New Zealand Geographer (2009) **65**, 211–221 doi: 10.1111/j.1745-7939.2009.01164.x

Research Article

Neighbourhoods and health: A review of the New Zealand literature

Anna Stevenson,[1] Jamie Pearce,[2] Tony Blakely,[3] Vivienne Ivory[3] and Karen Witten[4]
[1]*Community and Public Health, Canterbury District Health Board, Christchurch, New Zealand;* [2]*Institute of Geography, School of GeoSciences, University of Edinburgh, Edinburgh, UK;* [3]*Health Inequalities Research Programme, University of Otago, Wellington, New Zealand;* [4]*Centre for Social and Health Outcomes Research and Evaluation, Massey University, Auckland, New Zealand*

Abstract: Over the past two decades, there has been a resurgence of interest into place-based influences on health. Researchers have identified that various characteristics of neighbourhoods exert an influence on the health outcomes and behaviours of local residents. Understanding the processes linking places to health provides considerable potential for a range of policy interventions. We review the New Zealand-based neighbourhoods and health research. Consideration is given to the types of neighbourhood characteristics, as well the range of health outcomes that have been studied. Finally, we suggest some priorities for further research into the mechanisms underpinning neighbourhood influences on health in New Zealand.

Key words: health, health inequality, neighbourhood, New Zealand.

It has long been recognised that the places in which people live, work and play have direct and indirect impacts on individual-level and population-level health outcomes. These 'place effects' occur independently of individual-level demographic attributes, such as age, sex and ethnicity, but are mediated by behaviours, social position, health-care access and other physiological parameters that allow neighbourhood contexts to influence individual health and well-being outcomes (Kawachi & Berkman 2003). In very broad terms, three types of neighbourhood characteristics might be important for residents' health: physical (e.g. air pollution), socio-cultural (e.g. social cohesion) and community resource access (e.g. recreational facilities).

Policy interventions at the area level have a long history. They also vary widely by type and scale. To illustrate this variation, the restoration of a waterway constitutes an intervention altering a physical aspect of place; the socio-cultural environment may change with the introduction of a neighbourhood watch programme; and a new medical centre may increase health service access and use. The geographical scale of

Note about the authors: Anna Stevenson is a public health physician who works with Christchurch City Council and the Canterbury District Health Board on urban design issues; Jamie Pearce is a reader in Human Geography at the University of Edinburgh, UK, and co-director of the GeoHealth Laboratory, Department of Geography, University of Canterbury; Tony Blakely is research professor of Public Health at the Wellington School of Medicine and Health Sciences, University of Otago and the director of the Health Inequalities Research Programme (HIRP); Vivienne Ivory is a research fellow on the HIRP, Wellington School of Medicine and Health Sciences, University of Otago; Karen Witten is associate professor at the Centre for Social and Health Outcomes Research and Evaluation (SHORE), Massey University, Auckland.

E-mail: jamie.pearce@ed.ac.uk; jamie.pearce@canterbury.ac.nz

interventions that impact on the neighbourhood context also vary and may be city-wide, as with the WHO Healthy Cities, or locally based, such as the construction of a new supermarket or children's playground.

If place-based interventions are to improve health and well-being, it is necessary that the characteristics of a place *actually have a causal association with health*. Currently, the mechanisms by which place affects health are not well understood and this is a major challenge to research in the field. Considerable momentum has been building internationally in the area over the last 10–15 years, with contributions from disciplines such as geography, epidemiology, sociology and public health.

In this paper, we compile a stocktake of New Zealand-based neighbourhoods and health research. Our primary purpose was to ascertain what is known about the health impacts of 'neighbourhoods' in New Zealand. We focus on the mechanisms that potentially explicate the ways in which the local context influences a range of individual-level health outcomes, health-related behaviours and the utilisation of health care. We include studies that not only test directly the association between one of more neighbourhood characteristics and the health outcomes of local residents, but also research that considers processes operating in the residential neighbourhood which have a plausible link to health. This paper is the first to scan across the New Zealand research literature to note the breadth of completed research and highlight any important gaps in the evidence base that present a barrier to successful policy formulation.

Methods

Our initial literature search was a scoping exercise intended to inform the criteria for the final selection of papers. We used the search engines Ebsco, Scopus, EMBASE, Index New Zealand, Te Puna, Proquest, Web of Science and the Otago libraries catalogue. Key search terms were 'neighbourhood', 'community', 'social environment', 'mortality', 'morbidity', 'wellbeing', 'illness', 'health service', 'New Zealand' and a variety of health determinants such as 'obesity', 'tobacco' and 'greenspaces'. The time period 1996–2008 was selected because it was considered to capture the recent resurgence of interest in neighbourhood effects on health, as well as the most significant methodological advances (internationally) in the field. A letter seeking assistance in locating grey and unpublished research was sent to a variety of networks throughout New Zealand including public health units, local government policy analysts and academic researchers.

To aid both setting the inclusion/exclusion criteria and organising the literature into useful domains, we developed a categorisation and ranking criteria against which all elicited publications were assessed (Table 1). It should be noted that the assignment of the papers to the categories was not necessarily able to reflect the full scope of each paper, and that some papers could have been assigned to several categories. Inclusion required studies to evaluate the direct or indirect measurement of physical, social or community resources of neighbourhoods (i.e. the local context in which people reside) and the direct measurement of the health-related outcomes of people (direct mortality/morbidity measure, health-related risk factor or health-care utilisation status) or health-related neighbourhood processes. We were interested in health outcomes that were measured at the individual level but disseminated at either the individual or aggregated (neighbourhood) level.

Beginning with study design, the studies were first categorised by how they measured the neighbourhood. Studies were divided into whether they directly measured characteristics of the residential neighbourhood or whether they used proxy measures. The studies were then cross-classified by how health (broadly speaking) was measured. In addition to studies that measured individual health status, we included those that measured health-related processes and health services utilisation as all three outcomes were important for better understanding place effects on health.

There was some debate as to whether to include settings-based literature (e.g. provision of health promotion programmes within schools). Settings are important neighbourhoods in the sense that they are places where people spend a considerable proportion of their life, settings-based research has many useful parallels with the more geographically

Table 1 Cross-classified categorisation framework for retrieved literature – measurement of neighbourhoods by health outcome

Measurement of health outcome	Category A: Indirect measurement of physical, social or community resources of neighbourhoods	Category B: Direct measurement of physical, social or community resources of neighbourhoods
Neighbourhood-level intermediary factors/processes	Studies that indirectly measure some aspect of neighbourhood using a proxy, such as neighbourhood deprivation. These studies do not use data on individual-level health-related outcomes.	Studies that directly measure (by observation, mapping or questionnaires) some aspect of the residential neighbourhood. These studies do not use data on individual-level health-related outcomes.
Health services utilisation access at the individual level	Studies that indirectly measure some aspect of neighbourhood, using a proxy, such as neighbourhood deprivation, and examine its relationship to individual-level access to and/or utilisation of appropriate health services.	Studies that directly measure (by observation, mapping or questionnaires) a specific aspect of the residential neighbourhood and examine its association with individual-level access to and/or utilisation of appropriate health services.
Health status or risk factor outcomes at the individual level	Studies that indirectly measure some aspect of neighbourhood using a proxy, such as neighbourhood deprivation, and examine its relationship to risk factors or processes that impact on health-related outcomes.	Studies that directly measure (by observation, mapping or questionnaires) a specific aspect of the residential neighbourhood and examine its relationship with individual-level health status or health-related behaviour.
Category C: In-depth case studies of neighbourhood context and intermediary health-related factors/processes Studies which attempt to understand how a neighbourhood 'works'. They tend to use qualitative methodologies and questionnaires. These studies help us think about 'neighbourhood' in new ways and suggest new possibilities for research.		

based neighbourhoods field and settings such as school and marae have become common delivery sites for health-related interventions. However, it soon became clear that a full assessment of the settings literature was beyond the scope of this review and were therefore not included here.

Results

Unsurprisingly, given the necessarily broad search terms and wide coverage, there were a substantial number of articles and reports. In total, 2338 abstracts or titles were viewed. Titles (and abstracts where necessary) were initially scanned to exclude publications that would not contribute to Table 1. Books, video recordings, pamphlets and newsletters were not pursued. Further, a large number of papers were clearly not relevant to our topic. For example, papers that only used an area-level deprivation index as a proxy for individual-level socio-economic status rather than as a neighbourhood-level characteristic, and did not attempt to assess neighbourhood processes per se were excluded. Studies using area-level socio-economic measures as a proxy for individual-level socio-economic status accounted for a large proportion of the original publications. Using Table 1 as the inclusion criteria, 50 papers were included in this review.

Table 2 shows the distribution of the retrieved studies according to the categorisation specified in Table 1. The distribution was weighted towards studies directly measuring neighbourhood characteristics, but relatively evenly spread across the types of health outcome. In the remainder of this section, we review the studies stratified by the categories in Table 1 (A–C).

A: Indirect measurement of the physical, social or community resources of neighbourhoods

Over the past two decades, researchers in New Zealand have used various routinely created neighbourhood indices, usually derived from census data, to examine whether neighbourhood features are associated with health outcomes or the utilisation of health services. Of the eight studies in this category, seven utilised the New Zealand Deprivation Index (NZDep) to capture neighbourhood characteristics. The index was created by combining nine weighted census variables (e.g. income, employment status) aggregated to the area level (census meshblock or census area units)[1] (Salmond & Crampton 2002). Studies using NZDep as a neighbourhood measure have tended to demonstrate that more deprived neighbourhoods generally have poorer health outcomes, including higher rates of suicide (Pearce *et al.* 2007a), asthma (Salmond *et al.* 1999a), smoking (Barnett 2000, Crampton *et al.* 2000) and mortality from household fires (Duncanson *et al.* 2002). Moreover, some studies demonstrate that the relationship between area-level deprivation and individual-level health outcomes remains after controlling for various demographic and social characteristics at the individual level. For example, more deprived neighbourhoods have higher hospital admission rates (Barnett & Lauer 2003) and longer hospitalisations for psychiatric illnesses (Abas *et al.* 2006) than less deprived neighbourhoods, even after accounting for demographic factors and clinical factors. Other routinely created proxies for neighbourhood characteristics include measures of urban/rural status. An investigation of suicide rates in urban and rural areas (1980–2001) found that while suicide rates are higher in urban areas of the country, the urban/rural differential has narrowed (independently of NZDep), largely because of the rapid increase in rural suicides (Pearce *et al.* 2007a).

While these studies have been important in identifying that socio-economic characteristics of New Zealand neighbourhoods influence health independently of individual-level socio-demographic characteristics, interpreting the findings of these studies can be problematic. It is unlikely that the individual-level socio-economic factors included in such modelling fully capture the construct of individual socio-economic position. This means that there is very likely residual confounding of any NZDep association with health by individual socio-economic factors.

To summarise, NZDep has been an invaluable tool to highlight health inequalities and potential neighbourhood effects in New Zealand. Studies utilising NZDep have pointed to the strong likelihood that where you live matters for your health (and other social) out-

Table 2 Retrieved New Zealand-based neighbourhoods and health papers, categorised by neighbourhood setting and health outcome

Outcome	Category A: Indirect measurement of physical, social or community resources of neighbourhoods	Category B: Direct measurement of physical, social or community resources of neighbourhoods
Neighbourhood-level intermediary factors/processes, no individual-level outcomes		Cost of food and financial accessibility to healthy and 'non-healthy' food baskets by high and low deprivation neighbourhoods (Ling 2005) Locational access to all food outlets over time (Haigh 2006) Locational access to healthy and non-healthy foods (Pearce *et al.* 2007b) Locational access to food and alcohol outlets (Pearce *et al.* 2008a) Locational access to health promoting community resources (Pearce *et al.* 2007c) Locational access to health promoting community resources by rurality and region (Pearce *et al.* 2008d) Exposure to food advertising by neighbourhood (Maher *et al.* 2005) Locational access to gambling outlets (Ministry of Health 2006) Locational access to primary health-care services (Brabyn & Barnett 2004) Increased social capital and improvements in health and well-being of Ranui children and families (Adams *et al.* 2009) Accessibility of (pre)schools and development of social cohesion (Witten *et al.* 2007) Public health risks of community drinking supplies by neighbourhood deprivation (Hales *et al.* 2003) Locational access to contaminated sites (Salmond *et al.* 1999b) Ambient air pollution (particulate) by area socio-economic status (Pearce *et al.* 2006; Pearce & Kingham 2008)
Health services utilisation access at the individual level	Area deprivation and hospital admission rates (Barnett & Lauer 2003) Area deprivation and psychiatric hospitalisations (Abas *et al.* 2003, 2006)	Financial accessibility of primary health-care services by area deprivation and primary health-care utilisation (Barnett 2001) Locational access to general practitioners and pharmacies, and the utilisation of primary health-care services (Hiscock *et al.* 2008) Organisational structure of diabetes support groups and utilisation of group (Barnett *et al.* 2006)
Health status or risk factor outcomes at the individual level	Area deprivation and urban inequality, and smoking behaviour (Barnett 2000) Area deprivation and mortality in house fires (Duncanson *et al.* 2002) Area deprivation and adult asthma rates (Salmond *et al.* 1999a) Area deprivation and smoking rates (Crampton *et al.* 2000) Urban/rural location and suicide incidence (Pearce *et al.* 2007a)	Density of alcohol outlets and alcohol consumption by minors (Huckle *et al.* 2008) Impact of an alcohol ban on alcohol-related social and health issues (e.g. crime and motor vehicle accidents) (Conway 2002) Locational access to supermarkets and consumption of recommended daily intake of fruits and vegetables (Pearce *et al.* 2008b) Locational access to fast food outlets and consumption of recommended daily intake of fruits and vegetables, and weight (Pearce *et al.* 2008b) Perception of neighbourhood safety and opportunities for physical activity and levels of physical activity (Utter *et al.* 2006) Town size and level of physical activity (Badland & Schofield 2006) Locational access to open spaces and level of physical activity and body mass index (Witten *et al.* 2008) Locational access to gambling outlets and likelihood of being a gambler or problem gambler (Pearce *et al.* 2008c) Locational access to tertiary cancer treatment services and survival from upper gastrointestinal cancers (Gill & Martin 2002) Locational access to primary and cancer-related health services and survival from cancer (Haynes *et al.* 2008) Neighbourhood volunteerism and mortality (Blakely *et al.* 2006) Multi-modal community campaign and injury rates (Brewin & Coggan 2002)

Category C: In-depth case studies of neighbourhood context and intermediary health-related factors/processes
Perceived neighbourhood opportunities and uptake of physical activity opportunities (Hohepa *et al.* 2006)
Perceptions of ability to safely actively travel to school and uptake of active travel opportunities (Mitchell *et al.* 2007)
Neighbourhood features that enhance a sense of belonging and social cohesion (McCreanor *et al.* 2006)
Neighbourhood social connections and social capital (Witten *et al.* 2003; Stephens 2008)
Perceptions of neighbourhood barriers to accessing health care and uptake of appropriate health care (Simmons *et al.* 1998)
Impact of place on compositional density of psychiatric patients (Gleeson *et al.* 1998)

comes, over and above individual attributes. However, to advance our understanding of causal mechanisms, we need to *directly measure* those social, physical and community resources pertaining to neighbourhoods that we think actually determine health outcomes and test the association of these exposures on health and well-being outcomes.

B: Direct measurement of physical, social or community resources of neighbourhoods

Research that directly measures neighbourhood-level health determinants forms the bulk of this stocktake. Fourteen of the thirty papers in category B used geographical information systems, a technology which allows investigators to integrate spatial data from several sources (e.g. location of food outlets or health services) and construct measures of accessibility at varying spatial scales, including the neighbourhood; 12 of these were national studies. The spatial extent of the 'neighbourhoods' examined was defined in various ways. Nineteen studies defined neighbourhood by census area unit or meshblock. One national study grouped 'neighbourhood' by population size.

B1: Neighbourhood-level intermediary factors/processes, no individual-level outcomes. The following studies, while not determining an association with health, provided important information on neighbourhood-level mechanisms. Complementing the findings of studies that linked neighbourhood exposures to individual health outcomes and risk factors, a key finding in this category was that locational access to a variety of potentially health promoting resources (such as supermarkets, parks, health centres) was often better in more deprived neighbourhoods (Haigh 2006, Pearce *et al.* 2007c, 2008a). Although the quality of services or amenities was not examined in these studies, the findings are provocative as they suggest that, assuming that the provision of community resources matter for health, health inequalities could be even worse than they currently are if there were not such a pro-equity distribution of neighbourhood resources. However, potentially health damaging facilities such as fast food and alcohol outlets (Pearce *et al.* 2008a), opportunities to gamble (Ministry of Health 2006) and the advertising of unhealthy products (Maher *et al.* 2005) are also preferentially located in more deprived neighbourhoods. Therefore, it might be that historical transport routes, land values, rental costs and urban planning rules just so happen to result in services (whatever they are) being provided in more deprived areas of cities and that 'access' to them has less to do with distance but more to do with other factors (e.g. commuting patterns, quality of the resource, price barriers).

With regards to the physical environment, particulate air pollution tends to be higher in more deprived neighbourhoods (Pearce *et al.* 2006; Pearce & Kingham 2008). Work in progress (S. Hales, pers. comm., 2008) is also finding that census area unit levels of air pollution are associated with moderate differences in mortality (a 10 $\mu g\ m^{-3}$ difference in particulate pollution (PM10) was associated with, approximately, a 6% disparity in all-cause mortality), after adjusting for individual-level confounders (including smoking). Given that 'deprived people' are more likely to live in areas with air pollution, the contribution of air pollution to geographical inequalities in health warrants closer investigation. Similarly, high-deprivation areas are more likely to have greater numbers of hazardous substances sites (Salmond *et al.* 1999b) and unsatisfactory risk ratings for their public water supplies (Hales *et al.* 2003). Unfortunately, communicable disease data collection in New Zealand does not enable direct analysis of socio-economic status with gastrointestinal disease rates.

Turning to the social environment, several studies have explored neighbourhood social connections. The evaluation of a locality-based community development initiative in Ranui, West Auckland, included a before and after community social cohesion survey. The project's aims included improving the health of residents by building a more cohesive neighbourhood. Statistically significant increases over time in several indicators of social cohesion were observed: availability of youth activities, participation in community events and improved perceptions of Ranui as a good place to bring up children and to buy a home. Non-statistically significant positive changes in social cohesion ratings were also found (Adams *et al.* 2009).

Neighbourhood-level processes/factors that assist with building social connections were also examined in qualitative interviews with parents living in six diverse case study localities. Social connections were more evident where residents could identify public spaces that serve as neighbourhood meeting places. Channelling Bordieu, the researchers found that 'schools are amongst the *places*, school events the *occasions*, and reciprocity in child minding the *practices* that form the legitimate exchange which brings people together to build and maintain social capital' (Witten *et al.* 2007).

B2: Health services utilisation at the individual level. We have already seen that deprived neighbourhoods have higher rates of hospitalisations, but the pathway from deprivation to hospitalisation remains unclear. It is important to note that higher utilisation in more deprived areas may be expected because of worse health status and greater health-care needs in such areas. Only three papers met the criteria for inclusion in this category. Of the research that has been undertaken, the evidence suggests that neighbourhood access to health-care providers tends to exert an influence on the utilisation of those services. A national study of locational access to general practitioners (GPs) and pharmacies was associated with utilisation of, but not satisfaction with, those services (Hiscock *et al.* 2008). Another study of a cohort of low-income people found that their 'coping strategies' to gain access to primary health-care provision depended not only on individual-level characteristics but also on the location of the surgery they attended (Barnett 2001). The role of organisational structure was also emphasised in a study of the 41 Diabetes New Zealand societies across the country. It was found that those societies with decentralised structures had greater member involvement and were better at reaching 'at risk' (e.g. low income) groups (Barnett *et al.* 2006).

B3: Health status or risk factor outcomes at the individual level. There has been considerable interest in the role of the neighbourhood in explaining various obesity-related and nutrition-related health outcomes, including exposure to open spaces (Witten *et al.* 2008), supermarkets and convenience stores (Pearce *et al.* 2008b). Contrary to expectation, locational access to these resources did not tend to have a positive influence on health behaviours and outcomes. Further, some findings were counterintuitive, including poorer access to fast food (measured using distance in metres) outlets being associated with higher body mass index (BMI) (Pearce *et al.* 2009). However, one national study found that residents of larger urban areas tended to be less sedentary than those living is smaller towns, which related to differences in the infrastructural barriers (e.g. inadequate sidewalks, heavy traffic) to physical activity between these settings (Badland & Schofield 2006). There is also evidence that neighbourhoods exert an influence on alcohol consumption and related health outcomes, including an Auckland study which found that neighbourhood density of premises licensed to sell alcohol was associated with increased alcohol consumption among minors (Huckle *et al.* 2008). Similarly, an evaluation of the impact of a community-initiated alcohol ban found a large decline in the frequency and severity of alcohol-related incidents, including crime, motor vehicle accidents and antisocial behaviours (Conway 2002).

Other papers in this category included a national study linking mortality and census data, which found no association between neighbourhood levels of volunteering and mortality (including suicide) (Blakely *et al.* 2006). Similarly, at the national level, ethnic variation in cancer survival have been shown to be unrelated to distance and travel time to cancer services (Gill & Martin 2002; Haynes *et al.* 2008). However, greater exposure to gambling outlets was associated with higher rates of being a gambler and problem gambler (Pearce *et al.* 2008c). One local multi-modal campaign to improve childhood injury found that the introduction of a Māori-based child restraint hireage shop contributed to the improvement in car restraint use and a reduction in injury rates (Brewin & Coggan 2002).

C: In-depth case studies of neighbourhood processes

A number of papers were found that did not easily fit into our categorisation and yet were considered to make significant contributions to the neighbourhoods and health literature. In

the main, these papers are in-depth case studies concerned with the forces that may shape particular aspects of a neighbourhood. The majority of these papers use residents' understandings of their neighbourhood as the exposure and do not rely on administrative boundaries or data. Methodologies range from a door-to-door survey of over 25 000 houses in South Auckland (Simmons *et al.* 1998), to in-depth interviews with selected residents (Witten *et al.* 2003; Hohepa *et al.* 2006; McCreanor *et al.* 2006; Mitchell *et al.* 2007; Stephens 2008), to service mapping and analysis of health services data (Gleeson *et al.* 1998).

A consistent observation made in these studies was of a recursive relationship between the compositional and contextual aspects of neighbourhoods (Gleeson *et al.* 1998), a finding that supports research highlighting the role of national and local government policy as drivers of structural changes (Barnett & Lauer 2003), and subsequent compositional change of the characteristics of individuals living in the neighbourhoods. Schools appear to be particularly important sites of social connection for families (McCreanor *et al.* 2006; Witten *et al.* 2007), and the resultant social connections are likely to spill over into neighbourhood connections. Other common sites of everyday practices such as workplaces, sports clubs, churches and marae, neighbourhood and non-neighbourhood based, were important in the development of social capital (Witten *et al.* 2003; Stephens 2008). A significant finding of the studies reported here is the importance of perception (as distinct from objective reality) in driving behaviours (Hohepa *et al.* 2006; Mitchell *et al.* 2007), including, for example, if a neighbourhood is perceived as 'unsafe' (because of traffic or social incivilities); children's opportunities for active travel are diminished regardless of documented accident or crime rates. The case studies highlight that it cannot be assumed that the health-related experiences of a neighbourhood will be consistent across the life course, or for different demographic groups.

Discussion

We found six key themes in this stocktake of the neighbourhoods and health research in New Zealand. First, there are considerable variations in health status across neighbourhoods in New Zealand that probably cannot be entirely explained by compositional arguments. *Neighbourhood context appears to matter*. Second, neighbourhood health strongly varies when neighbourhoods are stratified by census-based indices such as area measures of social deprivation or urban/rural status. The effects tend to remain even after controlling for potential individual-level and area-level confounders. Third, considerable effort has been made to examine the potential health effects of neighbourhood community resources (e.g. access to greenspace, supermarkets etc.), and this research base is better developed than in most other countries (see Pearce *et al.* (2008a) for a review of the international evidence). Community resources vary significantly by measures of neighbourhood deprivation and, contrary to the international evidence, with better access in more deprived neighbourhoods, although this association is not consistent in rural areas or some regions of the country. There are important differences between objectively measured indices of access to community resources and local resident's perception on their availability. A number of studies have evaluated whether access to neighbourhood community resources exerts an independent effect on individual-level health status; the evidence is equivocal. Fourth, better locational access to neighbourhood health service provision (e.g. general practitioners) tends to improve the utilisation of these services and subsequent health outcomes, although this trend is not consistent for all social and ethnic groups. Fifth, social connections are based around the people and places (family, schooling, workmates) that are part of the people's everyday lives. The pathways, not all of which are neighbourhood-based, may differ by ethnicity and socio-economic status. Finally, it is clear that national-level policy can have significant impacts on health and health-related behaviours at the small area level. Macroeconomic changes and government-led adjustments to the health-care system can have unintended implications for health outcomes and health care at the neighbourhood level.

With regards to the types of health outcomes, behaviours and practices that have been considered in the New Zealand literature, the range is limited. There was a large grouping of

research papers which had a focus on the consumption environments (food and alcohol) and a smaller grouping which had a focus on physical activity. The impact of health-care provision on various aspects of utilisation and morbidity/mortality after adjustment for health needs was examined. There is a small but developing literature linking environmental hazards to putative health outcomes. The final significant grouping was papers on social capital – its generation and link to well-being.

While there are many pertinent opportunities for further neighbourhoods and health research in New Zealand, we argue that there are five priority areas, some methodological and others substantive. First, most neighbourhoods and health research has relied on administrative boundaries to delimit the area-based exposure of interest. It has been assumed that boundaries designed for the dissemination of census data are suitable geographical units for measuring place-based effects. However, the sensitivity of neighbourhood effects to the definition of neighbourhood boundaries used among New Zealand researchers has not been evaluated. New Zealand researchers have been quick to utilise geographical information systems methodologies, and many of the recent studies here have compelling findings, in large part because they were not what had been expected. Such contradictions may point to the need for better measurements, the need to conceptualise neighbourhoods as just one community (of many) that individuals inhabit and the need to construct measures of neighbourhood context tailored to the specific health outcomes under investigation. Second, it is important that issues of selective migration and mobility are evaluated using longitudinal data. The mobility patterns of individuals between neighbourhoods with different physical and social characteristics may lead to a misspecification of total (lifetime) neighbourhood exposure. Further, it is feasible that an association between a particular feature of New Zealand neighbourhoods and the health status of the local residents may be an artefact of selective migration patterns (e.g. individuals with high levels of physical activity may choose to live in a neighbourhood that is conducive to this lifestyle), a process known as endogeneity (Kawachi & Subramian 2007). This issue is particularly relevant in New Zealand where over a fifth of residents are born overseas, immigration policy is highly selective and half of the residents change address every five years.

A third priority area for further research in New Zealand is to closely examine whether neighbourhoods exert a disproportionate influence on specific demographic and social groups such as children, older residents, ethnic minority groups, etc. An improved understanding of the processes linking neighbourhoods to the health of specific population groups is critical to provide national and local government with the evidence base for informed policy making. Fourth, it is important for funders of research to consider how they can assist researchers to respond to 'natural experiments' such as the opening of supermarkets or playgrounds. This may also require the research community to engage more proactively with non-traditional partners such as local government bodies and corporate institutions. Funding bodies should also become more demanding of, and provide resource for, appropriate evaluation of interventions at the neighbourhood level. Finally, this stocktake reinforces the importance of evaluating the New Zealand-specific evidence, rather than relying on the findings from overseas studies. Many of the New Zealand findings are inconsistent with the international literature. For example, in contrast to work in the United Kingdom, Australia, the United States and Canada, community resources (whether they be beneficial or detrimental to health) are consistently and disproportionately located in more socially deprived neighbourhoods across the country. Evidence from New Zealand will more accurately capture 'on the ground' factors that are important for increasing our understanding of causal processes, and in so doing will better contribute to the international body of evidence.

Conclusion

Improving our understanding of the mechanisms linking neighbourhood characteristics to individual-level health status provides considerable potential for improving population-level health outcomes. In this New Zealand review, we have demonstrated that residential and non-residential neighbourhoods exert a sig-

nificant influence on individual-level health outcomes and health-related behaviours, even after taking into account the socio-demographic characteristics of the individuals occupying these areas. Although researchers in New Zealand have made considerable progress in furthering the understanding of the processes linking neighbourhoods to health status, many important challenges remain. Addressing these research challenges will undoubtedly assist in developing the theoretical understanding of the processes underpinning neighbourhood variations in health, and in doing so, offers important opportunities to improve health outcomes and reduce health inequalities.

Acknowledgement

This research was funded by the New Zealand Health Research Council as part of the Neighbourhoods and Health Project within the Health Inequalities Research Program.

Endnote

1 Meshblocks are the smallest geographic unit for the dissemination of census data, typically representing approximately 100 people. Census area units are aggregations of meshblocks, generally representing 3000–5000 people.

References

Abas M, Vanderpyl J, Robinson E, Crampton P (2003). More deprived areas need greater resources for mental health. *Australasian and New Zealand Journal of Psychiatry* **37**, 437–44.

Abas MA, Vanderpyl J, Robinson E, Le Prou T, Crampton P (2006). Socio-economic deprivation and duration of hospital stay in severe mental disorder. *British Journal of Psychiatry* **188**, 581–2.

Adams J, Witten K, Conway K (2009). Community development as health promotion: Evaluating a complex locality-based project in New Zealand. *Community Development Journal* **44**, 140–57. In press.

Badland H, Schofield G (2006). Understanding the relationships between town size and physical activity levels: A population study. *Health and Place* **12**, 538–46.

Barnett JR (2000). Does place of residence matter? Contextual effects and smoking in Christchurch. *New Zealand Medical Journal* **113**, 433–5.

Barnett JR, Lauer G (2003). Urban deprivation and public hospital admissions in Christchurch, New Zealand, 1990–1997. *Health and Social Care in the Community* **11**, 299–313.

Barnett JR, Pearce J, Howes P (2006). 'Help, educate, encourage?': Geographical variations in the provision and utilisation of diabetes education in New Zealand. *Social Science and Medicine* **63**, 1328–43.

Barnett R (2001). Coping with the costs of primary care? Household and locational variations in the survival strategies of the urban poor. *Health and Place* **7**, 141–57.

Blakely T, Atkinson J, Ivory V, Collings S, Wilton J, Howden-Chapman P (2006). No association of neighbourhood volunteerism with mortality in New Zealand: A national multilevel cohort study. *International Journal of Epidemiology* **35**, 981–9.

Brabyn L, Barnett R (2004). Population need and geographical access to general practitioners in rural New Zealand. *New Zealand Medical Journal* **117** (1199).

Brewin M, Coggan C (2002). Evaluation of a New Zealand indigenous community injury prevention project. *Injury Control and Safety Promotion* **9**, 83–8.

Conway K (2002). Booze and beach bans: Turning the tide through community action in New Zealand. *Health Promotion International* **17**, 171–7.

Crampton P, Salmond C, Woodward A, Reid P (2000). Socioeconomic deprivation and ethnicity are both important for anti-tobacco health promotion. *Health Education and Behavior* **27**, 317–27.

Duncanson M, Woodward A, Reid P (2002). Socio-economic deprivation and fatal unintentional domestic fire incidents in New Zealand 1993–1998. *Fire Safety Journal* **37**, 165–79.

Gill AJ, Martin IG (2002). Survival from upper gastrointestinal cancer in New Zealand: The effect of distance from a major hospital, socio-economic status, ethnicity, age and gender. *Australian and New Zealand Journal of Surgery* **72**, 643–6.

Gleeson B, Hay C, Law R (1998). The geography of mental health in Dunedin, New Zealand. *Health and Place* **4**, 1–14.

Haigh R (2006). Neighbourhood histories and health: An evolving social geography of community resource access in Christchurch, New Zealand (report). University of Canterbury.

Hales S, Black W, Skelly C, Salmond C, Weinstein P (2003). Social deprivation and the public health risks of community drinking water supplies in New Zealand. *Journal of Epidemiology and Community Health* **57**, 581–3.

Haynes R, Pearce J, Barnett R (2008). Cancer survival in New Zealand: Ethnic, social and geographical inequalities. *Social Science and Medicine* **67**, 928–37.

Hiscock R, Pearce J, Blakely T, Witten K (2008). Is neighbourhood access to health care provision associated with individual-level utilization and

satisfaction? *International Journal of Health Services* **43**, 2183–200.

Hohepa M, Schofield G, Kolt GS (2006). Physical activity: What do high school students think? *Journal of Adolescent Health* **39**, 328–36.

Huckle T, Huakau J, Sweetsur P, Casswell S (2008). Density alcohol outlets and teenage drinking: Living in an alcogenic environment is associated with higher consumption in a metropolitan setting. Density of outlets is associated with underage drinking. *Addiction* **103**, 1614–21.

Kawachi I, Berkman L, eds (2003). *Neighbourhoods and Health*. Oxford University Press, New York.

Kawachi I, Subramian SV (2007). Neighbourhood influences on health. *Journal of Epidemiology and Community Health* **61**, 3–4.

Ling N (2005). Are 'healthy' foods more expensive in deprived neighbourhoods? (report). University of Otago.

McCreanor T, Penney L, Jensen V, Witten K, Kearns R, Barnes HM (2006). 'This is like my comfort zone': Senses of place and belonging within Oruamo/Beachhaven, New Zealand. *New Zealand Geographer* **62**, 196–207.

Maher A, Wilson N, Signal L (2005). Advertising and availability of 'obesogenic' foods around New Zealand secondary schools: A pilot study. *New Zealand Medical Journal* **118** (1218).

Ministry of Health (2006). *Problem gambling geography of New Zealand 2005* (report). Ministry of Health, Wellington.

Mitchell H, Kearns R, Collins DCA (2007). Nuances of neighbourhood: Children's perceptions of the space between home and school in Auckland, New Zealand. *Geoforum* **38**, 614–27.

Pearce J, Kingham S, Zawar-Reza P (2006). Every breath you take? Environmental justice and air pollution in Christchurch, New Zealand. *Environment and Planning A* **38**, 919–38.

Pearce J, Barnett R, Jones I (2007a). Have urban/rural inequalities in suicide in New Zealand grown during the period 1980–2001? *Social Science and Medicine* **65**, 1807–19.

Pearce J, Blakely T, Witten K, Bartie P (2007b). Neighborhood deprivation and access to fast-food retailing. A national study. *American Journal of Preventive Medicine* **32**, 375–82.

Pearce J, Witten K, Hiscock R, Blakely T (2007c). Are socially disadvantaged neighbourhoods deprived of health related community resources? *International Journal of Epidemiology* **36**, 348–55.

Pearce J, Kingham S (2008). Environmental inequalities in New Zealand: A national study of air pollution and environmental justice. *Geoforum* **39**, 980–93.

Pearce J, Day P, Witten K (2008a). Neighbourhood provision of food and alcohol retailing and social deprivation in urban New Zealand. *Urban Policy and Research* **26**, 213–27.

Pearce J, Hiscock R, Blakely T, Witten K (2008b). The contextual effects of neighbourhood access to supermarkets and convenience stores on individual fruit and vegetable consumption. *Journal of Epidemiology and Community Health* **62**, 198–201.

Pearce J, Mason K, Hiscock R, Day P (2008c). A national study of neighbourhood access to gambling opportunities and individual gambling behaviour. *Journal of Epidemiology and Community Health* **62**, 862–8.

Pearce J, Witten K, Hiscock R, Blakely T (2008d). Regional and urban-rural variations in the association of neighbourhood deprivation with community resource access: A national study. *Environment and Planning A* **40**, 2469–89.

Pearce J, Hiscock R, Blakely T, Witten K (2009). A national study of the association between neighbourhood access to fast food outlets and the diet and weight of local residents. *Health and Place* **15**, 193–7.

Salmond C, Crampton P, Hales S, Lewis S, Pearce N (1999a). Asthma prevalence and deprivation: A small area analysis. *Journal of Epidemiology and Community Health* **53**, 476–80.

Salmond K, Howden-Chapman P, Woodward A, Salmond C (1999b). Setting our sights on justice: Contaminated sites and socio-economic deprivation in New Zealand. *International Journal of Environmental Health Research* **9**, 19–29.

Salmond C, Crampton PW (2002). *NZDep2001 Index of Deprivation* (report). Ministry of Health, Wellington.

Simmons D, Weblemoe T, Voyle J, Prichard A, Leakehe L, Gatland B (1998). Personal barriers to diabetes care: Lessons from a multi-ethnic community in New Zealand. *Diabetic Medicine* **15**, 958–64.

Stephens C (2008). Social capital in its place: Using social theory to understand social capital and inequalities in health. *Social Science and Medicine* **66**, 1174–84.

Utter J, Denny S, Robinson EM, Ameratunga S, Watson P (2006). Perceived access to community facilities, social motivation, and physical activity among New Zealand youth. *Journal of Adolescent Health* **39**, 770–3.

Witten K, McCreanor T, Kearns R (2003). The place of neighbourhood in social cohesion: Insights from Massey, West Auckland. *Urban Policy and Research* **21**, 321–38.

Witten K, McCreanor T, Kearns R (2007). The place of schools in parents' community belonging. *New Zealand Geographer* **63**, 141–8.

Witten K, Hiscock R, Pearce J, Blakely T (2008). Neighbourhood access to open spaces and the physical activity of residents: A national study. *Preventive Medicine* **47**, 299–303.