

Neighbourhood identification and mental health: How social identification moderates the relationship between socioeconomic disadvantage and health



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ABSTRACT

Locational disadvantage has negative effects on mental health, with research showing that low (vs. high) neighbourhood socioeconomic-status (SES) predicts worse outcomes. Perceived neighbourhood quality is a well-established mediator of this association. The present paper extends this analysis, focusing on the contribution of residents' social identification with their neighbourhood. In particular, it tests a model in which this neighbourhood identification *both* attenuates the effect of neighbourhood SES via perceived neighbourhood quality, and has a direct positive effect on mental health. Study 1 tested this hypothesized dual-effect neighbourhood identification model using a large nationally representative dataset ($N = 14,874$). Study 2 used a novel experimental design ($N = 280$) to investigate the causal effects of neighbourhood SES and neighbourhood identification on mental health. In line with the hypothesized model, in both studies, high neighbourhood identification attenuated the effects of neighbourhood SES on perceived neighbourhood quality, and neighbourhood identification had a direct positive impact on mental health. Additionally, and consistent with previous research, both studies also showed that perceived neighbourhood quality was the means through which neighbourhood SES affected mental health. The novel and far-reaching implications of neighbourhood identification for community mental health are discussed.

1. Introduction

The observation that there is a relationship between where a person lives and their mental health dates back to Faris and Dunhams (1939)' now-classic epidemiological study of the distribution of mental disorders in Chicago. This found higher rates of psychosis and schizophrenia among residents of deprived inner-city neighbourhoods than among their more affluent counterparts in the city's outskirts. Since this early work, evidence consistent with this pattern of mental health disparity, so called 'neighbourhood effects' research (van Ham, Manley, Bailey, Simpson, & Maclennan, 2013) has been growing — linking neighbourhood socioeconomic disadvantage to depression (Julien, Richard, Gauvin, & Kestens, 2012), anxiety (Remes et al., 2017), suicidal thoughts (Dupéré, Leventhal & Lacourse, 2009), and psychosis (March et al., 2008), above and beyond the effects of individual attributes (e.g., income, education, marital status).

At the same time, while there is general agreement that neighbourhood disadvantage has this effect on mental health, it is understood to be quite modest once such individual attributes are taken into account (Pickett & Pearl, 2001). One reason for this is that the effects of

neighbourhood disadvantage are quite mixed — sometimes being strong, but sometimes being weak (Richardson, Westley, Gariépy, Austin, & Nandi, 2015). The current paper provides a novel explanation for this variability, arguing that the impact of disadvantage on health is moderated by residents' social identification with their neighbourhood (which we refer to as *neighbourhood identification*). Moreover, as well as examining the moderated impact of neighbourhood identification, the paper also explores its direct effect on mental health. This research speaks to the fact that the numerous potential mechanisms and pathways through which neighbourhood disadvantage affects mental health are not well understood (as noted by Galster, 2012; Kim, 2008; Tunstall, Shaw, & Dorling, 2004; van Ham et al., 2013). One key reason for this is that relatively few studies have articulated or tested theory-derived hypotheses about the underpinnings of this relationship (Miltenburg, 2015; Owen, Harris, & Jones, 2016). The present research attempts to address this lacuna by drawing upon socio-psychological theorising in the social identity tradition (after Tajfel & Turner, 1979) to unpack key aspects of the neighbourhood–health relationship.

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1.1. Neighbourhood SES, perceived neighbourhood quality and mental health

Traditionally, much of the research that has investigated the effects of neighbourhood structure on mental health has focused on objective measures of neighbourhood SES (generally captured by census data; Mair, Diez Roux, & Galea, 2008). Previous studies have highlighted social capital, measured as an individual-level or community-level resource, and as a key mediator through which neighbourhood SES affects mental health (Cattell, 2001; Haines, Beggs, & Hurlbert, 2011). Other studies have found that mental health can also be predicted from *perceived neighbourhood quality*, which includes perceptions of such things as social and physical ‘disorder’ relating to the presence of litter, vandalism, aggressive neighbours, and loitering youth. These studies have shown that individuals who rate their neighbourhood higher on the presence of ‘disorder’ (i.e., scoring low on perceived neighbourhood quality) experience higher levels of depression (Ross, 2000), psychological distress (Cutrona, Russell, Hessling, Brown & Murray, 2000) and perceived lack of control (Ross, Mirowsky, & Pribesh, 2001). Indeed, perceived neighbourhood quality appears to be a better indicator of health outcomes than structural characteristics such as neighbourhood SES (e.g., Bowling & Stafford, 2007; Weden, Carpiano, & Robert, 2008).

Previous research that has examined the determinants of perceived neighbourhood quality has focused on neighbourhood-level rather than individual-level variables (Kim, 2008). Findings here show that neighbourhood SES (e.g., measured as percentage of families below the poverty line; Franzini, O’Brien-Caughy, Nettles & O’Campo, 2008) and racial composition (Sampson & Raudenbush, 2004) both predict perceived neighbourhood quality after controlling for individual attributes as well as objective measures of the physical environment. Thus, one way in which neighbourhood socio-compositional characteristics (e.g., SES, racial/ethnicity mix) have an impact on mental health is via their contribution to perceived neighbourhood quality. In line with this argument, studies have found that perceived neighbourhood quality is a *mediator* of the relationship between structural neighbourhood characteristics and subjective health status (Franzini, Caughy, Spears, & Fernandez Esquer, 2005; Ross & Mirowsky, 2001; Wen, Hawkey, & Cacioppo, 2006). These models argue that residents from disadvantaged (vs. advantaged) neighbourhoods are exposed to more ‘environmental stressors’ (e.g., traffic noise, urban decay, vandalism; Hill, Ross, & Angel, 2005) and that these lead residents to view their neighbourhood as unattractive and/or unsafe, which in turn has a negative impact on their mental health (Cutrona, Wallace, & Wesner, 2006; Mair, Diez Roux & Morenoff, 2010; Ross, 2000).

Yet while this mediating pathway between neighbourhood SES and mental health via perceived neighbourhood quality is plausible, it has at least two interrelated weaknesses. First, perceived neighbourhood quality may not be a veridical indicator of the objective environment because residents’ subjective experiences of neighbourhood often do not correlate highly with objective measures. Such non-correspondence was observed in a study that investigated perceived neighbourhood quality among residents of Seattle living within one or two blocks of each other (Wallace, Loughton, & Fornango, 2015). Findings revealed significant variation in the reporting of ‘disorder’ cues (e.g., teens loitering, vandalism, litter), such that there was substantially more variation within neighbourhoods than between them. Clearly, then, not all residents perceive their neighbourhood environment in the same way. Similarly, other studies find a low-to-moderate relationship between objective and subjective ratings of neighbourhood characteristics (e.g., neighbourhood aesthetics, green spaces, crime rates; Ambrey, Fleming, & Manning, 2014; Kamphius et al., 2010; Kothencz & Blaschke, 2017). These weak relationships speak to the second limitation in these models, namely that they fail to specify (and test) the socio-psychological processes that shape people’s perceptions of their neighbourhood environment. In other words, there is a need to expand these models in ways that help us understand the social psychological factors that

determine whether a given neighbourhood environment is perceived to be ‘ordered’ (and thus, good for mental-health) or ‘disordered’ (and thus, bad).

1.2. Social identification, perceived neighbourhood quality and mental health

The social identity approach centres on the argument that groups shape psychology through their capacity to be internalised within the self. This means that, as well as being structured by their sense of themselves as unique individuals (i.e., *personal identity*; Turner, 1982), people’s sense of self is also derived from their membership of social groups (i.e., *social identity*; Tajfel, 1978; Turner, Oakes, Haslam, & McGarty, 1994). In this way, the groups we belong to (e.g., our family, community, school, work team) are not merely external aspects of our environment (‘out there’) but also central to *who we are* (‘in here’). This sense of shared identification as ‘we’ and ‘us’ determines how group members perceive and behave both towards each other and towards those outside their group (Turner, 1982). Moreover, when we identify with a given group — for example, as ‘us Australians’ or ‘us teachers’ — we derive benefit not only from knowing our place in the social world, but also from a sense of connection to fellow ingroup members (e.g., see Haslam, Jetten, Cruwys, Dingle, & Haslam, 2018, for an extended discussion).

Many social identities incorporate geographical dimensions (Dixon & Durrheim, 2000; Obst & White, 2005), so there are several ways in which the localised context of a given neighbourhood can create and sustain meaningful social identities that directly benefit residents’ health and well-being. In particular, the neighbourhood not only provides the social context for everyday life, affording residents opportunities for social interaction (Cooper Marcus, 2003; Talen, 2000), but also facilitates formation of local friendship groups (Cattell, Dines, Gesler, & Curtis, 2008). Furthermore, identity-based bonds between neighbours can be the basis for a sense — and the reality — of mutual support, which is beneficial for mental health and well-being (Wenger, 1990). Indeed, to the extent that residents feel a sense of belonging and shared identity with their neighbours, this makes neighbourly relations *possible*, in allowing community members to behave *as a group* (Turner, 1982).

In the study of people-place relations there is no shortage of psychological constructs to quantify this relationship (Lewicka, 2011). For instance, place identity (Proshansky, Fabian, & Kaminoff, 1983), place attachment (Lewicka, 2011; Rollero & de Piccoli, 2010; Theodori, 2001) and sense of community (Chavis, Hogge & McMillan, 1986; Mak, Cheung, & Law, 2009) each emerge from theorising that draws from different disciplines. Nevertheless, what they each have in common is that they capture the psychological internalisations of place. From a social identity perspective, the neighbourhood is a social category, which can be internalised as part of the self and provides the basis for a common identity among residents (i.e., as ‘us’ from ‘The Bronx’). In this way, a key social psychological mechanism, which underpins perceptions of, and behaviour within, the residential environment is those residents’ sense of neighbourhood identification. Neighbourhood identification thus brings residents together *psychologically*, as it furnishes them with a sense of being a part of something larger than themselves and a sense that they can collectively tackle neighbourhood problems (Francis, Giles-Corti, Wood, & Knuiman, 2012; McNamara, Stevenson, & Muldoon, 2013; Twigger-Ross, Bonaiuto, & Breakwell, 2003).

Research using a social identity approach to examine place-based contexts suggests that shared social identities play a powerful role in shaping people’s evaluations of crowdedness (Alnabulsi & Drury, 2014); adverse weather (Pandey, Shankar, Stevenson, Hopkins & Reicher, 2014), and extreme noise (Shankar et al., 2013), as well as a range of other seemingly aversive environments. For example, in a survey study of 1194 pilgrims attending the Hajj (the annual gathering of millions of Muslims in Mecca), Alnabulsi and Drury (2014) found that participants’

feelings of personal safety during this extremely crowded event were moderated by their identification with fellow pilgrims. While high identifiers felt safer as crowd density increased, low identifiers felt less safe. Relatedly, Pandey et al.'s (2014) study of the Magh Mela (a religious festival held in Northern India during winter) showed that social identification among pilgrims — who were taking part in daily cleansing rituals along the Ganges river — served to buffer their perceptions of freezing weather conditions. More specifically, pilgrim's appraisal of the cold climate and their ability to endure the month-long festivities whilst living in makeshift tented communities, was determined by the extent of their religious group identification. In the present paper we argue that we can extend upon these findings to posit an 'identity buffering hypothesis', whereby the negative effect of neighbourhood features (including low neighbourhood SES) on perceived neighbourhood quality will be attenuated among those who have high neighbourhood identification.

Research using a social identity approach in the health domain also suggests that social identification with meaningful groups is a major determinant of health and well-being. Moreover, when the identities they relate to are positive, internalised group memberships have been identified as a source of a potent 'social cure' (Haslam et al., 2018; Haslam, Jetten, Postmes, & Haslam, 2009). This 'social identification hypothesis' suggests that if residents internalise a positive neighbourhood identity, this will tend to have a direct positive effect on mental health — whether in the context of neighbourhood socioeconomic advantage or disadvantage. While living in a disadvantaged neighbourhood may seem at odds with positive social identification, research on social stigma suggests that even among devalued groups social identification can be beneficial to self-esteem (Crocker & Major, 1989; Miller & Major, 2000). As this research shows, stigmatised social identities can be used by individuals in positive ways and protect wellbeing despite their disadvantageous circumstances (e.g., Gaudet, Clément, & Deuzeman, 2005; Schmitt & Branscombe, 2002; Shih, 2004).

Support for the 'social identification hypothesis' in the neighbourhood context emerges from a recent study conducted by McIntyre, Wickham, Barr and Bental, (2017). These researchers analysed data from a panel of 4319 community residents in the North West of England and found that neighbourhood identification (measured as sense of belonging to their immediate neighbourhood defined as their street or block) was negatively associated with paranoia and depressive symptoms. Additionally, the researchers found that residents who were strongly identified with their neighbourhood had higher self-esteem, — a finding which accords with previous studies that have examined the relationship between place-related identities and self-esteem (Knez, 2005; Fleury-Bahi & Marcouyeux, 2010; Twigger Ross & Uzzell, 1996). Along similar lines, other research informed by the social identity approach has shown that psychological wellbeing associated with restorative (Morton, van der Bles & Haslam, 2017), spiritual (Ysseldyk, Haslam, & Morton, 2016) and festive (Schmitt, Davies, Hung, & Wright, 2010) environments are shaped by social group identification.

As the above review suggests, neighbourhood identification not only functions as a potential perceptual buffer against neighbourhood stressors but also has a direct positive impact on mental health. These two hypothesized pathways, which outline a dual role of neighbourhood identification, have the potential to extend our understanding of the neighbourhood–health relationship in important ways. Indeed, in specifying these pathways more formally, we propose an integrated model of the mechanisms through which neighbourhood SES affects mental health: this hypothesized model, — which we refer to as the *Dual-Effect Neighbourhood Identification Model (DENIM)* — is represented schematically in Fig. 1.

The model incorporates the pathways suggested by previous research, specifically the effect of neighbourhood SES on health mediated through perceived neighbourhood quality. However, extending this, the social identity approach suggests that neighbourhood identification is also a key factor that supports mental health in two ways. First, it is

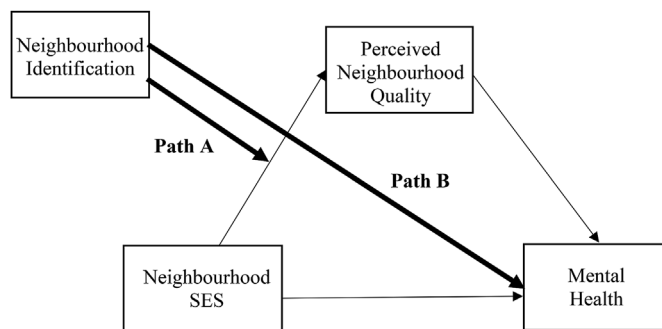


Fig. 1. A schematic representation of the Dual-Effect Neighbourhood Identification Model (DENIM).

theorised to moderate the relationship between neighbourhood SES and perceived neighbourhood quality (Path A in the DENIM) thereby providing a buffer against potential environmental stressors (e.g., by reducing the negative perceptions of low SES neighbourhoods). Second, it is theorised to enhance well-being directly (Path B in the DENIM).

1.3. The present research

The purpose of the present research is to see whether the model outlined above provides a plausible framework for understanding the complex relationship between the socioeconomic status of a neighbourhood and those residents' mental health. For this purpose, we conducted two studies. Study 1 tested the hypothesized model using a large sample of population data; Study 2 explored the directionality of these relationships using an analogue measure of mental health in an online experiment.

2. Study 1

Study 1 tested hypotheses suggested by both the established literature and the hypothesized model in a large cross-sectional dataset. First, it tested whether perceived neighbourhood quality mediated the path between neighbourhood SES and mental health (H1), as previous studies have shown. Second, extending on this established work, we tested whether neighbourhood identification moderates the relationship between neighbourhood SES and perceived neighbourhood quality (H2), and whether neighbourhood identification has a direct effect on mental health (H3). We predicted that the effect of neighbourhood SES on perceived neighbourhood quality would be weaker at high levels of neighbourhood identification. We also expected that these relationships would hold after controlling for relevant individual socio-demographic variables (i.e., age, gender, education, marital status and household income; H4), which have been previously associated with mental health (Bjelland et al., 2008; Kendler, Myers, & Prescott, 2005; Kessler & Essex, 1982; Mirowsky & Ross, 1992; Sareen, Afifi, McMillan, & Asmundson, 2011). Finally, it is possible that the established model, where the effect of neighbourhood SES on mental health is mediated by perceived neighbourhood quality, may be limited to explaining mental health outcomes in urban environments. This is because much of the research linking 'disorder' and other environmental features (e.g., lack of greenspace, population density) with mental ill-health has been associated predominantly with city-living (Galea, Ahern, Rudenstine, Wallace & Vlahove, 2005; Weich, Twigg, Holt & Lewis, 2006). Theoretically, the social identity approach does not predict any difference as a function of location (H5) and so we conducted a final test to determine whether our hypothesized model generalises across both city and rural dwellers.

Table 1
Sample demographics.

		Study 1 n = 14,874	%	Study 2 n = 280	%
Sex	female	7865	52.9	192	68.6
Age	18–24	1939	13.0	36	12.9
	25–44	5060	34.0	153	54.6
	45–64	4947	33.3	85	30.4
	65 +	2858	19.2	6	0.2
Marital status	Married/domestic rel.	9227	62.1	174	62.1
	Never married	2968	20.0	83	29.7
	Separated/divorced	1909	12.8	19	6.8
	Widowed	769	5.2	4	1.4
Education	Year 11 & below	3656	24.6	32	11.4
	Year 12	2343	15.8	35	12.5
	Cert or diploma	4928	33.1	99	35.4
	Bachelors/Hons	2226	15.0	84	30.0
	Postgraduate	1712	11.5	30	10.7
	Undetermined	9	0.1		
Location	Major city	10,007	67.3	207	73.9
	Regional areas	4675	31.4	73	26.1
	Remote	159	1.1		
	Very remote	33	0.2		

2.1. Method

2.1.1. Participants

Participants were respondents of Wave 14 of the Household, Income and Labour Dynamics in Australia (HILDA) survey (Department of Social Services, 2016). HILDA is a longitudinal household-based panel survey that collects broad data on housing, social and economic characteristics annually from a nationally representative sample. Wave 14 was chosen because it was the most recent that contained all the variables of interest, as the content of the Self-Completion Questionnaire (SCQ) varies annually. Participants were respondents over 18 years of age who had completed both the individual interview survey and the SCQ.

The demographic characteristics of the sample are presented in Table 1. The average age of respondents was 46.80 years ($SD = 18.23$; range 18–98). Females ($n = 7865$) comprised 52.9% of the sample. Eighty-eight percent of respondents were born in Australia or an English-speaking country. The majority lived in detached or semi-detached houses. In total 8540 households were sampled, averaging 1.74 people per household, across 5709 neighbourhoods. The number of residents per neighbourhood sampled ranged between 1 and 35 ($M = 2.61$, $SD = 2.74$). Each neighbourhood unit is based on the Australian Statistical Geography Standard Statistical Area 1 (SA1), which has a population ranging from 200 to 800 people, with an average of 400 people.

2.1.2. Measures

Neighbourhood socioeconomic status ($M = 5.58$; $SD = 2.87$). Derived from Australian Census data, this measure indexes collective (not individual) socioeconomic status (www.abs.gov.au). Each neighbourhood area is ranked from 1 (*most disadvantaged*) to 10 (*most advantaged*). This index was calculated by weighting variables that account for residents' collective access (within neighbourhood units at SA1) to material and social resources, and their ability to participate in society (Socioeconomic Indices for Areas [SEIFA] of Relative Advantage and Disadvantage; Pink, 2013).

Perceived neighbourhood quality ($M = 3.52$; $SD = 0.73$; $\alpha = 0.87$). This comprised seven items indexing respondent's perceptions of negative environmental features of their neighbourhood (e.g., *rubbish and litter lying around, homes and gardens in bad condition, vehicular traffic and noise, presence of teenagers in the street, graffiti/vandalism*; where 1 = *never happens*, 5 = *very common*). Scores were reversed and then

averaged, so that higher scores indicate higher neighbourhood quality (LaGrange, Ferraro, & Supancic, 1992).

Neighbourhood identification ($M = 6.74$; $SD = 2.13$). This single item asked residents the extent to which they were “*feeling part of your local community*”; phrasing that captures people's strength of belonging, or identification, with their neighbourhood. Responses ranged from 0 = *very unsatisfied* to 10 = *very satisfied*, with higher scores indicating higher neighbourhood identification. A similar item has been used by McIntyre and colleagues (2017) to capture neighbourhood identification, and previous research indicates that single-item measures of social identification are both valid and reliable (Postmes, Haslam, & Jans, 2013).

Mental health ($M = 73.78$; $SD = 17.67$; $\alpha = 0.83$). The SF-36 (MHI-5) is a well-validated self-report measure of mental health status (Ware & Sherbourne, 1992) that has been widely used in the Australian population (McCallum, 1995). This comprised five-items (e.g., *I felt calm and peaceful*, three of which were reverse-scored e.g., *I have been a nervous person*), with responses ranging from 1 (*none of the time*) to 5 (*all of the time*), reported over a period of the last four weeks. Scores were transformed so that the resulting scale ranged from 0 to 100, with higher scores indicating better mental health. The MHI-5 is closely associated with other widely used indicators of depression and anxiety, and a cut-off score of 52 has been suggested as a clinically meaningful indicator of major depression (Crosier, Butterworth, & Rodgers, 2007; Pfoh et al., 2016; Rumpf, Meyer & Hapke & John, 2001).

Control variables. We abstracted details of participants' age, gender, education (indicating highest level of educational attainment from 1 = *Year 11 and below* to 9 = *postgraduate: masters or doctorate*), marital status (1 = *married or in domestic relationship*; 0 = *separated, divorced, widowed, never married nor in domestic relationship*) and household income (based on reported gross income band of household for the last financial year), ranging from 1 to 13, where higher values indicated higher income.

2.1.3. Statistical analysis

Paths hypothesized in our model (see Fig. 1), were analysed using SPSS-AMOS v24 to test and estimate relationships between measured variables with multiple paths (Pearl, 2012). All constructs — including neighbourhood SES, neighbourhood identification, perceived neighbourhood quality and the outcome, mental health — were modelled as measured variables.

2.2. Results

As can be seen from Table 2, all independent variables were significantly and positively associated with mental health ($r_s = 0.10$ to 0.28). Neighbourhood SES, perceived neighbourhood quality and neighbourhood identification were also positively and moderately inter-correlated ($r_s = 0.08$ to 0.22).

The model and standardised coefficients are presented in Fig. 2. In line with H1, the indirect path between neighbourhood SES and mental health via perceived neighbourhood quality was significant, $\gamma = 0.03$, bias corrected confidence intervals (BCCI) 95% [0.02, 0.03], $p = .001$. Consistent with H2, the moderating effect of neighbourhood identification on the path between neighbourhood SES and perceived neighbourhood quality was significant, $\beta = -0.06$, $p < .001$. Follow-up simple slopes analysis indicated that the effect of neighbourhood SES was significant at both low neighbourhood identification, $\beta = .26$, $t = 23.34$, $p < .001$, $\eta_p^2 = 0.18$, and high neighbourhood identification, $\beta = 0.14$, $t = 12.18$, $p < .001$, $\eta_p^2 = 0.10$. As predicted, the effects of low neighbourhood SES on perceived neighbourhood quality were weaker for respondents with high neighbourhood identification (see Fig. 3).¹ Consistent with H3, the direct path between

¹ The full pattern of results was replicated in data from a previous wave

Table 2
Zero-order correlations, means and standard deviations of variables in Study 1.

Variable	Scale range	Mean	SD	1.	2.	3.	4.	5.	6.	7.	8.
1. Mental Health	0–100	73.78	17.67								
2. Neighbourhood SES	1–10	5.58	2.87	.10**							
3. Perceived N'hood Quality	1–5	3.52	0.71	.21**	.20**						
4. Neighbourhood Identification	1–10	6.74	2.13	.28**	.08**	.22**					
5. Age	18–98	46.80	18.23	.09**	-.04**	.16**	.17**				
6. Sex (Female, Male)	0 = F; 1 = M			.06**	.02*	.01	-.04**	-.01			
7. Marital status (Unmarried, Married)	0 = U; 1 = M			.11**	.06**	.04**	.09**	.09**	.05**		
8. Household income	1–13	8.55	3.01	.13**	.35**	.05**	.04**	-.29**	.07**	.27**	
9. Education	1–9	4.34	2.65	.07**	.26**	.03**	.04**	-.07**	.04**	.15**	.31**

Note. * $p < .05$, ** $p < .01$.

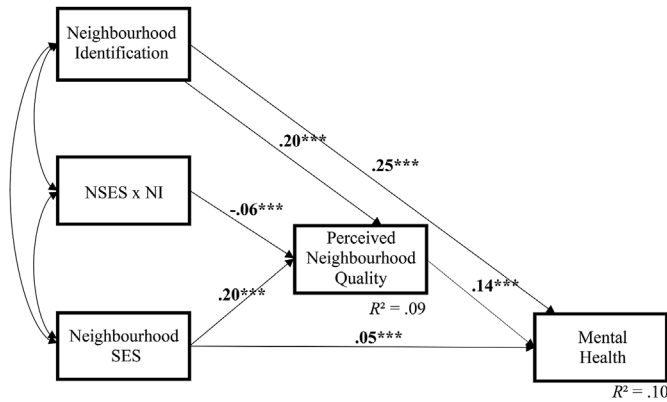


Fig. 2. Path analysis indicating standardised coefficients for Study 1. Note: ***All direct and indirect paths were significant, $ps = .001$.

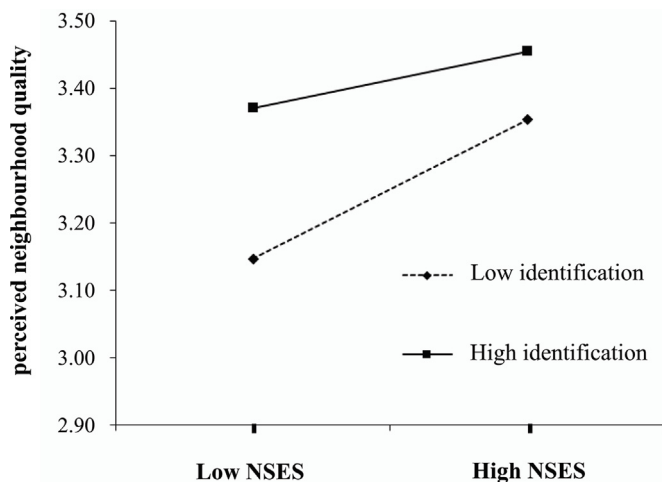


Fig. 3. Simple slopes analysis depicting the interaction between neighbourhood SES and neighbourhood identification on perceived neighbourhood quality, in Study 1.

neighbourhood identification and mental health was also significant, $\beta = 0.25$, $p < .001$. Results showed that neighbourhood SES ($\beta = 0.05$, $p < .001$), perceived neighbourhood quality ($\beta = 0.14$, $p < .001$) and neighbourhood identification ($\beta = 0.25$, $p < .001$) each have a positive effect on mental health. The model also indicated that both neighbourhood SES ($\beta = 0.18$, $p < .001$), and neighbourhood identification ($\beta = 0.20$, $p < .001$) have a positive effect on

(footnote continued)

(HILDA, Wave 6), which indicates robustness of the hypothesized relationships between our key variables (see Appendix A).

perceived neighbourhood quality. Overall model fit was very good (CMIN/DF = 0.97/1, $p = .326$, CFI = 0.99, TLI = 0.99, SRMR = 0.003). Together, then, these findings support our first three hypotheses.

To test whether the predicted pathways between the variables in our model remained significant after controlling for individual socio-demographic variables (H4), the specified model was reanalysed with their inclusion. Results indicated that once individual variables were accounted for, neighbourhood SES no longer had a direct effect on mental health ($p = .210$), but both neighbourhood identification ($\beta = 0.24$, $p < .001$) and perceived neighbourhood quality ($\beta = 0.13$, $p < .001$) remained significant predictors. Of the control variables, mental health was higher among people who were older ($\beta = 0.06$, $p < .001$), male ($\beta = 0.05$, $p < .001$), married ($\beta = 0.05$, $p < .001$), and had higher household income ($\beta = 0.11$, $p < .001$). Critically, the predicted indirect, moderation, and direct effects remained significant, thereby providing evidence that our findings were robust: supporting H1, the indirect path between neighbourhood SES and mental health via perceived neighbourhood quality was significant, $\gamma = 0.03$, BCCI 95% [0.02, 0.03], $p < .001$; supporting H2, the moderating effect of neighbourhood identification on the path between neighbourhood SES and perceived neighbourhood quality was significant, ($\beta = -0.06$, $p < .001$); and supporting H3, the direct path between neighbourhood identification and mental health was significant, ($\beta = 0.24$, $p < .001$).

To test H5, multi-group comparison analyses was conducted to compare city ($n = 10,007$) and rural ($n = 4867$) dwellers. The purpose of this was to establish whether the strength of any particular pathway in the model was moderated by the geographical location of respondents. Results indicate that all paths remained significant for each between-groups model. Model fit indices demonstrated good fit for both the unconstrained (CMIN/DF = 2.03/2, $p = .362$, CFI = 0.99, NFI = 0.99, SRMR = 0.01) and fully-constrained (CMIN/DF = 11.26/2, $p = .188$, CFI = 0.99, NFI = 0.99, SRMR = 0.01) models. Follow-up model comparisons indicated that the two models were not significantly different $\Delta \chi^2 = 9.22$, $df(6)$ critical ratio, < 12.59 ; Δ CFI < 0.01 . As model parameters did not significantly vary between the two groups, it appears that the model described the data equally well for city and rural respondents.

2.2.1. Sensitivity analysis

Because multiple respondents from the same household and neighbourhood were sampled, multi-level modelling was conducted to address the potential problem of non-independent data. A preliminary null model analysis was performed for the individual outcome mental health (Level 1) and the grouping variable of household (Level 2) and respondents' neighbourhood (Level 3) as a random intercept. The intra-

² Through random assignment, the number of participants in the four conditions were 66 in low-neighbourhood SES (NSES)/low-neighbourhood identification (NI); 72 in low-NSES/high-NI; 70 in high-NSES/low-NI; and 72 in high-NSES/high-NI conditions.

class coefficient for household was 0.26 and for neighbourhood was 0.03, indicating that respondents' household and neighbourhood accounted for 25.6% and 3.4% of the variance for mental health, respectively. Log-likelihood ratio tests between the Level 1 and 2 models, $\chi^2(3, N = 14,874) = 452.06, p < .001$, and Level 2 and 3 models, $\chi^2(4, N = 14,874) = 12.32, p = .001$, were both significant. To account for this data non-independence, further sensitivity analyses were conducted to correct for the potential misestimation of standard errors (Hox, 1998). This involved conducting analyses, which adjust for neighbourhood and household clustering. The statistical method using 'complex' survey analyses (Mplus v8.1; Muthén & Muthén, 2017) is suitable for both path analysis models and clustered survey data. Results showed that the coefficient estimates and model fit statistics were similar to those reported above, providing further support for H1 to H3, (see Appendix B).

2.3. Discussion

This study used population data to test a theoretical model, which proposes a dual role for neighbourhood identification in the relationship between neighbourhood SES and mental health. Results of analysis supported our two main hypotheses. First, neighbourhood identification attenuated the effects of neighbourhood SES on perceived neighbourhood quality, and, second, neighbourhood identification had a direct positive effect on mental health. Noteworthy was that after controlling for individual attributes, neighbourhood identification remained the strongest predictor of mental health. Additional to our predicted findings, our model indicated that both neighbourhood SES and neighbourhood identification independently predicted mental health. The effect of neighbourhood SES was negligible once individual attributes were accounted for, in part because in line with previous research, the effects of neighbourhood SES were indirect via the mediator perceived neighbourhood quality.

2.3.1. Study limitations

Despite finding support for our hypotheses, this study had two key limitations. The first was its reliance on cross-sectional data, which means that we are unable to make inferences about the causal role of neighbourhood identification in the above relationships. A second was its reliance on a pre-existing data set, which required use of a single-item proxy for neighbourhood identification that could not capture this construct as precisely as we would have liked. In particular, while this was the closest proxy of identification, it was not a direct measure of the extent of neighbourhood identification per se. While our analysis supports previous findings that perceived neighbourhood quality is a better predictor of mental health than neighbourhood SES, our findings also show that neighbourhood identification had an even larger effect on mental health. Nevertheless, further research is clearly needed to establish both the relative importance of neighbourhood identification, by using a validated measure, and neighbourhood SES, and the direction of the relationship between these variables (via perceived neighbourhood quality) and mental health. For these reasons, we conducted a second study in the form of an experiment.

3. Study 2

All researchers who investigate neighbourhood effects are faced with the challenge of determining the direction of proposed relationships. This is because individuals are not randomly assigned to neighbourhoods, but instead — theoretically at least — select and stay in neighbourhoods that match their resources and needs (Goering & Feins, 2003). Selection-bias and endogeneity issues cannot be resolved in observational studies alone and might be better addressed with experimental or quasi-experimental longitudinal research (Oakes, 2013). Nevertheless, the expense of conducting a large-scale randomised controlled study (such as the well-known American Movement to

Opportunity Studies; Goering & Feins, 2003) is prohibitive for most researchers. Accordingly, in order to provide a causal analysis of the patterns that emerged from Study 1, in Study 2 we developed a novel experimental method. This involved adapting the *Bimboola paradigm* to manipulate neighbourhood identification and neighbourhood SES experimentally.

The Bimboola paradigm was originally developed to examine the effects of income and perceived inequality on attitudes towards immigration (Jetten, Mols, & Postmes, 2015), but it was adapted here to examine the directionality of the links specified in the hypothesized model. More specifically, participants were randomly assigned to high or low levels of neighbourhood identification and neighbourhood SES, before being asked to rate their perceived neighbourhood quality and mental health. Our hypotheses in Study 2 mirrored those of H1 to H4 in Study 1.

3.1. Method

3.1.1. Participants, design and procedure

Participants were UK residents ($N = 280$), 192 of whom were female, and aged from 18 to 73 ($M = 39.04, SD = 12.26$). The full sample demographics are presented in Table 1. The dataset and study materials can be accessed following this link (<http://dx.doi.org/10.17632/mn7dn6wt5w.2>). The percentage of participants who reported being married and lived in a major city were comparable to our Study 1 sample; however, generally Study 2 participants were more highly educated, younger and more likely to be female.

After ethical approval was obtained from the researchers' university, the study was advertised on the Prolific participants recruitment platform (www.prolific.ac.uk). Each participant who completed the survey was paid UK£0.84 and average completion time was 10 min. A sample size of 280 was considered adequate for path analysis based on recommended power calculations of 20 participants per parameter (Kline, 2016; the hypothesized model includes 14 parameters). A post-hoc power analysis for a 2×2 ANOVA confirmed that a sample size of 280 participants provided .99 power to detect a medium effect size ($r = 0.30$).

To begin, participants were informed that they would become a resident of Bimboola, a hypothetical society, and would start a new life in one of its 28 neighbourhoods. They were provided information regarding Bimboola's annual household income structure and told that neighbourhoods in this community were divided into five tiered groups based on the average household income. Group 1 neighbourhoods had the lowest income, where the average household income was below 25,000 Bimbooleen dollars (B\$); Group 2 represented neighbourhoods of below average income (B\$25,000 to B\$75,000); Group 3 represented neighbourhoods of average income (B\$ 75,000 to B\$ 125,000); Group 4 represented neighbourhoods of above average income (B\$125,000 to B \$250,000) and Group 5 were Bimboola's highest income neighbourhoods.

Following this, participants were given different information about their neighbourhood and neighbourhood life via random assignment to a 2 (high-vs. low-neighbourhood identification) \times 2 (high-vs. low-neighbourhood SES) design.² The neighbourhood identification manipulation was conducted first. In the high-neighbourhood identification condition, participants read about having sociable neighbours and were told that people in their neighbourhood knew each other by name and exchanged greetings and shared common interests. In the low-neighbourhood condition, neighbours were described as unsociable, with people *not* knowing each other by name, exchanging greetings, or having shared interests. Following this, all participants were asked to write about what they might have in common with the people in this hypothetical neighbourhood. This writing exercise and vignettes were created to prime participants with a sense of belonging and affiliation (or a lack of) with their Bimboolean neighbourhood.

The neighbourhood SES manipulation followed next, with

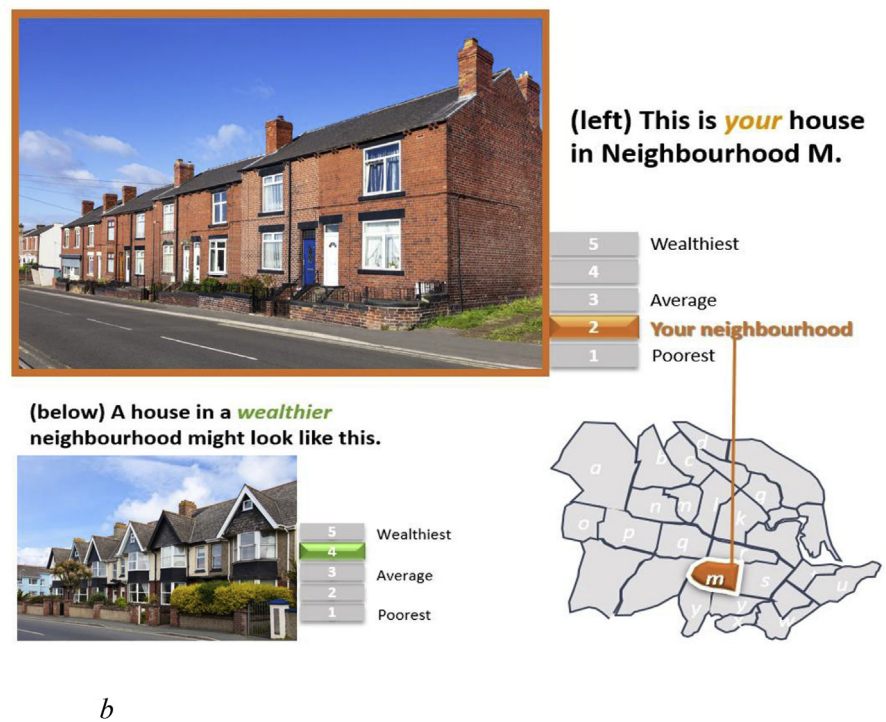
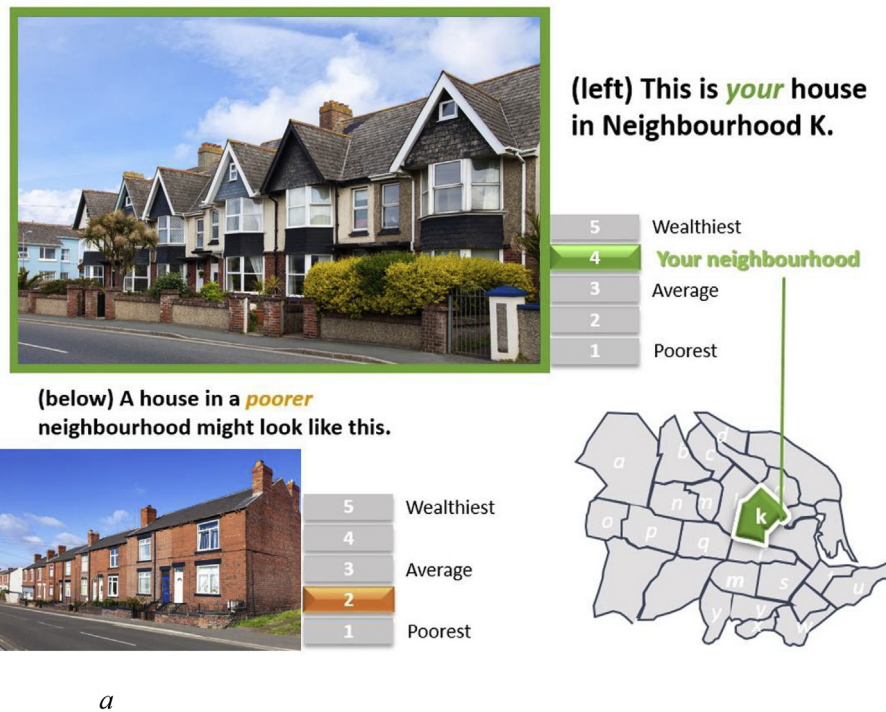


Fig. 4. *a*. Example manipulation stimuli: *high*-neighbourhood SES condition (Study 2).
b. Example manipulation stimuli: *low*-neighbourhood SES condition (Study 2).

participants being given information about their neighbourhood's collective socioeconomic status. Participants were either informed that their neighbourhood had above, (high-neighbourhood SES: 'Neighbourhood K' from income Group 2), or below (low-neighbourhood SES: 'Neighbourhood M' from income Group 4), average wealth. As part of this information, participants were shown a photograph of their house and a comparison photograph of another house. Depending

on their assigned neighbourhood ('K' or 'M'), the comparison photograph showed a house either in a 'poorer' or 'wealthier' neighbourhood, see Fig. 4a and b for an example. The same two stimuli were used across conditions; what varied was which house was indicated as being the participants' and the size of the photograph (their house photograph was larger than the comparison photograph). The images of the two houses were matched on a number of features including dwelling type

(terraced house), size (two storey), the number of cars shown, and weather conditions, such that only the condition and aesthetic qualities, signalling neighbourhood SES, differed (see Fig. 4a and b).

3.1.2. Measures

3.1.2.1. Key constructs. *Neighbourhood identification proxy* ($M = 4.13$; $SD = 2.15$). Participants were asked to rate one item indexing the extent to which they felt a part of their assigned neighbourhood on a scale of 1 (strongly disagree) to 7 (strongly agree).

Perceived neighbourhood quality ($M = 3.18$; $SD = 1.83$; $\alpha = 0.93$). This comprised seven items indexing respondent's perceptions of negative environmental features of their neighbourhood (LaGrange et al., 1992). Scores ranged from 1 to 5 where higher scores indicated better perceived quality.

Mental health ($M = 69.19$; $SD = 16.39$; $\alpha = 0.93$)³. Participants were asked to think of themselves living in their assigned neighbourhood. Given the information provided, they were asked to imagine how often they might be feeling (e.g., *down, happy and down in dumps*, on a scale ranging from 1 = *none of the time* to 5 = *all of the time*). The wording of these stems was identical to that of the MHI-5 (Ware & Sherbourne, 1992). Scores were transformed into a scale ranging from 0 to 100, with higher scores indicating better mental health.

3.1.3. Manipulation checks

Neighbourhood identification scale ($M = 4.24$; $SD = 1.84$; $\alpha = 0.96$, adapted from Doosje, Ellemers, & Spears, 1995). This was administered after the manipulation of neighbourhood identification and comprised 4-items measuring identification with the assigned neighbourhood by indicating the extent to which participants agreed with statements such as, "I identify with other residents of this neighbourhood." This scale, ranging from 1 (*strongly disagree*) to 7 (*strongly agree*), correlated highly with the single-item proxy neighbourhood identification measure from Study 1, which was also included ($r = 0.93$, $p < .001$).

Perceived neighbourhood poverty ($M = 3.18$; $SD = 1.83$). After the neighbourhood SES manipulation, participants rated the extent to which they agreed with the statement "my neighbourhood is poor." Higher scores therefore indicate lower perceived wealth.

3.2. Results

3.2.1. Manipulation checks

The results of our manipulation checks suggested that the two manipulations were successful. Participants who were assigned to the high-neighbourhood identification condition felt significantly more identified with their neighbourhood ($M = 5.77$, $SD = 0.83$) than those in the low-NI condition ($M = 2.60$, $SD = 1.04$), $t(255.46) = 27.86$, $p < .001$. A second independent t -test indicated that participants also rated the perceived poverty of their assigned neighbourhood in the predicted direction. Specifically, participants who were assigned to the low-neighbourhood SES condition perceived their neighbourhood to be significantly poorer ($M = 4.70$, $SD = 1.27$) than those assigned to high-neighbourhood SES condition ($M = 1.69$, $SD = 0.74$), $t(220.83) = -24.17$, $p < .001$.

A final analysis was conducted to examine the independence of manipulations. A 2 X 2 ANOVA was conducted for each manipulation check. For perceived identification with neighbourhood, results showed a main effect of neighbourhood identification, $F(1, 276) = 793.03$, $p < .001$, $\eta_p^2 = 0.74$, but no significant main effect of neighbourhood SES ($p = .100$) nor an interaction ($p = .629$). For perceived neighbourhood poverty, however, there were two main effects: neighbourhood SES, $F(1, 276) = 652.33$, $p < .001$, $\eta_p^2 = 0.70$; neighbourhood

identification, $F(1, 279) = 16.51$, $p < .001$, $\eta_p^2 = 0.05$, and a significant interaction, $F(1, 276) = 11.96$, $p = .001$, $\eta_p^2 = 0.04$. This suggested that the neighbourhood SES manipulation did not work independently of the neighbourhood identification manipulation. Consistent with this reasoning, participants who were first assigned to the high- (rather than low-) neighbourhood identification condition and then subsequently assigned to the low-neighbourhood SES condition, rated their neighbourhood as being significantly less poor (mean difference = 0.89). The effect of neighbourhood SES on perceived neighbourhood poverty was significant at both low neighbourhood identification, $\beta = -0.94$, $t = 20.13$, $p < .001$, $\eta_p^2 = -0.65$, and high neighbourhood identification, $\beta = -0.72$, $t = 15.88$, $p < .001$, $\eta_p^2 = -0.52$.

3.2.2. The moderating effect of neighbourhood identification

A 2 X 2 ANOVA was conducted on perceived neighbourhood quality, the proposed mediator. This analysis revealed two main effects of the neighbourhood identification manipulation, $F(1, 276) = 59.18$, $p < .001$, $\eta_p^2 = 0.18$, and the neighbourhood SES manipulation, $F(1, 276) = 386.01$, $p < .001$, $\eta_p^2 = 0.58$, and a significant interaction, $F(1, 276) = 14.37$, $p < .001$, $\eta_p^2 = 0.05$. This interaction mirrored the findings of Study 1 (see Fig. 5). The effect of neighbourhood SES was significant at both low neighbourhood identification, $\beta = 0.73$, $t = 11.15$, $p < .001$, $\eta_p^2 = 0.51$, and high neighbourhood identification, $\beta = 0.34$, $t = 5.34$, $p < .001$, $\eta_p^2 = 0.24$. As predicted, the effect of neighbourhood SES on perceived neighbourhood quality was much lower for high identifiers.

3.2.3. Model testing

SPSS-AMOSv24 with 5000 bootstrapped samples was used to test the hypothesized pathways. To enable causal inferences, the manipulated indicators of neighbourhood identification and neighbourhood SES were used. Results showed that all paths were significant except the direct effect of neighbourhood SES on mental health, $p = .513$ (see Fig. 6). In line with H1, the indirect path between neighbourhood SES and mental health through perceived neighbourhood quality was significant, $\gamma = 0.59$, BCCI 95% [0.46, 0.71], $p < .001$, again replicating this relationship as reported in the literature. Critically, consistent with our model, the effect of neighbourhood SES on perceived neighbourhood quality was moderated by neighbourhood identification, $\beta = -.25$, $p < .001$ (in line with H2), and the direct path between neighbourhood identification and mental health was significant, $\beta = 0.15$, $p < .001$ (in line with H3). In addition to support for the hypothesized relationships, overall model fit statistics were also good (CMIN/DF = 7.13/1, $p = .008$, CFI = 0.99, NFI = 0.99, GFI = 0.99, SRMR = 0.02). The same pattern of results held after controlling for participants' sex, age, marital status and education (in line with H4).

3.3. Discussion

This experimental study provided causal evidence of the positive direct effect of neighbourhood identification on mental health. It also provided causal evidence that neighbourhood identification acts as a buffer against the negative effects of low neighbourhood SES on perceived neighbourhood quality. Interestingly, this same interaction effect was replicated in our manipulation check of perceived neighbourhood poverty, with high- (vs. low-) neighbourhood identification participants perceiving their assigned 'below average income' neighbourhood to be less poor. Together, these results provide clear evidence of the way that social identification can shape perceptions of objective neighbourhood characteristics.

It is also worth noting that while the relationship between neighbourhood SES and mental health has been well-documented in previous research, this study is one of the few to investigate this relationship causally. As previous studies have reported, here our results indicated that the effect of neighbourhood SES on mental health was indirect,

³ A number of relevant outcomes were also included as exploratory measures (for results, see link <https://data.mendeley.com/datasets/mn7dn6wt5w/draft/a=e4bab920-3f8b-4774-8951-5a3dfd2a7f7b>).

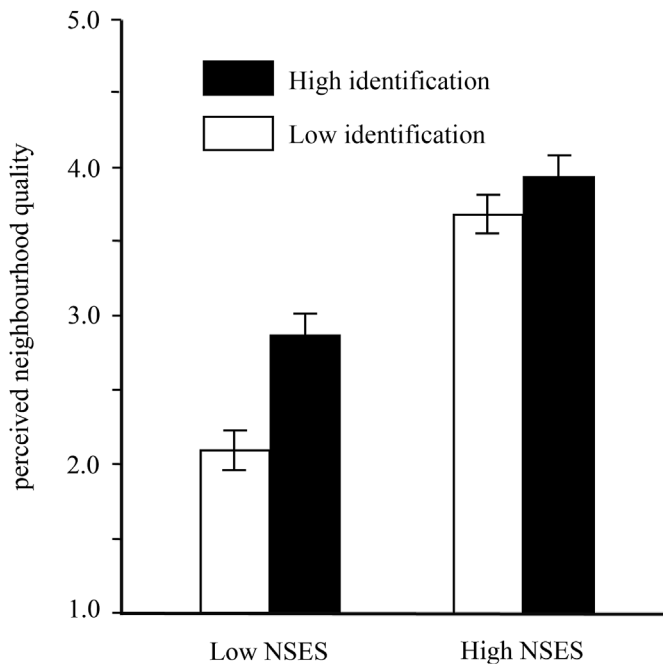


Fig. 5. Interaction between the manipulated independent variables neighbourhood identification and neighbourhood SES on perceived neighbourhood quality in Study 2.

explain why residents perceive the same environmental conditions differently. Future studies should consider changing the order or randomising the order of the two manipulations to disentangle the non-independence of manipulations. Second, it is clearly the case that the Bimboola paradigm itself offers only a limited avenue for exploring the variables in which we were interested. Third, while respondents of Study 1 were reporting frequency of *experiencing* mental health symptoms, participants of Study 2 were asked to ‘imagine’ living in an assigned neighbourhood when rating their ‘projected’ feelings of mental health. Clearly, these two measures are not equivalent and thus the outcome of Study 2 can only be interpreted as an analogue of mental health, although such analogues have been widely used in previous experimental clinical research (e.g., Abramowitz et al., 2014; Praharso, Tear, & Cruwys, 2017).

4. General discussion

This paper reports findings from two studies that investigated relationships between neighbourhood identification, neighbourhood SES, perceived neighbourhood quality and mental health. Our goal was to test the hypothesized model (as presented in Fig. 1) using first cross-sectional population data (Study 1), and then an experimental design (Study 2). Previous studies have found that perception of the neighbourhood environment is a key means through which neighbourhood SES influences mental health. In line with this claim, we found support for this indirect effect of perceived neighbourhood quality in both studies. To our knowledge, this is only the third study to replicate the

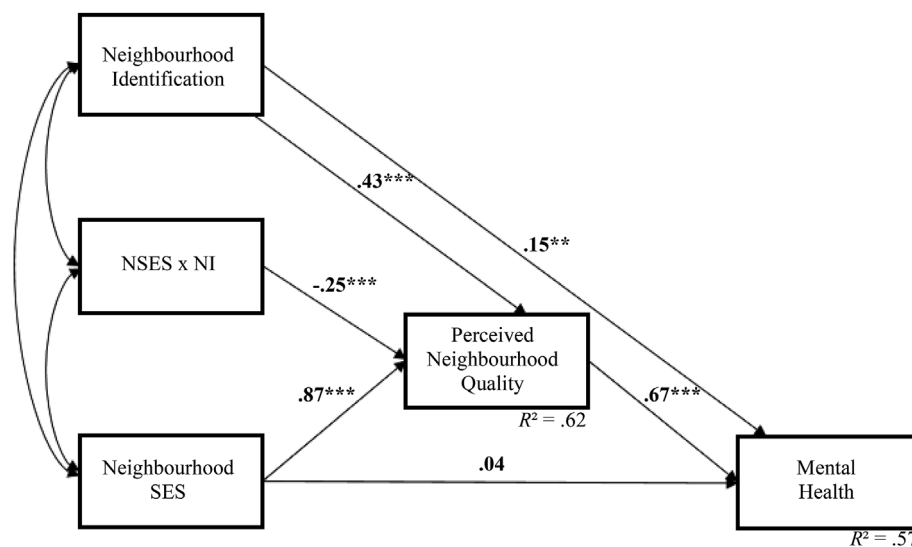


Fig. 6. Model where the manipulated independent variables neighbourhood SES and neighbourhood identification interacts to predict perceived neighbourhood quality and directly affect mental health in Study 2. Standardised coefficients: ** $p < .01$, *** $p < .001$. All indirect effects were significant $ps = .001$.

through perceived neighbourhood quality. This too accords closely with the findings that emerged from correlational data in Study 1. Indeed, we found a consistent pattern of results between the two studies.

3.3.1. Study limitations

This study was not without limitations. First, despite demonstrating the causal role that neighbourhood identification plays in influencing mental health and attenuating the negative effects of low neighbourhood SES, we cannot claim independence in our manipulations. Consistent with our model, participants' subjective appraisals of neighbourhood poverty were also a function of whether they had previously been assigned to the high- or low-neighbourhood identification condition. This suggests that identification informs perceptions of structural/objective characteristics of place, which may also help to

mediating role of perceived neighbourhood quality on mental health in a nationally representative sample (after Weden et al., 2008; Poortinga, Dunstan, & Fone, 2008) and the first to do so using an Australian sample.

Together, the results of these two studies speak to the importance of neighbourhood identification as a key variable in explaining health outcomes in ways previous research using a social identity approach would predict (Haslam et al., 2009). Moreover, the findings support the proposed dual role that neighbourhood identification plays in health, as specified within the DENIM. In line with this model's central hypotheses, our findings imply that neighbourhood identification is an important factor in explaining health disparities across neighbourhoods that have different socioeconomic characteristics. While previous research on neighbourhood effects has investigated the way in which

neighbourhood SES affects perceptions of the environment and mental health, our studies have shown that neighbourhood identification makes a distinctive and important contribution via its dual role in (a) attenuating the effects of low neighbourhood SES on perceptions of the neighbourhood environment and (b) directly impacting on residents' mental health. Indeed, as predicted, the effects of neighbourhood SES on perceived neighbourhood quality were substantially reduced (by half) for high- (vs. low-) identifiers, across both studies. Furthermore, of the variables that were examined in Study 1, neighbourhood identification was the *most important* determinant of mental health, as measured in terms of effect size, above and beyond other individual attributes such as household income. These data suggest that social identification plays a key role in our understanding of the direct, indirect and conditional effects of relative neighbourhood disadvantage on outcomes — in line with theorising, which explains how structural features of our physical world (“out there”) become internalised and psychologically relevant (“in here”; see Haslam et al., 2018, for an extended discussion of these issues).

The present study recognises the larger body of neighbourhood effects research, which examines how objective (e.g., social, physical, economical) characteristics of the residential environment shape individual outcomes. Our findings, along with previous research, illustrate the importance of including subjective perceptions of the neighbourhood environment into the analysis. Indeed, past research examining aspects of neighbourhood diversity (in terms of categorical differences of ethnicity, socioeconomic, age, etc.) has highlighted the importance of including the perceived environment as a mediator of the objective environmental context on outcomes such as attitudes towards immigration, (Newman, Velez, Hartman, & Bankert, 2015), social cohesion (Koopmans & Schaeffer, 2016), and place attachment (Toruńczyk-Ruiz & Lewicka, 2016).

Our focus here was on examining individual-level neighbourhood identification and its capacity to buffer the effects of neighbourhood SES. In this regard, neighbourhood identification, which we have defined as a psychological resource that comes from internalising the social identity associated with place of residence, overlaps closely with other constructs such as place identity (Proshansky et al., 1983) place attachment (Lewicka, 2011; Rollero & de Piccoli, 2010; Theodori, 2001), cognitive social capital (Giordano & Lindström, 2011; Verhaeghe & Tampubolon, 2012), sense of community (Chavis, Hogge, McMillan, & Wandersman, 1986; Mak et al., 2009) and sense of place (Jorgensen & Stedman, 2001; Tuan, 1979). However, while these constructs have a similar focus on how neighbourhood as a place can meaningfully inform one's personal sense of self, neighbourhood identification draws on a social identity approach, which emphasizes the importance of a group-based sense of self — as ‘us neighbours’ and ‘our neighbourhood’ — for both social functioning and wellbeing (Haslam et al., 2018).

4.1. Implications and directions for future research

Our findings have clear implications for the management of health disparities in the neighbourhood context. Many neighbourhoods in developed nations are still facing the challenging consequences of de-industrialisation, with the effects of this felt in some neighbourhoods more than others (Beer, 2018). As reinvestment is not equally distributed, locational disadvantage can be entrenched for less mobile residents who lack the means to relocate to more advantaged neighbourhoods (Cheshire, Pawson, Easthope, & Stone, 2014). While improving the physical conditions of neighbourhoods may certainly be beneficial for residents' psychological well-being (Gong, Palmer,

Gallacher, Marsden, & Fone, 2016), our results suggest that working to build strong neighbourhood identification (a place-based sense of ‘we’) may provide an additional and important means of reducing the well-known health gap associated with neighbourhood socioeconomic disadvantage.

By drawing on this novel theoretical perspective, we are able to posit testable new relationships that have been borne out by the existing literature. Therefore, future research may benefit from looking to the social identity approach for guidance on conceptualising other research problems (as well as strategies for intervention). At the same time, we recognise that in Study 1 we did not control for objective measures of neighbourhood ‘disorder.’ Accordingly, future research should test whether neighbourhood identification or spatial-community identity (Piekut, Rees, Valentine & Kupiszewski, 2012) can buffer against other negative features of the neighbourhood (e.g. disorder, rate of crime) on people's perceptions and sensitivity towards such cues (e.g., degree of safety, Jaśkiewicz & Besta, 2017). While this study has focused on perceived neighbourhood quality as a mediator of neighbourhood effects, social capital has been proposed as another means through which neighbourhood SES affects mental health (Cattell, 2001; Ehsan and De Silva, 2015; Fone et al., 2014; Jones, Heim, Hunter, & Ellaway, 2014; Kawachi, Kennedy, & Glass, 1999; Mohnen, Groenewegen, Völker & Flap, 2011; Tampubolon, 2012). Future studies could therefore also examine whether neighbourhood identification plays a moderating role in this pathway. Furthermore, whereas we have used an experimental scenario approach to infer causal relationships, quasi-experimental longitudinal analyses using a temporal ordering approach could also be employed in future studies.

4.2. Conclusion

The present research furthers our understanding of the relationship between neighbourhood SES and mental health. Drawing on social identity theorising we demonstrate how an individuals' sense of psychological connectedness to their residential community (i.e., their identification with their neighbourhood) impacts upon their well-being. We have also demonstrated the capacity of the social identity approach to generate novel hypotheses about the precise role that neighbourhood identification plays in the relationship between neighbourhood SES and health, via perceived neighbourhood quality. In generating support for these hypotheses, we also provide evidence of the capacity for neighbourhood identification both (a) to reduce the effects of relative neighbourhood disadvantage by enhancing perceptions of neighbourhood quality, which in turn affect mental health, and (b) to directly enhance mental health.

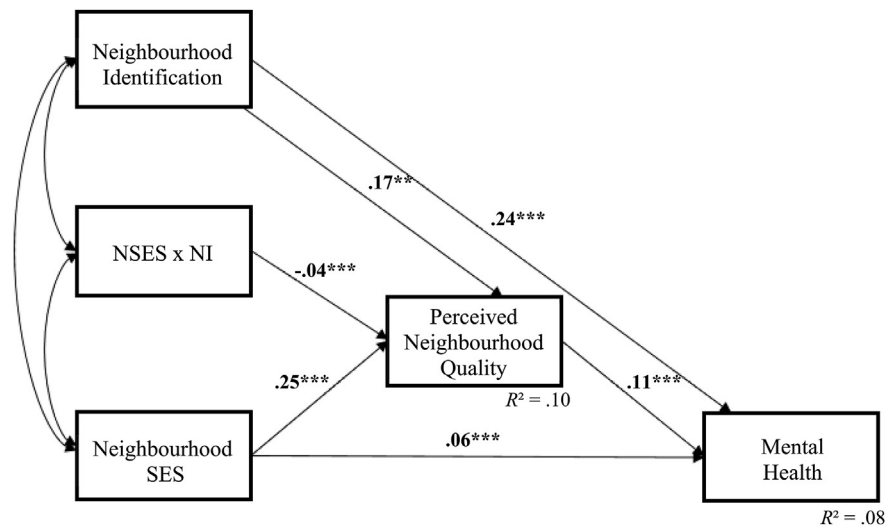
In this context, our findings highlight the importance of residents' social identification with their local community groups for mental health, and of the additional benefits that flow from the capacity for neighbourhood identification to buffer the effects of environmental stress (e.g., in ways suggested by Haslam & Reicher, 2006). In developing our model, we have also addressed criticisms concerning the atheoretical nature of previous research in this area (Owen et al., 2016), and the lack of research which examines the mechanisms through which neighbourhoods shape individual outcomes (Miltenburg, 2015). Most importantly, though, we have demonstrated that social identification with one's neighbourhood is protective of mental health even in the context of challenging environmental conditions.

Declarations of interest

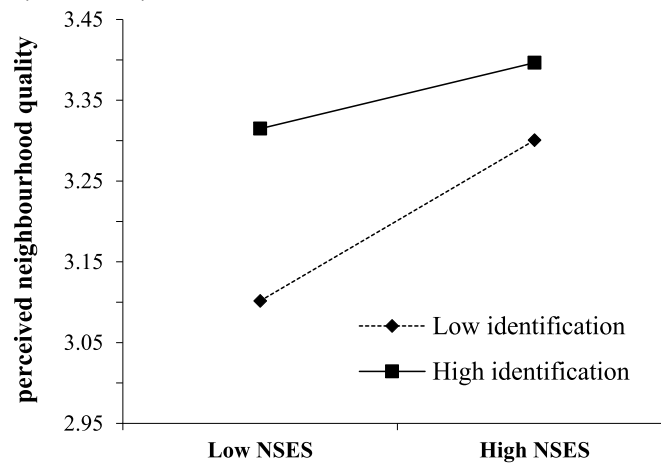
None.

Appendix A

Study 1: Replication analyses of H1 to H3 using Wave 6 data (N = 10, 835).



Path analysis indicating standardised coefficients. Note: ***All direct and indirect paths are significant, $p = .001$. Model fit statistics: $\chi^2 = 2.269$, $df(1)$, $p = .132$, CFI = 0.99, TLI = 0.99, SRMR = 0.01.

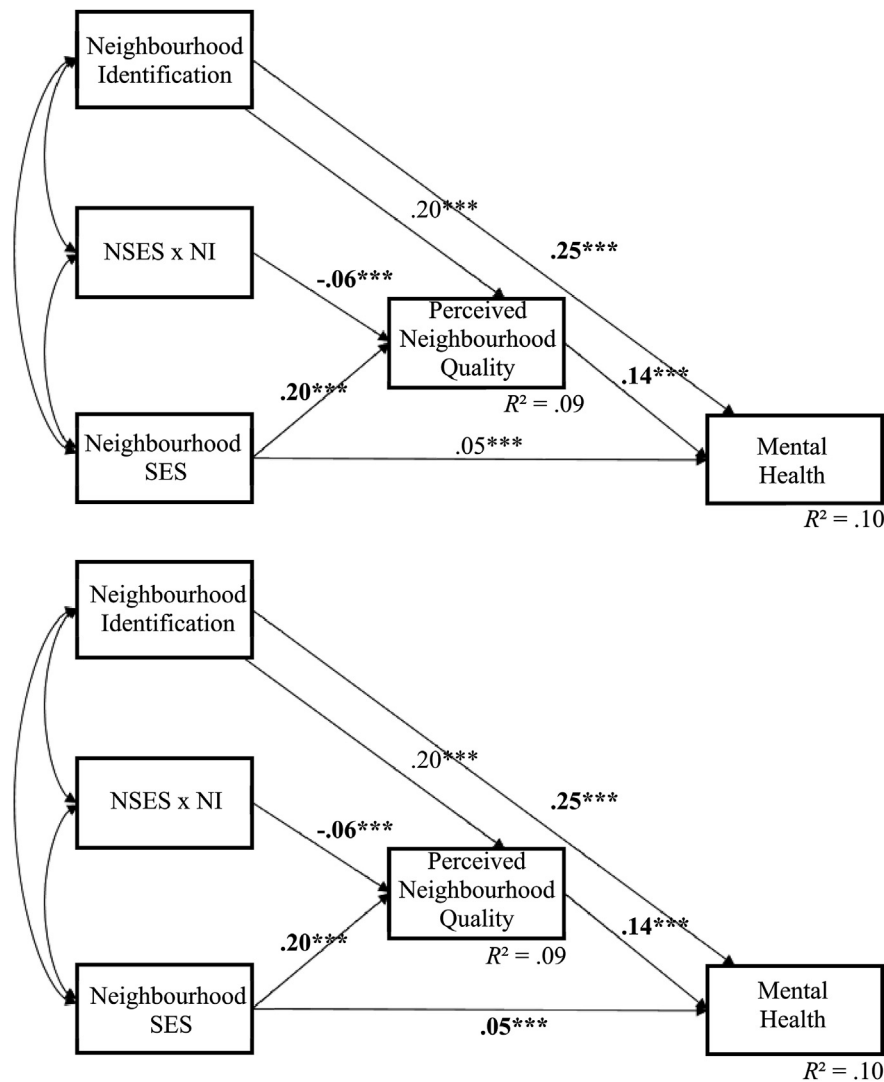


Graph depicting the interaction between neighbourhood SES and neighbourhood identification on perceived neighbourhood quality. Follow up simple slope analyses indicated that the effect of neighbourhood SES (NSES) was significant at both low neighbourhood identification, $\beta = .08$, $t = 22.25$, $p < .001$, $\eta_p^2 = 0.20$, and high neighbourhood identification, $\beta = 0.05$, $t = 16.18$, $p < .001$, $\eta_p^2 = 0.15$.

Appendix B

Study 1 ($N = 14,874$): Replication analyses (MPLUS v8.1 COMPLEX; Muthén & Muthén, 2017). Results demonstrate support for H1 to H3, after taking into account the nested structure of the data: for neighbourhood, (a) and (b) for household.

(a) Path analysis model where standard errors are adjusted for neighbourhood ($n = 5709$) clustering. Model fit statistics: $\chi^2 = 0.97$, $df(1)$, $p = .326$, CFI = 0.99, TLI = 0.99, SRMR = 0.003. Standardised indirect effect = 0.03, $SE = 0.002$, $p < .001$, 95%CI[0.02, 0.03].



(b) Path analysis model where standardised errors are adjusted for household (n = 8540) clustering. Model fit statistics: $\chi^2 = 0.95$, $df(1)$, $p = .329$, CFI = 0.99, TLI = 0.99, SRMR = 0.003. Standardised indirect effect = 0.03, SE = 0.002, $p < .001$, 95%CI[0.02, 0.03].

Appendix D. Supplementary data

Supplementary data to this article can be found online at <https://doi.org/10.1016/j.jenvp.2018.12.006>.

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