5\]](#) [\[6\]](#) [\[7\]](#).

Improvements made to the physical environment during the first half of the 20th century led to substantial gains in the health status of the general Australian population. The same improvements have not been achieved in many Indigenous communities, particularly those in remote parts of the country, and therefore, many potential health gains have not occurred. Important aspects of the physical environment that influence the health status of many Indigenous Australians are: general housing characteristics, overcrowded houses, high housing costs relative to income, and inadequate sanitation and water supply [\[8\]](#).

Housing has been identified as an important factor affecting the health of Aboriginal and Torres Strait Islanders [\[9\]](#). Substandard and badly maintained housing together with the lack of functioning infrastructure can create serious health risks. The impact of housing on health can be through direct and indirect ways [\[10\]](#). Direct means are associated with the material condition of housing on physical health, for example, inadequate water supply, washing facilities, sanitation and overcrowding. This can in turn influence the mental health and wellbeing of households due to the many social issues which arise from inadequate material conditions. Indirect means are about individual and community elements, including the location of the housing, closeness to essential services and the overall functioning of the community [\[10\]](#) [\[11\]](#) [\[12\]](#). The health effects of housing can be mediated by the design, function, cleanliness and crowding of a dwelling [\[13\]](#).

Overcrowding is linked with poor health [\[7\]](#), but its actual impact, independent of associated factors (such as poverty, poor housing condition, limited health hardware, and the like), is not entirely clear [\[14\]](#). A study undertaken in Sydney, NSW has now found that a strong association between overcrowding and health still exists when factors including education, income, ethnicity, poverty and unemployment are controlled for [\[15\]](#). Generally, overcrowding is considered to have its main impact on the health of children, particularly in terms of respiratory conditions, skin infections and meningitis, and possibly mental health [\[7\]](#) [\[14\]](#). Overcrowding also puts increased stress on health infrastructure, such as water supply and sewage disposal systems, and is closely linked to housing standards and conditions. The Western Australian Aboriginal Child Health Survey conducted in 2005 highlighted a relationship between overcrowding and poor housing quality and also, increased levels of life stressors, harmful alcohol use and community social problems [\[16\]](#).

Inadequate housing standards and limited access to functional health hardware can have a number of negative effects on health outcomes. The breakdown of essential systems such as water supply, sewage disposal and the supply of electricity can lead to health risks and a range of associated health problems.

Access to clean water is essential for healthy living. Diseases associated with the consumption of water of poor quality include gastroenteritis, diarrhoea, typhoid fever and hepatitis [8]. Parasitic diseases associated with contaminated water include giardiasis, dysentery and diarrhoea. Young children are particularly at risk of suffering from potentially severe consequences due to infection with water-borne diseases.

Inadequate water supply may also lead to parasitic infection. Water shortages may restrict water use with negative consequences for personal hygiene and an increased risk of infectious disease associated with the transmission of contaminated human secretions.

The accumulation of human waste and inadequate disposal may lead to contamination of living areas with infected material such as faeces [5] [7]. Organisms such as shigella, E coli, salmonella, and rotavirus contained in this material can cause gastroenteritis. Parasitic infection, hepatitis A, and strongyloidiasis are also associated with inadequate disposal of human waste.

Links between inadequate rubbish disposal and health include: trauma from slipping on wet/dirty surfaces; trauma from glass or other sharp objects and infections from injuries; suffocation of children from plastic bags; fire risk from inflammable materials; and health problems associated with blocked health infrastructure such as sewerage systems [5] [17]. Bore water may be contaminated from waste dumps and undisposed rubbish may lead to an increase in vermin and other disease vectors.

Inadequate power and electricity supply may restrict the capacity of people to carry out healthy living practices such as washing, cooking, food storage, temperature control and lighting. Poor electricity supply or inadequately maintained power supply may also cause trauma and injury [18].

Flooding can pose serious health risks to people living in or near affected areas, including immediate risks such as drowning, interruption of essential services, and damage to health-related infrastructure [5]. Ponding can have serious implications for health, mainly because stagnant water provides breeding grounds for mosquitoes that may act as vectors for diseases such as Murray Valley Encephalitis and Ross River Virus.

Home ownership, as such, does not appear to have a direct impact on health outcomes, but the lowest housing costs are experienced by people who own their accommodation. The allocation of a high proportion of income to secure housing reduces the ability to buy other essential goods or services and may thus have an indirect effect on health outcomes [8].

Housing

Based on information collected by the Australian Bureau of Statistics (ABS) 2006 census, there was estimated to be 166,700 Indigenous households in Australia representing 2.3% of all Australian households [19]. A household is considered

Indigenous if it includes at least one Indigenous resident of any age, excluding visitors.

Information about Indigenous housing

The five-yearly Australian Census of Housing and Population is the only source of information about all households in Australia [20], but the level of detail available is less than that from two other ABS sources: the Australian Housing Survey (AHS), which collected in 1999 information about people living in private dwellings throughout Australia except those living in 'sparsely settled or remote areas' [21]; and the Community Housing and Infrastructure Needs Surveys (CHINS), which collected in 1999, 2001 and 2006 information on Indigenous organisations that provide housing to Indigenous people and information about housing in discrete Indigenous communities throughout Australia [22]. The AHS reported information about approximately 145,500 Indigenous households [21], the 2006 CHINS about more than 21,850 households (approximately 7,000 in non-remote areas and around 14,850 in discrete communities) [22], and the 2006 Census about more than 166,700 households with at least one Indigenous resident across Australia [9].

For the purposes of this review comparison between the 2006 and 2001 CHINS reports are provided if possible. For Indigenous communities of 50 people or less the 2001 CHINS did not report for many of the sections to follow and therefore some comparisons are summarised for only Indigenous communities of 50 people or more.

Household size

According to the 2006 Australian Census of Housing and Population, Indigenous households are generally larger in terms of the number of occupants than other Australian households. The average size of an Indigenous household was 3.4 persons compared with 2.6 persons per non-Indigenous household [9] with the average size of Indigenous households increased with remoteness of residence.

Overcrowding

Twenty seven percent of Indigenous people (102, 400) were living in overcrowded conditions in 2006 [9]. The proportion of households requiring additional bedrooms provides some indication of overcrowding: 14% of Indigenous households were considered as requiring at least one additional bedroom in the 2006 census compared with 15% for the 2001 census [9]. By state and territory, the Northern Territory reported the highest rates of overcrowding in Indigenous households (38%) [9]. Overcrowding rates were associated with the form of tenure of the housing; the highest rates of overcrowding were experienced in Indigenous households renting Indigenous and mainstream community housing (40%) with Indigenous home owning households only reporting overcrowding at a rate of 7% [9].

The actual extent of overcrowding will reflect not only usual residents, but also temporary visitors. Twenty one per cent of discrete Indigenous communities in remote and very remote parts of Australia reported, in the 2006 Community Housing and Infrastructure and Needs Survey (CHINS), experiencing temporary increases in

community size lasting two weeks or more in the previous 12 months [22]. Fifty three per cent (53%) of such temporary expansion was due to cultural reasons and 25% due to holiday visitors. Such temporary increase in community-size is a substantial factor in temporary overcrowding in Indigenous communities, thus posing increased risks to the health of the people involved.

Condition of housing

According to the National Aboriginal and Torres Strait Islander Social Survey, 2002 40% of Indigenous people in non-remote (32%) and remote areas (58%) reported that their homes were structurally unsound (e.g. rising damp or major cracks) [23]. The 2006 CHINS reported that in discrete communities, of the dwellings managed by Indigenous Housing Organisations (IHO), 23% required major repairs and 7% were in need of replacement, compared with 19% requiring major repairs and 10% in need of replacement in the 2001 report [20, 22].

Form of tenure

The form of housing tenure may have indirect implications for health outcomes. Forms of tenure are home ownership (with or without mortgage) and renting (from private, government or non-government landlords). According to the 2006 Census, 59% (63% in 2001) of Indigenous households were renting their accommodation compared with 26% (27% in 2001) of non-Indigenous households [8] [9]. Thirty four per cent of Indigenous households owned their homes (with or without a mortgage) compared with 69% of non-Indigenous households.

Water

Access to clean water is essential for healthy living. Ideally, the quantity supplied fully meets domestic needs for drinking, personal hygiene, bathing and food preparation. The water quality with regard to micro-organisms and chemical residues and other disease-inducing agents is of major importance to health outcomes.

Bore water was reported to be the main source of drinking water for 58% of the total number of discrete Indigenous communities included in the 2006 CHINS survey compared with 62% in 2001 [20] [22]. Smaller communities (less than 50 people) were less likely to be connected to a town supply (11%) an increase of 3% from the 2001 CHINS (8%). Larger communities (more than 50 people), were more likely to be connected to a town supply (41%), an improvement of 7% since the 2001 survey. Town water is the main source of water for 19% of the total discrete Indigenous population living in communities compared with 15% in 2001. For nine discrete communities there was no organised water supply, down from 21 in the 2001 report.

In 2006, water restrictions affecting discrete Indigenous communities were significant, with 22% of Indigenous communities (with a usual population of 50 or more) having experienced water restrictions within the previous year [20] [22]. This is a fall of 13% from 35% in the water restrictions recorded for Indigenous communities in the 2001 CHINS survey [20]. A large proportion of the water restrictions reported in the 2006 CHINS were due to equipment failure, a finding also established in the 2001 survey.

Testing the water quality at certain intervals is essential to ensure that it is free of hazardous micro-organisms, chemicals and other potentially health threatening agents. Information gathered from discrete Indigenous communities with 50 or more residents who were not connected to town water, found that 19% of these communities did not have their water tested within the previous year, these data present an increase of 4% since the results from 2001 [\[20\]](#) [\[22\]](#). Twenty nine per cent of the communities had drinking water of poor quality and failed testing at least once within the previous year, an increase of 3% since the 2001 CHINS [\[20\]](#) [\[22\]](#).

Sewerage and drainage

According to the 2006 CHINS, 2% of discrete Indigenous communities had no organised sewerage system, compared with 7% for 2001 [\[20\]](#) [\[22\]](#). Septic tanks with leach drains were the predominant form of sewerage system used in 50% of all discrete Indigenous communities, similar to the 2001 figure of 49%. In the larger communities (200 -500 people) water-borne systems, which involved flushed toilets, pumping stations and sewerage treatment plants were more likely to be used, and these larger communities (200 – 500 people) represented 12% of communities with 50 or more people with organised sewerage systems.

Sewerage system failure, such as overflows or leakages, can have serious implications for the health of community residents. Of 361 discrete Indigenous communities 40% reported a sewage overflow or leakage within the year leading up to the 2006 CHINS, compared to 48% (327) in the 2001 report. Blocked drains, equipment failure and design and installation problems were the main causes for sewerage system failures in Indigenous communities with a population of 50 or more in both the 2006 and 2001 data [\[20\]](#) [\[22\]](#).

Rubbish disposal

Regular, organised rubbish disposal is an important factor in community health. It can prevent chemical and food poisoning, physical trauma from sharp and insecure objects and infectious diseases associated with vector agents such as vermin and insects [\[4\]](#).

Three hundred and thirty seven (337) discrete Indigenous communities reported access to organised rubbish collection in 2006 compared to 363 in 2001. In 2006, 29 communities did not have access to any organised rubbish collection [\[22\]](#).

Electricity and gas

Access to electricity and gas allows for the operation of health-related infrastructure, such as lighting, heating and cooling, water heating, refrigeration of foods, power supply for kitchen appliances, communication, education, and the use of other electrical equipment.

Three per cent of all discrete Indigenous communities included in the 2006 CHINS had no organised electricity supply, an improvement from the 2001 reported figure of 7% [\[20\]](#) [\[22\]](#). Most of these communities had 50 or fewer residents consistent with 2001. A total of 284 people lived in communities without an organised supply of

electricity, a significant reduction from the 681 identified during the 2001 CHINS survey.

Generators were the main source of organised electricity for 52,378 people living in 555 discrete Indigenous communities (51% of the discrete communities) included in the 2006 CHINS [22]. This result compared with 66,451 people from 647 discrete Indigenous communities (53%) in the 2001 report [20]. Communities with a population of more than 50 people were more likely to be connected to the state electricity grid (44%: 46% for 2001) than were communities with less than 50 residents (17%: 21% for 2001). Overall, 35,217 people living in 274 communities (25%) received their electricity through the state grid or another form of transmitted electricity, compared with 36,909 people in 260 communities or 21% in 2001 [20] [22].

A total of 246 discrete Indigenous communities (79% of the 311 discrete Indigenous communities with 50 or more residents) experienced electricity interruptions within the year prior to the 2006 CHINS. Data for 2001 showed higher figures for 267 communities (82% of 327) experiencing similar problems with electricity supply [20] [22]. Five or less power cuts within that period were reported to have occurred in 42% of the affected communities for 2006, compared to 37% in the 2001 CHINS. Sixteen percent of the affected communities experienced 20 or more electricity interruptions within the year prior to the 2006 CHINS, down from the 20% reported in 2001 [20] [22]. The main causes for electricity interruptions reported in 2006 were storms (59%), equipment breakdown (56%) and planned outages for maintenance reasons (44%) [22].

Flooding and ponding

Flooding can be described as situations in which 'watercourses overflow and inundate either part or all sections of the community' [4]. Flooding of areas was reported in the 2006 CHINS by 17% of the discrete Indigenous communities with 50 or more residents, down from 31% reported in the 2001 survey [20, 22].

Ponding, which is defined as the formation of 'pools of still water that remain stagnant for a period of one week or more and cover an area of at least 10 square metres' [4], is reported to have occurred in 35% (42% for 2001) of the discrete Indigenous communities with 50 or more residents in the year prior to the 2006 CHINS [20] [22]. In 36% of affected communities, ponding occurred more than five times during that year an improvement from the 46% reported in 2001.

Addressing environmental health in Indigenous communities

Healthy living practices

The provision of housing and associated infrastructure is essential to improve the health of Indigenous people [4] and will facilitate healthy living practices, which also play a key role in health outcomes [7]. Healthy living practices include: personal hygiene, washing clothes, removing waste, improving nutrition, reducing crowding,

separating dogs and children, controlling dust, controlling temperature and reducing trauma.

Environmental health workers

Indigenous environmental health workers play a vital role in promoting healthy living practices, and maintaining infrastructure to ensure long-term, effective use [\[7\]](#).

The National Environmental Health Strategy - developed in 1999 by the National Environmental Health Forum (now the enHealth Council) under the auspices of the National Public Health Partnership [\[24\]](#) - acknowledges that Indigenous environmental health workers are central to promoting and enhancing environmental health in Indigenous communities [\[25\]](#).

Indigenous environmental health workers are integral to efforts to manage environmental health needs associated with housing, water quality, refuse, food safety and sanitation. Their duties involve taking an active role in the maintenance and inspection of their community's infrastructure, and the reporting of any environmental concerns to relevant government bodies. They frequently undertake a range of specific activities, such as rubbish disposal and dog and pest control [\[20\]](#). Keeping records of environmental health conditions within the community; reporting to the community council; and providing education to community members regarding healthy living practices are also among their tasks [\[3\]](#).

Promoting and creating sustained environmental health improvements in remote Indigenous communities requires a dedicated and well trained health workforce, but across Australia vocational training and education for Indigenous environmental health workers lacks uniformity, and wages, conditions, and support vary [\[18\]](#).

National Indigenous Environmental Health Forum

In May 1999, the enHealth Council established the National Indigenous Environmental Health Forum (NIEHF). The NIEHF, a sub-committee of the enHealth Council, comprises Indigenous environmental health practitioners from each state and territory [\[25\]](#). Facilitating the development of an appropriately supported and trained Indigenous environmental health workforce is central to NIEHF objectives. The NIEHF advises the enHealth Council and makes recommendations for Indigenous environmental health [\[24\]](#) [\[26\]](#). Its aims are to

- provide a mechanism for environmental health workers to participate in decision-making and information-sharing;
- be a reference group for the enHealth Council to comment on issues and information referred by the enHealth Council, or identified by the NIEHF, that impact on the work of Indigenous environmental health;
- facilitate community representation and consultation; and
- convene biennial national Indigenous environmental health conferences [\[26\]](#).

In 2004, the enHealth Council released a discussion paper reviewing the work undertaken by Indigenous environmental health workers, and outlining existing training and classification systems across jurisdictions. The discussion paper arose

from a NIEHF workshop convened in 2003. Its primary objective is to develop an action plan to improve Indigenous environmental health by ensuring a sustained role for Indigenous environmental health workers in its management [\[25\]](#).

Conferences

National Indigenous environmental health workshops and conferences have been held since 1988 to

- provide a forum for the discussion of Indigenous environmental health issues;
- raise the profile of relevant issues; and
- give Indigenous environmental health practitioners a voice [\[24\]](#).

The aim of these forums is to help identify the concerns and issues facing environmental health workers and their communities by providing an opportunity to: share information; present papers on successful projects and innovative techniques; establish networks with environmental health workers in other States and Territories; and highlight common issues that would benefit from attention nationally [\[27\]](#).

Indigenous environmental health workforce development has been a recurring theme at conferences and workshops. The development needs, work impediments and ways forward for Indigenous environmental health workers have been the subject of discussion and various issues have been identified, including: training; career paths; support and representation; award wages linked to qualifications; and working in partnerships [\[25\]](#).

Summary

The physical environment has a strong influence on the health of many Indigenous people, particularly those living in remote or very remote parts of Australia.

Indigenous households are significantly larger in size than other Australian households. Overcrowding is common for many Indigenous households, and may increase risks to health. Indigenous people are more likely than other Australians to live in rented houses, resulting in relatively higher accommodation costs. Dwellings in many Indigenous communities are more likely to require repairs or replacements than are dwellings occupied by non-Indigenous people. Many Indigenous communities experience disruptions to their electricity and water supplies, mainly due to equipment failure. Rubbish disposal is organised widely, but inadequacies (such as a lack of fencing around the tips) increase risks to health. Flooding and ponding occur in a large number of Indigenous communities.

The provision of high quality housing and related infrastructure (to the standards experienced by other Australians) is essential to ensure more equitable health outcomes for Indigenous people, but this alone does not guarantee sustained health benefits. National policy initiatives, including: the establishment of the NIEHF; the conduct of national conferences; and efforts to support the development of a well-trained Indigenous environmental health workforce are also integral to current endeavours to develop a healthy environment for Indigenous communities.

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