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Article

Place, health, and community attachment: Is community capacity associated with self-rated health at the individual level?

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ABSTRACT

Community-level interventions dominate contemporary public health responses to health inequalities as a lack of political will has discouraged action at a structural level. Health promoters commonly leverage community capacity to achieve programme goals, yet the health implications of low community capacity are unknown. In this study, we analyse perceptions of community capacity at the individual-level to explore how place-based understandings of identity and connectedness are associated with self-rated health. We examine associations between individual community capacity, self-rated health and income using a cross-sectional survey that was disseminated to 303 residents of four small (populations 1500–2000) New Zealand towns. Evidence indicating a relationship between individual community capacity and self-reported health was unconvincing once the effects of income were incorporated. That is, people who rated their community's capacity higher did not have better self-rated health. Much stronger evidence supported the relationship between income and both higher individual community capacity and higher self-rated health. We conclude that individual community capacity *may* mediate the positive association between income and health, however, overall we find no evidence suggesting that intervening to enhance individual community capacity is likely to improve health outcomes.

1. Introduction

The means by which places are understood to shape health outcomes is multifactorial and remains contested (Pearce, 2013, Wilkinson and Pickett, 2009). Across both individual and multi-level studies of place, the majority of variance in health outcomes is consistently attributed to individual risk factors that play out through the composition of those places (Bentley & Kavanagh, 2007; Gattino, De Piccoli, Fassio, & Rollero, 2013; Linden-Bostrom, Persson, & Eriksson, 2010; Muhajarine, Labonte, Williams, & Randall, 2008; Pearce, 2007). In particular, a robust body of evidence demonstrates the critical role of income as a source of health disparities (see Wilkinson and Marmot (2003) for example), yet policy responses rarely seek to improve the material realities of individual lives (Smith, 2013). Instead, health promotion efforts commonly target health behaviours through community-level or policy responses, the success of which is often sensitive to socio-economic status (Magnée et al., 2013). Gaining prominence within health promotion is the concept of community capacity building, understood as the process of enhancing the skills, networks, and resources of a community to improve their own health outcomes (Liberato et al., 2011). Health promoters commonly leverage community capacity to achieve programme goals, yet the health implications of low community capacity are unknown. In this paper, we explore the concept of community capacity further by examining the relationship between community capacity and health at the individual level and contextualise this relationship in light of evidence surrounding associations between income and self-rated health. In the following paragraphs, we examine the evidence gained from individual level studies demonstrating (1) the importance of subjective experiences of community to health, (2) that community is inextricably grounded in the place and is (3) (re) produced through our social interactions.

Individual-level studies of sense of place have lacked conceptual cohesion, coming under various guises including 'place attachment' (Hidalgo & Hernandez, 2001; Scannell & Gifford, 2010), 'sense of community' (Gattino et al., 2013), and 'sense of place' (Pretty, Chipuer, & Bramston, 2003; Williams & Kitchen, 2012). Perceptions of place provide an indicator of our cognitive and emotional responses to the local environment and, in turn, may shape our physiological and behavioural response to that place (Ellaway & Macintyre, 2009; Hystad & Carpiano, 2012; Lengen & Kistermann, 2012; Muhajarine et al., 2008; Scannell & Gifford, 2010). Unresolved in this literature

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are the specific perceptions of place that elicit responses that impact our health. Work to-date has found positive associations between various dimensions of mental and physical health and sense of attachment to one's neighbourhood (Muhajarine et al., 2008; Williams & Kitchen, 2012), community participation (Muhajarine et al., 2008; Pollack & von dem Knesebeck, 2004), perceptions of neighbourhood problems (Ellaway, Macintyre, & Kearns, 2001), and satisfaction with the physical features of one's neighbourhood (Muhajarine et al., 2008; Wilsonet al., 2004). Collectively, this research indicates that residents holding positive perceptions of the place they live are more likely to rate their own health highly.

Turning to the psychological literature, connections to place that evoke personal meaning often arise from our experiences in those places (Scannell & Gifford, 2010). Importantly, *perceptions* of one's neighbourhood appear more closely linked to health outcomes than objective measures of neighbourhood quality (Wen, Hawkley, & Cacioppo, 2006). This leads us to question whether the physical features of a landscape can elicit a cognitive response that is distinct from the social connections to place identified in the previous paragraph. That is, when I visit a familiar beach does hearing the waves crashing and feeling the warm sand between my toes evoke the same sense of place as when I visit the beach of my childhood and recall memories of running across the hot sand to score a run during a family cricket match? Hidalgo and Hernandez (2001) found social connections to place elicited greater place attachment than the physical dimensions at the home, neighbourhood and city scales. Gattino et al. (2013) similarly found sense of community was a predictor of higher quality of life whereas attachment to place was not; conflicting results from Wen et al. (2006) suggest this debate is a long way from being resolved. Nonetheless, neurological evidence that heightened emotions play a positive role in memory retention would suggest that a sense of place is greatest where both physical and social stimuli have been elicited (see Lengen and Kistermann (2012) for discussion).

When we consider the sociological literature, 'community' is now more frequently defined by the common qualities or interests we share with others rather than geographic co-location. Advances in technology and our lived environment have led us to become more mobile and connected with those beyond our neighbourhood (Day & Murdoch, 1993). Measures of sense of community are multidimensional capturing the meanings, attachments and satisfaction that are elicited from individual and collective experiences of a place (Stedman, 2002). As a community-level construct, place may be co-constituted, its meaning embedded in a group's social and cultural practices (Scannell & Gifford, 2010). Perhaps even more importantly, a community may be a site of belonging. Research illustrates that a positive sense of identity can emerge from strong social connections (Glendinning, Nuttall, Hendry, Kloep, & Wood, 2003; Stedman, 2002), and confidence in the collective efficacy of a community (Jung & Viswanath, 2013). Interestingly, perceived problems within one's neighbourhood have been identified as a stronger predictor of poor health than a sense of neighbourhood cohesion (Ellaway et al., 2001). We argue that significant health promotion efforts remain focussed on the community and the changing nature of 'community' warrants further investigation.

Research quantifying community capacity has identified statistically significant differences amongst neighbourhoods (Jung & Rhee, 2013) and between towns (Lovell et al., 2015a), thus confirming the importance of place to our social relationships. Place is recognised by geographers as those aspects of space that possess meaning for both individuals and collectives (Cresswell, 2014). Research examining the impact of such place effects on health has garnered considerable attention in the fields of sociology, geography, and public health (see Macintyre, Ellaway and Cummins (2002) and Pearce (2007) for discussion). Frequently measured with multi-level studies, place effects are understood as the impact that contextual variables have on health outcomes (Pearce, 2007; Bentley & Kavanagh, 2007). Yet, within the geographic literature, researchers have highlighted that place effects may be multiple and impact people and places differentially (Macintyre et al., 2002). Place are locations individuals imbue with a sense of meaning arising from their connections with people, social institutions and the built environment; this paper explores how such perceptions of one's community, may be associated with self-rated health.

2. Measuring individual community capacity and health

Community capacity building has gained traction as a strengths-based health promotion tool as it emphasises local ownership over both health problems and their solutions. Health promoters have recognised the appeal of such approaches to communities so commonly adopt capacity building as a means to achieve the goals of their health promotion programmes (Hawe et al., 1997; Lovell et al., 2011). Despite support for the concept, evidence that initiatives to build community capacity can improve health outcomes is far from conclusive. Promising work by Jung and Viswanath (2013) in Seoul, Korea has identified an association between community capacity and self-rated health (dichotomised as low versus high). However, a paucity of research into the health outcomes of investing in community capacity may be leading supporters to overstate the benefits of capacity building (Ebbesen et al., 2004; Liberato et al., 2011). Jung and Viswanath (2013) justifiably conclude that building community capacity should be further investigated as a health promotion tool (Jung & Viswanath, 2013).

Evidence highlighting the affective dimensions of place clarifies the value of examining community capacity from the perspective of residents. In the current study, we use the qualified term 'individual community capacity' to capture the perceptions, experiences, and attitudes participants held about their town. When aggregated, individual community capacity ought to be an indicator for the community capacity of a place. We reserve the unqualified term 'community capacity' for those instances where the town or neighbourhood is the unit of analysis. Community capacity is captured through six distinct but interrelated constructs. Each construct, or 'dimension', reflects an emphasis of the community capacity literature. First, 'participation' in one's community has been associated with higher self-rated health in Germany (Pollack & von dem Knesebeck, 2004), less emotional distress but, interestingly, not overall health status in Canada (Veenstra et al., 2005). Constructs were measured on scales using likert-type items, for example, measuring community participation, we sought to capture residents' perceived support (in-kind and financially) for local groups with questions such as "I support the local school whenever I can", "Participating in local clubs and events is good for the community". Second, 'sense of place' taps into notions of place attachment as a source of identity (Stedman, 2002); survey questions addressed residents' attachment to the landscape and history of their town e.g. "I am very attached to the local environment and landscape", "I see how economic changes have affected [my town]." Whereas sense of place emphasises the affective experience of belonging, 'community attitudes', captured participant's satisfaction with their place of residence e.g. "My town has a positive future." "I am happy to live in [name of town]." Fourth, 'social cohesion' addressed residents' perceptions of their community as a trusting and inclusive place e.g. "I have little in common with most people who live here" (reverse scored). Linden-Bostrom et al. (2010) and self-rated health were indirectly associated but social support remained an important factor when rating one's health.

Community capacity building eschews a focus on deficits and considers concepts of place through residents' sense of community (Jung & Viswanath, 2013), and perceived collective efficacy. Consistent with Ellaway et al.'s (2001) findings that perceived problems within a community were associated with worse health, the final two dimensions of the community capacity scale consider the potential of a community to resolve problems. 'Problem assessment' captures whether residents communicate to identify problems and take action

e.g. “If there was a serious problem, people here could get together and solve it”, “I frequently discuss community issues with my friends and neighbours.” ‘Leadership’ addresses residents’ confidence in, perceived accessibility and responsiveness of local leaders e.g. “The most important issues affecting [my town] are being addressed”, “If I share my ideas and opinions with local leaders they will listen.” Putnam's early work in Italy, found a clear relationship between indicators of civic participation and effective governance or “the hallmarks of a successful region” (Putnam, 1995). In measuring collective efficacy and leadership, we extend the current literature on health and community by capturing these neglected, political dimensions of place.

Community capacity building is commonly used as a tool by health promoters tasked with implementing community-level interventions and is considered the mainstay of public health. Given the paucity of evidence addressing the health impacts of community capacity building, we sought to interrogate community capacity as a predictor of self-rated health. Previous research demonstrating associations between income inequality and health at the ecological level has highlighted the possible mediating role of social capital in this relationship (Kawachi, Kennedy, Lochner, & Prothrow-Stith, 1997; Veenstra, 2002). This work had us questioning whether community capacity could play a mediating role in the income-health nexus. We explore these issues by testing the following hypotheses:

H1. Income was anticipated to demonstrate a strong association with self-rated health.

H2. We anticipated that, when socio-demographic factors were controlled for, individual community capacity would be directly associated with self-rated health.

H3. We expected that income would demonstrate a stronger association with self-rated health than individual community capacity.

Analysing perceptions of community capacity, and its six dimensions, at the individual-level allowed us to explore how the affective dimensions of place, identity and connectedness are associated with self-rated health.

3. Methods

3.1. Design and sample

A baseline survey of residents of four study towns was undertaken between October and November, 2011. Methods for the baseline survey are described in more detail in Lovell et al. (2015a) and only essential details are provided here. The baseline sample consisted of residents of a small town (Mataura) who were matched with a comparison population from three additional towns comparative in size and demographics. Participants were randomly selected from the New Zealand electoral role, (including those of Māori ethnic identity who opted to register in a Māori electorate rather than a General electorate) with the sample stratified using age, sex and NZ Deprivation Quintile (a place-based indicator of socio-economic status). Baseline (2011) survey respondents (n=295) received a follow-up postal survey in 2013; the results of this follow-up survey are reported in the current study.

3.2. Measures

The key variable in our study was individual community capacity which was measured through a survey instrument previously developed by the authors (Lovell et al., 2015a) and consisting of six dimensions (discussed earlier). Self-rated health was reported using one of five ordinal categories: excellent, very good, good, fair, and poor. As a single-item, self-reported health status is a compact and efficient indicator of health that has been significantly associated with mortality (Idler & Benyamini, 1997). However, as a subjective measure, self-rated health is often relative and can be conflated with other factors (Mellor & Milyo, 2005). Socio-demographic data (including age, sex, homeownership status, employment status, estimated household income, and time spent in the community) was also collected as part of the baseline (2011) and follow-up (2013) surveys.

3.3. Study sites

In November of 2013, a five-page 46-item questionnaire was disseminated by post to residents in four South Island, New Zealand towns who had been randomly selected from the Electoral Roll in the previous phase of the study. Located at the far south of New Zealand's South Island, Mataura, Winton, Riverton and Milton are small (populations 1500–2000) rural towns. Rural areas are widely acknowledged as disproportionately affected by New Zealand's history of economic restructuring. The neoliberal drive of the 1980s and ’90s hollowed out the provision of state services to rural areas while impacting the profitability of many industries within the primary sector (Kearns & Joseph, 1997). Each of the study towns faired differently during this period: Mataura experienced a series of major industry closures, the dramatic decline of its main street and a drop in house prices whereas Milton and Winton retained robust retail streets that serve the rural hinterland. Riverton, a coastal community, has begun to transition into a tourist town but, like the other centres, residents retain a low average income of NZ$24,547 (well below the median New Zealand income of NZ$29,900 for individuals in 2013) and an ageing population.

3.4. Data collection procedures

The questionnaire was tailored to each town by using the town's name but otherwise the same questions were asked of all participants. A cover letter was personally addressed to each recipient introducing the purpose of the survey and assuring confidentiality. The survey procedure was based on a modified form of Dillman's Tailored Design Methods (2007) with up to five contacts with each participant: the first mail-out of the questionnaire, a thank you/reminder postcard (sent to both responders and non-responder), a replacement questionnaire for non-responders, and a final reminder postcard to non-responders. In addition, non-responders residing in Mataura were approached once in a door-to-door method as the focus of the follow-up study was the impact of a specific economic event within that community. Data collection ended in December 2013. To minimise data errors, all data were entered twice and compared with any inconsistences resolved. Ethical approval was granted by the University of Otago Ethics Committee; informed consent was implied by the return of a completed survey.

3.5. Statistical analysis

Sample size calculations were based on a planned intervention in one of the study towns rather than the secondary analyses presented here and details of these calculations can be found in Lovell et al. (2015a). Prior to undertaking the present analyses, the internal consistency of items in the community capacity scale and each subscale was evaluated using Cronbach alpha; this is discussed in detail in Lovell et al. (2015a). Where participants did not answer all items, their score for the (sub)scale was estimated using the mean of all of their available item responses as long as at least 80% of items in the (sub) scale were answered.

Appropriate descriptive statistics are presented for all relevant variables. For statistical modelling, household income categories were collapsed into up to $30,000, between $30,001 and $70,000, and over

Table 1
Characteristics of the sample.

		Total (n=178)	Mataura (n=78)	Milton (n=53)	Riverton (n=21)	Winton (n=26)
Age	median (IQR)	59.0 (21.0)	60.0 (19.0)	58.5 (22.0)	51.5 (25.0)	64.0 (22.0)
	Missing	*3*	*1*	*1*	*1*	*0*
Sex	Male n(%)	78 (44)	34 (44)	24 (46)	10 (48)	10 (38)
	Female n(%)	98 (56)	43 (56)	28 (54)	11 (52)	16 (62)
	Missing	*2*	*1*	*1*	*0*	*0*
Income	–$20,000	29 (17)	17 (23)	8 (16)	2 (10)	2 (8)
	–$30,000	35 (21)	18 (24)	8 (16)	3 (15)	6 (24)
	–$50,000	40 (24)	14 (19)	15 (30)	5 (25)	6 (24)
	–$70,000	35 (21)	15 (20)	9 (18)	5 (25)	6 (24)
	–$100,000	24 (14)	9 (12)	10 (20)	3 (15)	2 (8)
	> $100,000	6 (4)	1 (1)	0 (0)	2 (10)	3 (12)
	Missing	*9*	*4*	*3*	*1*	*1*
Relationship status	Single	20 (11)	9 (12)	6 (12)	3 (15)	2 (8)
	Separated	5 (3)	4 (5)	1 (2)	0 (0)	0 (0)
	Divorced	8 (5)	4 (5)	1 (2)	1 (5)	2 (8)
	Widowed	24 (14)	9 (12)	9 (17)	0 (0)	6 (23)
	Married	92 (53)	40 (52)	27 (52)	12 (60)	13 (50)
	Living as married	26 (15)	11 (14)	8 (15)	4(20)	3 (12)
	Missing	*3*	*1*	*1*	*1*	*0*
Ethnicity	NZ European	144 (86)	56 (77)	46 (98)	17 (81)	24 (92)
	Māori	15 (9)	12 (16)	1 (2)	2 (10)	1 (4)
	Other	8 (5)	5 (7)	0 (0)	2 (10)	1 (4)
	Missing	*11*	*5*	*6*	*0*	*0*

$70,000; relationship statuses were collapsed to single/separated/divorced/widowed and married/de facto; and ethnicities were collapsed to New Zealand European/Other and Māori with the latter being prioritised over the former due to the particular interest in the wellbeing of the indigenous people of New Zealand. Where age was missing in this follow-up survey, it was estimated by adding two to their baseline survey age.

Ordinal logistic regression models were used to explore individual-level associations between both income and individual community capacity scores (and subscale scores) and self-rated health. For these analyses, health was collapsed into poor/fair, good, very good, and excellent due to small numbers in the poor category. Proportionality was assessed, and non-proportionality modelled when appropriate, using a generalised ordinal logistic regression model, for the income, individual community capacity, and other variables included as potential confounders (age, sex, Māori ethnicity, relationship status, and location). As well as models examining the associations with health, similar models were investigated with income as the outcome variable and linear regression models were investigated with each community capacity measure as an outcome. All of the these sets of models followed a similar process: an unadjusted model was constructed looking at a single predictor; same but adjusting for non-modifiable potential confounders (age, sex, Māori ethnicity, relationship status, and location); and an adjusted model including all of these variables along with income, health, or individual community capacity also included. Where the predictor was health or income, linear and higher-order trends were examined using orthogonal polynomials. All models incorporated Froot's (1989) robust standard errors with clustering by town. For linear regression models, residual diagnostics were inspected for evidence of non-normality, heteroscedasticity, and non-linearities. Where appropriate, natural log transformations were investigated along with the inclusion of quadratic terms following centring of continuous predictors. Data analysis was undertaken by the second author using the software programme Stata 14.1 for all analyses and two-sided $p < 0.05$ was considered statistically significant in all cases. No formal adjustments were made for multiple comparisons as this was an exploratory study. Isolated or marginal results should be interpreted with caution.

3.6. Response rate

The final response rate was 70% (195/(295-7-8), after taking into account seven deceased individuals and eight non-deliveries. The response rates between the four towns ranged from 64% in Mataura to 78% in Winton. Of this 195, 14 respondents were no longer living in their original community and a further three did not provide sufficient data to allow their inclusion in any analyses, leaving 178 individuals across four communities.

Between 21 and 78 responses were received from each community. For the 175 respondents, who provided this information (3 missing ages), the median age was 59 years and most (86% of those with a valid ethnicity with 11 missing) identified as NZ European. The median household income was $30,001–50,000 (9 missing, see Table 1 for further demographic details of the study sample). As shown in Table 2, the scale had excellent internal consistency (alpha 0.91) with four of the subscales displaying acceptable internal consistency (alphas 0.74–0.77) with two of the subscales being slightly short of acceptable (alphas of 0.58 and 0.59).

Table 2
Instrument properties.

	Number of items	Cronbach alpha	Item-test correlations	Item-rest correlations
Total score	32	0.91	0.17–0.77[a]	0.12–0.74[a]
Participation	4	0.58	0.53–0.77	0.22–0.54
Leadership	4	0.74	0.65–0.84	0.39–0.67
Connections	8	0.75	0.51–0.77	0.33–0.68
Sense of place	4	0.59	0.55–0.75	0.27–0.47
Community attitudes	5	0.76	0.59–0.82	0.38–0.64
Problem assessment	7	0.77	0.62–0.72	0.43–0.57

[a] The low item-test and item-rest correlation was for "I see how economic changes have affected [my town]". This item had item-test and item-rest correlations of 0.02 and -0.02 respectively in Mataura but these were higher with values of 0.34–0.61 and 0.28–0.58 respectively for the other three locations.

Table 3
Community capacity and self-rated health by town.

		Overall		Mataura	Milton	Riverton	Winton
		n	Mean (SD) or n (%)	Mean (SD) or n (%)	Mean (SD) or n (%)	Mean (SD) or n (%)	Mean (SD) or n (%)
Community capacity[a]	Total score	178	5.13 (0.70)	4.96 (0.73)	5.13 (0.65)	5.45 (0.67)	5.42 (0.54)
	Participation	162	5.42 (0.91)	5.21 (1.00)	5.60 (0.82)	5.61 (0.86)	5.52 (0.73)
	Leadership	170	4.55 (1.10)	4.63 (1.13)	4.22 (1.08)	4.56 (1.24)	4.99 (0.79)
	Connections	176	5.06 (0.87)	4.80 (0.92)	5.06 (0.79)	5.43 (0.81)	5.50 (0.62)
	Sense of place	174	5.51 (0.82)	5.41 (0.85)	5.44 (0.89)	5.96 (0.64)	5.58 (0.62)
	Community attitudes	178	5.37 (0.91)	4.99 (1.00)	5.45 (0.79)	5.92 (0.59)	5.90 (0.50)
	Problem assessment	177	5.01 (0.79)	4.90 (0.83)	5.03 (0.72)	5.25 (0.81)	5.08 (0.76)
Self-rated health[b]	Poor	175	5 (3)	2 (3)	0 (0)	3 (14)	0 (0)
	Fair		20 (11)	8 (11)	6 (12)	3 (14)	3 (12)
	Good		49 (28)	18 (24)	21 (40)	5 (24)	5 (19)
	Very good		64 (36)	32 (42)	14 (27)	5 (24)	13 (50)
	Excellent		37 (21)	16 (21)	11 (21)	5 (24)	5 (19)
	Missing		*3*	*2*	*1*	*0*	*0*

[a] Showing mean (SD) on a 1–7 scale.
[b] Showing n (%).

4. Results

Of the 175 respondents providing their self-rated health, the most common response (36%) was 'very good' (see Table 3) with a further 21% rating their health as 'excellent'. This pattern was consistent across the four settings with the median response dipping into 'good' in two towns (Milton and Riverton). A community capacity score was calculated for each town based on the aggregated response of individual residents; median scores ranged from 4.96 in Mataura to 5.45 in Riverton; the overall median score was 5.13. The instrument's subscales were developed to identify the unique strengths of each community. High scores were observed in the 'participation' subscale across the four communities but, when examining the remaining dimensions of community capacity, residents' 'sense of place' emerged as a particular strength for Mataura and Riverton whereas positive 'community attitudes' was weaker in Mataura compared to other towns (see Table 3).

Income was positively associated with health in a dose-response manner both before and following adjustment in the individual-level analyses using three levels of income and including clustering at the town-level (linear trend p=0.009), see Table 4 (unadjusted results were very similar to the adjusted results with linear trend p=0.002).

Associations between self-rated health and the instrument's subscales were investigated (shown in Table 4). Among the subscales, participating in one's community demonstrated the strongest relationship and was associated with health in a positive direction both before and after adjustment for non-modifiable factors. The participation measure captured apolitical elements of civic engagement, such as support for community groups, and corresponds with a Canadian study that found social participation was positively associated with self-rated health (whereas civic participation was not) (Veenstra, 2000). In the partially adjusted models, total individual community capacity, sense of place, community attitudes, and problem assessment variables were all statistically significantly positively associated with health. For the non-significant associations, we note that all of these associations were also in the positive direction providing an overall consistency to these models.

In the interest of further exploring associations between community capacity and health, we included income alongside each dimension of community capacity. Along with the non-modifiable variables, income was always statistically significantly associated with self-rated health and individual community capacity and subscale measures were always non-significant, although again with all seven estimates being in the positive direction. Irrespective of which of the variables was included in the model, income remained positively associated with health. There was little evidence of attenuation in the association between income and health by individual community capacity, although there was a 10% reduction in the effect when participation was included and a 5% reduction when leadership was included.

To examine whether the associations were consistent with a particular causal direction, we next explored associations between health and community capacity in the opposite direction (Table 5). Here we found no evidence of an association between health and any community capacity measure aside from problem assessment (linear trend p=0.020) when partially adjusted (including all covariates aside from income). Given that 21 models were examined, this is at the level expected by chance under the global null hypothesis of no associations. In this instance, good health does not appear to be a prerequisite for individuals to rate their community capacity highly.

5. Discussion

We investigated the relationships between individual community capacity, income, and self-rated health undertaking regression modelling of data from residents of four small, high-deprivation communities in the South Island of New Zealand. Previous research has demonstrated differences in community capacity scores that may be attributed to both the unique context of a community and the population's characteristics (Jung & Rhee, 2013; Lovell et al., 2015). In the introduction, we conceived of community capacity as produced via the socio-affective relationships people have with place. We anticipated that individual community capacity scores would be associated with self-rated health. However, evidence indicating a relationship between individual community capacity and self-reported health was unconvincing once the effects of income were incorporated. That is, people rating their town's community capacity higher did not have better self-rated health. These results contrast with the work of Minsoo, Jung and Viswanath (2013) who found self-rated health was positively associated with community capacity, notably, they controlled for risk factors such as smoking, obesity and exercise.

Turning to the socio-demographic characteristics of our communities, we found consistent positive associations between income and self-rated health. Individual income is well established as a determinant of health (Wilkinson & Marmot, 2003), and was statistically significant in both our unadjusted and partially-adjusted models. Interestingly, when we adjusted for individual community capacity, the association between income and self-rated health was slightly attenuated in some cases, with the strongest effect from including the measure of participation in one's community. These findings suggest that individuals who rate their community's capacity highly may be

Table 4
Associations between both individual-level income and community capacity and self-rated health showing odds ratios of a higher health category.

	Income without adjusting for community capacity (n=155)			Total score[c] (n=175/161/155)			Participation[c] (n=159/147/143)			Leadership[c] (n=167/154/151)			Connections[c] (n=173/160/154)			Sense of place[c] (n=171/157/153)			Community attitudes[c] (n=175/161/155)			Problem assessment[c] (n=174/160/154)		
	OR	**95% CI**	**p**	**OR**	**95% CI**	**p**	**OR**	**95% CI**	**p**	**OR**	**95% CI**	**p**	**OR**	**95% CI**	**p**	**OR**	**95% CI**	**p**	**OR**	**95% CI**	**p**	**OR**	**95% CI**	**p**
Community capacity measure unadjusted				1.36	0.75, 2.48	0.312	1.48	1.15, 1.89	**0.002**	1.23	0.81, 1.87	0.327	1.08	0.69, 1.71	0.726	1.10	0.74, 1.63	0.629	1.18	0.83, 1.67	0.357	1.20	0.87, 1.66	0.269
Community capacity measure partially adjusted[a]				1.43	0.83, 2.44	0.195	1.61	0.97, 2.65	0.063	1.29	0.92, 1.83	0.143	1.16	0.79, 1.70	0.450	1.10	0.75, 1.59	0.631	1.19	0.91, 1.57	0.208	1.25	0.93, 1.69	0.145
Income[a]			**0.009**			**0.008**			**0.006**			**0.004**			**0.007**			**0.008**			**0.014**			**0.009**
−$30,000	1.00			1.00			1.00			1.00			1.00			1.00			1.00			1.00		
−$70,000	2.73	1.60, 4.67		2.76	1.70, 4.47		2.52	1.61, 3.94		2.92	1.64, 5.19		2.73	1.64, 4.55		2.81	1.60, 4.92		2.74	1.60, 4.69		2.82	1.76, 4.51	
> $70,000	3.94	1.24, 12.59		3.97	1.23, 12.79		3.53	1.26, 9.92		3.74	1.34, 10.46		3.97	1.27, 12.36		3.89	1.25, 12.11		3.84	1.13, 13.10		4.04	1.21, 13.44	
Community capacity measure fully adjusted[b]				1.33	0.67, 2.65	0.410	1.53	0.89, 2.62	0.125	1.31	0.91, 1.88	0.140	1.12	0.70, 1.78	0.636	1.03	0.71, 1.49	0.868	1.11	0.75, 1.62	0.606	1.15	0.75, 1.78	0.518

All models include clustering at the town level (clustered robust standard errors) and p-values for income are for linear trends.

[a] Adjusting for age, sex, location, Māori ethnicity, relationship status.

[b] Also adjusting for income/community capacity.

[c] Note that each of these models includes only one measure of community capacity, either the total score or a single subscale. The n's in these columns refer to the unadjusted model, the model adjusted without income, and the model also adjusted for income.

Table 5
Associations between self-reported health and individual-level community capacity showing differences in mean community capacity scores for each health category.

	Total score[c]			Participation[c]			Leadership[c]			Connections[c]			Sense of place[c]			Community attitudes[c]			Problem assessment[c]		
	Effect	**95% CI**	**p**	**Effect**	**95% CI**	**p**	**Effect**	**95% CI**	**p**	**Effect**	**95% CI**	**p**	**Effect**	**95% CI**	**p**	**Effect**	**95% CI**	**p**	**Effect**	**95% CI**	**p**
Unadjusted	n=175			n=159			n=167			n=173			n=171			n=175			n=174		
Health			0.395			0.116			0.418			0.774			0.646			0.460			0.341
Poor/fair	0.00			0.00			0.00			0.00			0.00			0.00			0.00		
Good	0.09	-0.37, 0.54		0.37	0.03, 0.70		0.00	-0.64, 0.65		-0.14	-0.47, 0.19		0.20	-0.40, 0.80		0.01	-0.72, 0.73		0.24	-0.24, 0.73	
Very good	0.06	-0.47, 0.59		0.32	-0.34, 0.98		0.19	-0.68, 1.06		-0.17	-0.79, 0.46		0.02	-0.63, 0.67		0.08	-0.75, 0.90		0.08	-0.25, 0.41	
Excellent	0.29	-0.41, 0.99		0.70	-0.02, 1.41		0.38	-1.06, 1.82		0.08	-0.61, 0.78		0.25	-0.43, 0.93		0.19	-0.65, 1.04		0.32	-0.11, 0.76	
Partially adjusted[a]	n=161			n=147			n=154			n=160			n=157			n=161			n=160		
Health			0.115			0.129			0.185			0.263			0.125			0.192			**0.020**
Poor/fair	0.00			0.00			0.00			0.00			0.00			0.00			**0.00**		
Good	0.18	-0.38, 0.75		0.48	0.03, 0.93		0.25	-0.33, 0.84		0.00	-0.91, 0.91		0.24	-0.14, 0.63		0.09	-0.51, 0.68		**0.31**	**-0.39, 1.01**	
Very good	0.18	0.04, 0.32		0.46	0.12, 0.81		0.42	0.15, 0.69		-0.00	-0.45, 0.44		0.11	-0.16, 0.38		0.23	-0.43, 0.89		**0.17**	**-0.08, 0.42**	
Excellent	0.49	-0.04, 1.02		0.86	-0.01, 1.72		0.66	-0.44, 1.76		0.32	-0.14, 0.78		0.50	0.13, 0.87		0.35	-0.32, 1.03		**0.54**	**0.12, 0.96**	
Fully adjusted[b]	n=155			n=143			n=151			n=154			n=153			n=155			n=154		
Health			0.215			0.164			0.228			0.354			0.168			0.304			0.142
Poor/fair	0.00			0.00			0.00			0.00			0.00			0.00			0.00		
Good	0.21	-0.34, 0.77		0.46	0.06, 0.86		0.28	-0.24, 0.81		0.00	-0.74, 0.75		0.30	-0.01, 0.62		0.16	-0.62, 0.93		0.38	-0.34, 1.09	
Very good	0.15	-0.12, 0.42		0.40	0.03, 0.77		0.39	0.11, 0.68		-0.04	-0.24, 0.16		0.11	-0.17, 0.39		0.23	-0.62, 1.07		0.16	-0.13, 0.45	
Excellent	0.46	-0.22, 1.14		0.81	-0.12, 1.75		0.64	-0.54, 1.82		0.29	-0.14, 0.72		0.47	0.09, 0.86		0.33	-0.52, 1.18		0.52	-0.18, 1.22	

All models include clustering at the town level (clustered robust standard errors) and p-values for health are for linear trends.

[a] Adjusting for age, sex, location, Māori ethnicity, relationship status.

[b] Adjusting for age, sex, location, Māori ethnicity, relationship status, and income.

[c] Note that each of these models includes only one measure of community capacity, either the total score or a single subscale.

more resilient to the detrimental health effects of low income but that these effects are likely to be very small. Overall, this data provides no evidence that intervening to build community capacity will be an effective health promotion strategy to improve health outcomes. Rather, our findings provide further evidence of the need to address income as a sustained and inequitable determinant of health.

Interrogating the six dimensions of community capacity highlights the underexplored relationship between local political context and self-rated health. Among the subscales (participation, leadership, social cohesion, sense of place, community attitudes, and problem solving), participation offered the most promise for associations with health (being statistically significant in the unadjusted model, p=0.002, and a non-significant tendency with p=0.063 after adjustment for confounders other than income). Community participation has received considerable attention as a proxy for social capital (Greiner, Li, Kawachi, Hunt, & Ahluwalia, 2004; Pollack & von dem Knesebeck, 2004), and demonstrated a dose-response relationship in our study. Previous research (e.g. Cummins, Stafford, Macintyre, Marmot & Ellaway, 2005; Veenstra, 2000) has provided conflicting evidence for another construct, *civic* participation. Predominantly explored in the form of voting behaviour, civic participation *may* capture experiences of marginalisation and disenfranchisement leading to poorer health outcomes (Cummins et al., 2005). Yet, local politics remains under-researched as a dimension of community in the health literature. The small town context of our study enabled us to go beyond variables such as voting behaviour to identify perceived efficacy and responsiveness of local leaders. The tendency for positive perceptions of local leadership to predict higher self-rated health highlights the need for further research to untangle whether such perceptions are consistent with effective governance. Alternatively, positive perceptions of leadership may be associated with psycho-social dimensions such as belonging. These results provide motivation for collecting data on as full a set of potential confounders as possible when examining the complex interplay between any of income, health, and individual community capacity.

The results presented here are from a follow-up survey with attrition of the study cohort leading to modest responses in some communities that weakened the statistical power of our analysis. We have provided confidence intervals in all cases to enable consideration of whether statistically non-significant results are still consistent with practically important effects. Further, our analysis relies on data from only four reasonably homogenous communities; a much larger sample of communities would have reduced the impact of any outlying communities in the dataset. The average age of respondents in the four study communities exceeded the median age of the four towns (averaging 59 years compared with Census data indicating a median age ranging from 41 to 51 years) (Statistics New Zealand, 2013). These differences impact on the generalisability of our results as we have previously observed trends in community capacity scores that differ with age (Lovell et al., 2015a). Only one previous study has comprehensively examined the relationship between community capacity and health outcomes; Jung and Viswanath (2013) observed positive associations between community capacity and health in a study of over 400 communities in South Korea, however, the authors controlled for health behaviours which may be influenced by the place one lives. Our research, instead, suggests that some dimensions of community capacity, may have indirect health benefits by providing a buffer against the health impacts of low income but we estimate that any such effects are small.

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