



The contribution of crime to the longitudinal relationship between neighbourhood disadvantage and mental well-being, 2009 to 2016

Emily M. Davis^{a,*}, Kristiann C. Heesch^a, Jerome N. Rachele^b, Nicola W. Burton^{c,d}, Gavin Turrell^e

^a School of Public Health and Social Work, Queensland University of Technology, Brisbane, Queensland, Australia

^b College of Health and Biomedicine and Institute for Health and Sport, Victoria University, Victoria, Australia

^c School of Applied Psychology, Griffith University, Brisbane, Queensland, Australia

^d Centre for Mental Health, Griffith University, Queensland, Australia

^e School of Global, Urban and Social Studies, RMIT University, Victoria, Australia

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ABSTRACT

Actions to reduce neighbourhood-level socioeconomic inequities in mental well-being hinge on contemporary research exploring neighbourhood-level mechanisms, such as crime—a social factor widely known to be disproportionately distributed in disadvantaged neighbourhoods. We used longitudinal data from the HABITAT study (2009–2016) and random effects linear regression models to explore the contribution of objectively measured crime (crime against the person, social incivilities, unlawful entry) and a self-report indicator (perceptions of crime and safety) to the relationship between neighbourhood disadvantage and mental well-being, adjusting for neighbourhood self-selection and other time-varying (age, occupation, household income) and time-invariant (gender, education) covariates. People with greater concerns about crime and safety in their neighbourhood had poorer mental well-being. This partly explained the relationship between neighbourhood disadvantage and mental well-being. However, objectively measured crime did not contribute to this relationship. Adjustment for neighbourhood self-selection made little to no contribution to the neighbourhood disadvantage—mental well-being relationship. This study's findings suggest that policies and programs aimed at reducing concerns about crime and safety in disadvantaged neighbourhoods may provide an opportunity to reduce socioeconomic inequities in population mental well-being.

1. Background

Just as neighbourhood disadvantage *gets under the skin* (Taylor et al., 1997), so too can it *get into the mind*. Extensive evidence now supports a relationship between neighbourhood disadvantage and poorer mental health, even after controlling for individual-level socio-economic factors (e.g. Kirkbride et al., 2024; Lund et al., 2018; Mann et al., 2022; Sui et al., 2022). These studies highlight the importance of neighbourhood environments to mental health. There is widespread consensus that good mental health is more than the absence of mental health conditions (World Health Organization, 2022); it encompasses two inter-related, but distinct, continua: (1) common mental health conditions (i.e., anxiety, depression); and (2) mental well-being (MWB), which includes happiness; confidence; adaptive psychological functioning, such as resilience and sense of purpose; and satisfying relationships (Westerhof

and Keyes, 2010). Most studies of the association between residential neighbourhood and mental health examine common mental health conditions as outcomes, yet MWB is an equally important aspect of mental health. Higher MWB has been associated with decreased mortality (Chida and Steptoe, 2008), improved biological processes (Steptoe, 2019), enhanced neural correlates (conflict monitoring, error detection, motivation, emotion regulation, attention, and cognitive control) (King, 2019), and slower telomere attrition (related to decelerated aging) (Boccardi and Boccardi, 2019).

Heeding calls to reduce neighbourhood-level socioeconomic inequities in MWB (Kirkbride et al., 2024) requires researchers to shift from quantifying social patterning of MWB to understanding why and how neighbourhood characteristics contribute to poor MWB (Diez Roux and Mair, 2010). This is important because neighbourhood characteristics are modifiable (Giles-Corti et al., 2016) and can be addressed

* Corresponding author. School of Public Health and Social Work, Queensland University of Technology, Victoria Park Road, Kelvin Grove, QLD, 4059, Australia.
E-mail address: e32.davis@qut.edu.au (E.M. Davis).

through policies and practices. Conceptual models of the determinants of mental health (Herrman, 2011; Keleher and Armstrong, 2006; Lorenc et al., 2012) suggest crime occurrence (hereafter named objective crime) and the emotions, beliefs, understanding and perceptions towards crime and safety (hereafter named perceptions of crime) of the neighbourhood residents are important modifiable factors influencing MWB, akin to their impact on mental ill-health (Baranyi et al., 2021). Furthermore, decades of criminology research indicate that disadvantaged neighbourhoods have higher levels of violent (Jones and Pridemore, 2018; Sampson et al., 1997) and property crimes (Jones and Pridemore, 2018) and their residents perceive more crime and feel less safe (Kuen et al., 2022; Di Rocco, Vasiljevic and Ivert, 2023), compared to their advantaged counterparts. Yet, there is a lack of research examining the influence of objective crime and perceptions of crime on the association between neighbourhood disadvantage and MWB.

Understanding why disadvantaged neighbourhoods experience more crime and why their residents have greater concerns about crime and safety than their advantaged counterparts can be explained by contemporary criminology theoretical models on the links between crime and place (Jones and Pridemore, 2018). An integrated, multi-level theoretical model of crime and place explains how street- and neighbourhood-level criminogenic factors lead to crime in disadvantaged neighbourhoods (Jones and Pridemore, 2018). At the street level, disadvantaged neighbourhoods have greater opportunity (i.e., increased probability of interactions between victims and offenders), lower guardianship (e.g., presence of CCTV, alarm systems, and police and fire services), and increased social and physical disorder (e.g., vandalism, physically deteriorating and abandoned buildings, graffiti, loud neighbours, loitering youth, and drug use) (Jones and Pridemore, 2018). At the neighbourhood level, disadvantaged neighbourhoods are socially disorganised due to neighbourhood instability (e.g., residential mobility, rental households, population density) and a lack of resources, institutions, and organisations (Jones and Pridemore, 2018). These factors inhibit community solidarity, informal social control, and collective efficacy, which can prevent or make crime less likely (Jones and Pridemore, 2018).

The link between objective crime and perceptions of crime is complex (Hale, 1996) due to conceptual and measurement issues (Farrall et al., 2007). The indicators are conceptually distinct: objective crime refers to police-recorded crime incidents, while perceptions of crime and safety are self-reported and reflect an individual's evaluation of personal risk to signals of crime in their immediate environment (Chataway and Mellberg, 2021). Yet, these conceptual differences are often overlooked and studies examining crime typically interchange objective and perceived crime. This is despite the two indicators being weakly correlated (Baranyi et al., 2021) and when modelled together, neither indicator attenuates compared to when modelled separately (Ambrey et al., 2014). Although objective and perceived crime represent different concepts, studies rarely examine both indicators in the same study (Baranyi et al., 2021). Notwithstanding the conceptual independence of each indicator, objective crime is the most obvious—and extensively researched—contextual factor contributing to perceptions of crime. The multi-level model of crime generation (Jones and Pridemore, 2018) encourages researchers to measure crime at multiple levels, including the street and neighbourhood levels. The findings of a study that accounted for spatial-measurement factors suggest that objective crime assessed at the street-level near a resident's home likely contributes to that resident's perceptions of crime, whereas objective crime assessed at the neighbourhood level does not (Kuen et al., 2022). These conceptual and measurement issues have implications for future policies and their underpinning research. However, perceptions are not *merely* based on objective crime. Contemporary criminology research asserts that perceptions also develop through complex interplays and evaluations of emotional, behavioural, and cognitive responses to crime risk cues (Hart et al., 2022; Chataway and Hart, 2016; Jackson, 2005). Criminogenic cues are ubiquitous in disadvantaged neighbourhoods and include social

fragmentation (Breetzke and Pearson, 2014), social (Kuen et al., 2022) and physical (Chataway and Hart, 2016; Di Rocco et al., 2023) disorder, and media reports of crime (Jahiu and Cinnamon, 2022). In short, criminology research, coupled with broader evidence of the impact of neighbourhood crime on mental ill-health, suggests that neighbourhood objective crime and perceptions of crime should be considered separate, but related, contextual neighbourhood predictors of MWB.

Objective crime in a neighbourhood likely *gets into the mind*, manifesting as poor MWB, through direct and indirect aetiological pathways (Lorenc et al., 2012). Although the probability of being directly affected is low, there are significant consequences of victimisation on MWB (Cornaglia et al., 2014). Beyond the few residents who are directly affected by objective crime in the neighbourhood, the MWB of many more residents—entire neighbourhoods—is likely indirectly affected through perceptions of crime (Ambrey et al., 2014). Yet, studies exploring if and how MWB is indirectly affected by neighbourhood objective crime and perceptions of crime are lacking. Regardless if the aetiological pathway is direct or indirect, objective crime and perceptions of crime are likely to act on MWB through psychological functioning and biological response pathways. Several aspects of psychological functioning may become compromised. These include low self-esteem (Haney, 2007); feeling undervalued or lack a sense of belonging (Jones et al., 2014); not trusting others (Ross and Jang, 2000); avoidance or constraining behaviour (Cornaglia et al., 2014); or cognitive escape from thoughts, feelings, individuals, or places associated with crime (Kilpatrick and Acierno, 2003). In turn, compromised psychological functioning can lead to limited opportunities to form social ties and reduced social engagement in the neighbourhood. Biological response pathways may become activated due to increases in stress levels. This may lead to detrimental physiological responses and unhealthy coping behaviours (Cornaglia et al., 2014; Stafford et al., 2007).

Evidence of a neighbourhood crime—MWB relationship is emerging. Associations between greater concerns about crime and safety and poorer MWB have been reported in cross-sectional studies of the Scottish (Jones et al., 2014) and UK (Toma et al., 2015) general and older populations (Gale et al., 2011) and in a UK longitudinal study (Toma et al., 2015). These studies indicate there is merit in advancing research to further disentangle the effects of neighbourhood crime on MWB among residents of disadvantaged neighbourhoods, over time, but such studies have been limited in several ways that will be addressed in the current study. First, most studies in this research area used cross-sectional designs, which are vulnerable to bias and overestimation of association. The current study uses a longitudinal design. Second, the crime—MWB association has not previously been examined across levels of neighbourhood disadvantage; thus, it is unknown if neighbourhood-level crime explains neighbourhood socioeconomic inequities in MWB. The current study examines the contribution of neighbourhood crime to the relationship between neighbourhood disadvantage and mental well-being. Third, in these previous studies only perceptions of crime were measured. In the current study we measure both objective crime and perceptions of crime. Last, neighbourhood self-selection, which refers to the decision to move to a particular neighbourhood, was not accounted for in previous research. The decision to select a neighbourhood to live in is influenced by many factors, such as individual attitudes, preferences, and ability to afford housing in the neighbourhood. When self-selection is not accounted for in analyses, MWB estimates could be inflated (Lamb et al., 2020). In the current study we adjust for neighbourhood self-selection.

In summary, this study aimed to examine the contribution of neighbourhood-level objective crime and individual-level perceptions of crime to the association between neighbourhood disadvantage and MWB over 7 years, taking account of neighbourhood self-selection, individual socioeconomic position (education, occupation, household income), age, and gender.

2. Methods

2.1. Data source and study population

This study used data from HABITAT (How Areas in Brisbane Influence health and Activity), a multilevel, longitudinal study (2007–2016) of mid-aged (40–65 years old) participants of Brisbane, Australia. HABITAT's sampling design has been published elsewhere (Burton et al., 2009). Briefly, a multi-stage probability sampling design was used to select a stratified random sample ($n = 200$) of Census Collector's Districts (CCD). The median land area of a HABITAT CCD was 0.27 km² (range: 0.02 km² to 70.7 km²). At the time of sampling in 2007, 50% of CCDs had at least 542 residents (range: 209–1661) (Learnihan et al., 2022). CCDs were embedded within larger neighbourhoods; hence, the area corresponding to, and immediately surrounding, a CCD was likely to have meaning and significance for residents. For this reason, we hereafter use the term neighbourhood to refer to CCDs. From within each CCD, a random sample of participants aged 40–65 years (on average, 85 people per CCD; $n = 17,000$) was drawn.

A structured, self-administered survey was sent to 17,000 potential participants between May and July 2007 using Dillman's mail-survey method (Dillman, 2000). After excluding 873 out-of-scope contacts (i.e., deceased, no longer at the address, unable to participate for health-related reasons), 11,035 useable surveys were returned, yielding a baseline response rate of 68.3%. The baseline sample broadly represented the wider Brisbane population, although participants from disadvantaged neighbourhoods, blue-collar employees, and persons with no post-secondary school qualification were underrepresented (Turrell et al., 2010; Turrell et al., 2014). Since the baseline data collection in 2007, the cohort (i.e. those who responded in 2007 and who had not actively withdrawn) have been approached to complete four follow-up surveys (2009, 2011, 2013 and 2016). The response rates from in-scope and contactable participants in 2009, 2011, 2013, and 2016 were 72.6 % ($n=7866$), 67.6 % ($n=6900$), 67.6 % ($n=6520$), and 58.8 % ($n=5187$), respectively. This study received ethics approval from the Queensland University of Technology Human Research Ethics Committee (Ref. No. 3967H & 1300000161).

For the current analyses, we used data from the 2009, 2011, 2013, and 2016 waves; 2007 did not include MWB, therefore was not used. Using data from four waves allowed us to pool observations to create a larger dataset and increase statistical power.

2.2. Exposure and outcome variables

2.2.1. Objective crime

Reported crime data in each study year from the Queensland Police Service (QPS) were used as an objective indicator of neighbourhood crime. These data were geocoded to street address locations. The total number of reported crimes were assigned to each Habitat neighbourhood, in each study year after baseline (2009, 2011, 2013, 2016). The three QPS categories of crime were used separately: crimes against the person (homicide, assault, sexual offenses, robbery, and other offenses against the person), unlawful entry (unlawful entry without violence—dwelling, unlawful entry with intent—shop, unlawful entry with intent—other), and social incivilities (drug offenses, prostitution offenses, trespassing and vagrancy, and good order offenses). For interpretability, total counts of crime were rescaled by a factor of 100 so that for each category of crime a one unit increase in crime-counts represents 100 additional crimes in the study year.

2.2.2. Perceptions of crime

Participants' perceptions of crime and safety in their neighbourhood was measured at each of the four surveys after baseline with six items adapted for the Australian population from the Neighbourhood Environment Walkability Scale (NEWS) questionnaire (Cerin et al., 2006), which has been found to be valid (Cerin et al., 2006) and reliable

(Turrell et al., 2011). The items captured judgements or cognitive assessment of personal safety or risk, rather than the emotional reaction or degree of worry or concern about criminal victimisation by a specific type of crime (Foster et al., 2016). The items were: 'There is a lot of crime in my suburb', 'Children are safe walking around the suburb during the day', 'The level of crime in my suburb makes it unsafe to walk on the streets at night', 'There are rowdy youth on the streets or hanging around in parks in my suburb', 'The level of crime in my suburb makes it unsafe to walk on the streets during day', and 'In my suburb, I would feel safe walking home from the bus stop or train station at night'. Response options were on a 5-point Likert scale (1, strongly disagree; 5, strongly agree). Principal component analysis with varimax rotation revealed all items loaded onto one factor, interpreted as perceptions of crime, which had a Cronbach's alpha of 0.80 in 2009, 0.80 in 2011, 0.81 in 2013, and 0.81 in 2016. In 2009, the mean perceptions of crime score was 2.3 (SD=1.0); in 2011, 2.3 (SD=1.0); in 2013, 2.1 (SD=1.0); and in 2016, 2.0 (SD=1.0).

2.2.3. Neighbourhood disadvantage

Each neighbourhood was assigned a socioeconomic score using the Australian Bureau of Statistics Index of Relative Socioeconomic Disadvantage (IRSD) (Australian Bureau of Statistics, 2008). The IRSD reflects each neighbourhood's overall level of disadvantage based on numerous socioeconomic attributes including education, occupation, income, unemployment, and household tenure. For analysis, the 200 neighbourhoods were grouped into quintiles based on their IRSD scores with Q1 denoting the 20% ($n = 40$) most disadvantaged areas in Brisbane and Q5, the least disadvantaged 20% ($n = 40$).

2.2.4. Mental well-being

Mental well-being was measured at each of the four surveys after baseline using the well-validated, 7-item, Short Warwick-Edinburgh Mental Well-being Scale (SWEMWBS), which captures psychosocial functioning and relationships (Ng Fat, Scholes, Boniface, Mindell and Stewart-Brown, 2017). Response options were on a 5-point Likert scale (1, none of the time; 5, all of the time). Raw scores were summed, ranging from 7 to 35, then transformed according to a raw-score-to-metric-score conversion table (Stewart-Brown et al., 2009); higher scores indicate better MWB. In 2009, the mean MWB score was 23.2 (SD=3.6); in 2011, 23.2 (SD=3.5); in 2013, 23.8 (SD = 3.9); and in 2016, 23.8 (SD = 3.9). Internal consistency of scale items was high for all years: Cronbach's alpha was 0.86 for 2009, 0.85 for 2011, 0.88 for 2013 and 0.88 for 2016.

2.3. Neighbourhood self-selection

In 2007, participants were asked, 'How important were each of the following in your decision to move to your current suburb?' before being presented a list of items. Response options were on a 5-point Likert scale (1, not at all important; 5, very important). Neighbourhood self-selection was assessed as the response to a single item on the list (safety from crime). The mean neighbourhood self-selection score was 3.7 (SD=1.2).

2.4. Potential confounders

The following covariates were included in the models to reduce confounding bias between the independent variables and the dependent variable, MWB. All models were adjusted for age (years) and gender (male or female). All covariates, except education, were measured and operationalised identically at each of the four time points. Education data were only collected at baseline in 2007.

2.4.1. Education

Participants were asked their highest education qualification attained. Nine response options were coded and collapsed into four

categories: bachelor's degree or higher (graduate certificate or diploma, Masters' degree or doctorate), diploma or associate degree (an undergraduate qualification to undertake specialised, technical or para-professional work, and as pathway to further education), certificate (trade or business), and no post-secondary school qualification.

2.4.2. Occupation

If employed, participant's job title, main tasks, and duties performed were coded to the Australian and New Zealand Classification of Occupations (Australian Bureau of Statistics, 2013) and collapsed into three categories: managers/professionals (managers and administrators, professionals and para-professionals), white collar employees (clerks, sales-persons and personal service workers), and blue-collar employees (tradespersons, plant and machine operators and drivers, and labourers and related workers). Non-employed participants were classified as having home duties, retired, permanently unable to work, unemployed, or not easily classifiable (student, other, or missing).

2.4.3. Annual household income

Participants estimated their total pre-tax household income from 13 categories. These were collapsed into six categories: $\geq$ A\$130,000, A\$129,999–A\$72,800, A\$72,799–A\$52,000, A\$51,999–A\$26,000, $\leq$ A\$25,999, and don't know/don't want to answer.

2.5. Data analysis and modelling

We excluded participants who: (1) did not reside at the same address at each wave ($n=1916$) to maximise the exposure to the neighbourhood and minimise the risk of bias associated with people relocating to a more disadvantaged neighbourhood due to poorer mental health (van Lenthe et al., 2007); (2) were not the same responding household member at each wave ($n=299$); (3) had missing data for education in 2007 ($n=17$) or income ($n=73$) at all four waves; (4) had missing data for neighbourhood self-selection in 2007 ($n=157$); or (5) had missing data for both perceptions of crime and MWB at all four waves ($n=102$). The final analytic samples in 2009, 2011, 2013, and 2016 comprised 5296, 4772, 4389, and 3478 participants, respectively. In binary logistic regression models, we found that participants more likely to drop out had certificate level or no post-secondary school education or lived in households earning less than A\$51,599 per year. There were no significant differences in MWB score or socioeconomic characteristics between those who dropped out and those who remained in the cohort.

Descriptive statistics compared the sociodemographic characteristics of the baseline sample (2007) to those of the first (2009) and final (2016) waves. The bivariate association between MWB and each characteristic measured in 2009 and 2016 was also computed.

Analysis was conducted in three stages. In Stage 1, we used ANOVAs to test for differences between objective crime counts and perceptions of crime scores for 2009 and 2016, for the total samples and the samples stratified by neighbourhood disadvantage quintiles. In Stage 2, we examined associations between each neighbourhood crime indicator and perceptions of crime and MWB, in models without and with adjustment for neighbourhood self-selection. All models controlled for age, gender, education, occupation, household income, and neighbourhood disadvantage. In Stage 3, we examined the contribution of each crime indicator to the association between neighbourhood disadvantage and MWB, without and with adjustment for neighbourhood self-selection, in the following sequential models. In Model 1, the baseline model, MWB was regressed onto neighbourhood disadvantage, adjusting for age, gender, education, occupation, and household income. In Models 2–5, we further adjusted Model 1 for crime against the person, social incivilities, unlawful entry, and perceptions of crime, respectively. Models 6–10 adjusted Models 1–5 for neighbourhood self-selection. Both Stages 2 and 3 estimated associations using random-effects linear regression models.

Data were analysed using Stata 17.0 (StataCorp, College Station,

Texas).

3. Results

Table 1 summarises sociodemographic characteristics of baseline (2007) and the first and last analytic samples (2009, 2016), and the unadjusted bivariate association between MWB and each characteristic. MWB scores for each characteristic were marginally higher for 2016 than for 2009. Regardless of survey wave, MWB scores were lowest for those living in the most disadvantaged neighbourhoods, those with no post-secondary school education, those permanently unable to work or unemployed (looking), and members of households in the lowest income category ($<$ A\$25,999 per year).

Table 2 presents mean crime counts for crime against the person, social incivilities, and unlawful entry and mean perceptions of crime scores (95% CI), stratified by neighbourhood disadvantage quartiles for the first and last analytic samples (2009, 2016). Mean scores for each objective crime and perceptions of crime indicator were highest in the most disadvantaged neighbourhoods and lowest in the least disadvantaged neighbourhoods ($p < 0.001$).

Table 3 presents results of modelling the longitudinal association between objective crime counts, perceptions of crime scores, and MWB, without and with adjustment for neighbourhood self-selection. In Model 1, perceptions of crime, but not objective crime, was significantly associated with MWB ($p < 0.05$). These results remained unchanged after adjusting for neighbourhood self-selection (Model 2).

Table 4 presents results of modelling the association between neighbourhood disadvantage and MWB. In Models 1–5, participants living in the most disadvantaged neighbourhoods (Q4, Q5) had significantly lower MWB scores than those living in the least disadvantaged neighbourhoods (Q1) ($p < 0.05$). When crime against the person (Model 2), social incivilities (Model 3), or unlawful entry (Model 4) was added, the results were unchanged from Model 1. When the perceptions of crime variable was added (Model 5), MWB coefficients attenuated and became non-significant for participants living in the most disadvantaged neighbourhoods (Q4, Q5) ($p < 0.05$). These findings indicate that having greater concerns about crime and safety may partly explain the association between neighbourhood disadvantage and poorer MWB. In Models 6–10, neighbourhood self-selection was added to Models 1–5. MWB coefficients attenuated slightly but remained significant for crime against the person (Q4–Q5 in Model 7) and the baseline model, social incivilities, and unlawful entry (Q5 in Model 6, 7 and 8, respectively), indicating that bias due to neighbourhood self-selection is negligible.

4. Discussion

Critical to understanding the contribution of neighbourhood environments to socioeconomic inequities in MWB is advancing research about neighbourhood-level exposures. This longitudinal study aimed to examine the contribution of different types of neighbourhood crime, measured using objective crime and perceptions of crime, to the relationship between neighbourhood disadvantage and MWB, also accounting for neighbourhood self-selection and other demographics. We found that residents of the most disadvantaged neighbourhoods have the poorest MWB over time and that this relationship is partly explained by perceptions of crime, but not objective crime. This finding extends results from cross-sectional research into neighbourhood socioeconomic inequities in MWB (Mann et al., 2022) by highlighting the importance of contextual neighbourhood circumstances in shaping individual MWB, beyond an individual's circumstances and adds new evidence to the few crime—mental health studies that measure objective and perceptions of crime in the same study (Baranyi et al., 2021).

This paper advances our understanding of the complex contribution of neighbourhood crime to neighbourhood socioeconomic inequities in MWB in three ways. First, neighbourhood crime was measured using objective crime and perceptions of crime indicators separately. This was

Table 1

Sociodemographic characteristics of the baseline and first and final analytic samples and mental well-being scores of the first and final analytic samples^{a,b}.

N = 200 neighbourhoods	Sample characteristics (%)			Mental well-being score (mean, 95 % CI)	
	Baseline sample	Analytic samples			
	2007 (n = 11,035)	2009 (n = 5296)	2016 (n = 3478)	2009 (n = 5296)	2016 (n = 3478)
Total sample				23.2 (23.1, 23.3)	23.8 (23.7, 23.9)
Gender					
Male	43.9	42.4	41.6	23.0 (22.9, 23.1)	23.5 (23.3, 23.7)
Female	56.0	57.6	58.4	23.4 (23.2, 23.5)	24.0 (23.8, 24.1)
Age (years)					
40–44	22.9	11.4	–	22.9 (22.7, 23.2)	–
45–49	21.6	21.4	2.4	22.7 (22.5, 22.9)	23.0 (22.3, 23.8)
50–54	20.9	21.3	20.1	23.0 (22.8, 23.2)	23.2 (22.9, 23.5)
55–59	18.9	19.4	21.9	23.4 (23.1, 23.6)	23.5 (23.2, 23.8)
60–64	15.0	18.9	20.8	23.8 (23.5, 24.0)	23.8 (23.5, 24.0)
65–69	0.7	7.7	19.9	23.9 (23.6, 24.3)	24.4 (24.1, 24.7)
70–74	–	–	14.9	–	24.2 (23.8, 24.5)
75–79	–	–	0.06	–	31.6 (29.8, 33.4)
Education					
Bachelor's degree or higher	31.3	32.8	38.2	23.6 (23.4, 23.7)	24.2 (24.0, 24.4)
Diploma/associate degree	11.5	11.1	11.8	23.5 (23.2, 23.7)	24.1 (23.7, 24.5)
Certificate (trade/ business)	17.7	17.3	16.8	23.2 (22.9, 23.4)	23.6 (23.3, 23.9)
No post-secondary school qualification	39.0	38.8	33.2	22.8 (22.7, 23.0)	23.3 (23.1, 23.5)
Missing ^c	0.4	–	–	–	–
Occupation					
Manager/ professional	33.4	31.9	30.2	23.5 (23.3, 23.6)	24.0 (23.8, 24.3)
White collar	22.0	20.0	15.7	23.0 (22.8, 23.2)	23.3 (23.0, 23.6)
Blue collar	14.3	13.1	8.5	22.7 (22.5, 23.0)	23.2 (22.8, 23.7)
Home duties	5.6	5.9	4.3	23.4 (22.9, 23.8)	24.0 (23.4, 24.7)
Retired	8.5	12.6	33.2	23.9 (23.6, 24.2)	24.2 (24.0, 24.4)

Table 1 (continued)

N = 200 neighbourhoods	Sample characteristics (%)			Mental well-being score (mean, 95 % CI)	
	Baseline sample	Analytic samples			
	2007 (n = 11,035)	2009 (n = 5296)	2016 (n = 3478)	2009 (n = 5296)	2016 (n = 3478)
Permanently unable to work	2.8	2.1	1.6	20.8 (20.1, 21.6)	21.2 (20.0, 22.2)
Unemployed (looking)	1.3	1.7	1.8	21.9 (21.2, 22.6)	21.1 (20.3, 21.9)
Not easily classifiable ^d	12.0	12.8	4.7	23.1 (22.9, 23.4)	23.6 (23.0, 24.2)
Annual household income					
A\$130,000+	17.1	18.2	20.1	23.7 (23.5, 23.9)	24.2 (23.9, 24.5)
A\$72,800–129,999	25.8	25.3	23.7	23.2 (23.0, 23.4)	23.8 (23.5, 24.0)
A\$52,000–72,799	14.7	13.7	12.4	23.0 (22.8, 23.3)	24.0 (23.7, 24.5)
A\$26,000–51,599	18.1	17.9	18.3	23.0 (22.9, 23.3)	23.6 (23.3, 23.8)
Less than A\$25,999	9.5	11.6	11.2	22.5 (22.2, 22.8)	22.9 (22.5, 23.3)
Don't know/don't want to answer	12.8	12.4	12.0	23.5 (23.2, 23.8)	24.0 (23.6, 24.4)
Missing ^e	1.9	1.2	2.4	22.7 (21.9, 23.6)	23.9 (22.9, 25.0)
Neighbourhood disadvantage					
Q1 (Least disadvantaged)	29.7	26.3	29.4	23.5 (23.3, 23.7)	24.2 (24.0, 24.5)
Q2	19.4	23.6	22.4	23.4 (23.2, 23.6)	23.8 (23.5, 24.0)
Q3	18.6	18.7	19.9	23.0 (22.8, 23.3)	23.7 (23.4, 24.0)
Q4	18.9	18.5	15.1	23.1 (22.9, 23.4)	23.5 (23.2, 23.9)
Q5 (Most disadvantaged)	13.4	12.9	13.3	22.6 (22.4, 22.9)	23.2 (22.8, 23.5)

Note: A\$, Australian dollars; Q, quartile. Q1: Quartile 1 denotes the 20 % least disadvantaged areas in Brisbane; Q5: Quartile 5 denotes the 20 % most disadvantaged areas in Brisbane.

^a Unadjusted for any other factors. 2007 was the baseline year for HABITAT. 2009 was the baseline year for the current analysis, and 2016 was the final follow-up year included in the analysis. Other follow-up years were 2011 and 2013.

^b MWB not measured in 2007.

^c Participants' data were excluded from the analytic samples if education was not reported in 2007, the only wave which assessed education.

^d Student, other, or missing.

^e Participants' data were excluded from the analytic samples if income was missing for all four of the 2009–2016 waves.

in response to calls in the crime—mental health literature for more studies to examine the two indicators in the same study (Baranyi et al., 2021) and to assertions in the neighbourhood—health literature that each indicator taps into neighbourhood features not captured by the

Table 2

Objective crime and perceptions of crime (mean, 95 % CI), stratified by quintile (Q) of neighbourhood disadvantage.

	Total (all neighbourhoods)	Q1 (Least disadvantaged)	Q2	Q3	Q4	Q5 (Most disadvantaged)	p-value ^a
Objective crime (n = 200 neighbourhoods)							
Crime against the person ^b							
2009	2.62 (2.08, 3.15)	0.90 (0.53, 1.28)	1.21 (0.86, 1.57)	2.70 (1.34, 4.06)	2.98 (2.18, 3.77)	5.58 (3.65, 7.51)	<0.001
2016	2.53 (1.95, 3.10)	0.58 (0.37, 0.80)	1.66 (1.12, 2.21)	2.23 (1.57, 2.88)	3.29 (1.32, 5.26)	5.40 (3.55, 7.25)	<0.001
Social incivilities ^c							
2009	5.94 (3.29, 8.59)	1.12 (0.66, 1.57)	2.30 (1.50, 3.09)	4.80 (3.24, 6.36)	5.45 (3.14, 7.76)	17.30 (3.51, 31.09)	<0.001
2016	10.08 (6.75, 13.41)	2.22 (1.47, 2.96)	3.87 (2.80, 4.95)	7.15 (4.02, 10.27)	16.82 (3.55, 30.08)	22.64 (12.83, 32.46)	<0.001
Unlawful entry ^d							
2009	6.32 (5.51, 7.11)	4.23 (3.31, 5.15)	5.43 (4.17, 6.69)	6.30 (5.00, 7.59)	7.57 (5.24, 9.89)	8.20 (5.76, 10.63)	<0.001
2016	4.24 (3.71, 4.77)	2.35 (1.88, 2.82)	3.74 (2.72, 4.77)	4.08 (3.18, 4.97)	4.97 (3.62, 6.32)	6.54 (4.86, 8.22)	<0.001
Perceptions of crime (2009 n = 5296, 2016 n = 3478)							
Perceptions of crime and safety ^e							
2009	2.31 (2.29, 2.34)	1.95 (1.90, 1.99)	2.19 (2.14, 2.24)	2.35 (2.30, 2.40)	2.54 (2.48, 2.61)	2.92 (2.84, 3.01)	<0.001
2016	2.06 (2.03, 2.10)	1.74 (1.68, 1.79)	1.99 (1.92, 2.05)	2.07 (2.00, 2.15)	2.27 (2.19, 2.36)	2.67 (2.56, 2.77)	<0.001

Notes: Q1: Quartile 1 denotes the 20 % least disadvantaged areas in Brisbane; Q5: Quartile 5 denotes the 20 % most disadvantaged areas in Brisbane. 2009 was the baseline year for the current analysis, and 2016 was the final follow-up year included in the analysis. Other follow-up years were 2011 and 2013.

^a ANOVA-derived differences in means.

^b Crime against the person: homicide, assault, sexual offenses, robbery, or other offenses; 2009 range=0 to 26, 2016 range=0 to 33.

^c Social incivilities: drug offenses, prostitution offenses, trespassing and vagrancy, good order offenses; 2009 range=0 to 238, 2016 range=0 to 231.

^d Unlawful entry: unlawful entry without violence—dwelling, unlawful entry with violence—dwelling, unlawful entry with intent—shop, unlawful entry with intent—other; 2009 range=0 to 47, 2016 range=0 to 24.

^e A factor-scale ranging from 0 to 6 and comprising six items measuring perceptions of crime and safety in the neighbourhood; higher scores indicate greater concerns about crime and safety.

Table 3Modelling the association between objective crime, perceptions of crime, and mental well-being, without and with adjustment for neighbourhood self-selection, 2009–2016.^a

	Model 1	Model 2
	β (95% CI)	β (95% CI)
Objective crime		
Crime against the person	0.79 (−1.21, 2.80)	0.96 (−1.04, 2.97)
Social incivilities	0.05 (−0.45, 0.55)	0.10 (−0.40, 0.60)
Unlawful entry	−0.19 (−1.18, 0.80)	−0.17 (−1.16, 0.82)
Perceptions of crime		
Perceptions of crime and safety	−0.45 (−0.51, −0.39)	−0.45 (−0.51, −0.40)

Notes: Boldface indicates statistical significance ($p < 0.05$); Model 1: adjusted for age, gender, education, occupation, household income, and neighbourhood disadvantage. Model 2: Model 1, additionally adjusted for neighbourhood self-selection in 2007.

^a Objective crime counts have been rescaled for interpretability; a one unit increase in crime count represents an additional 100 additional crimes in the previous year.

other (Wen et al., 2006). Our finding that perceptions of crime, but not objective crime, contributes to the relationship between neighbourhood disadvantage and MWB reaffirms arguments that the indicators are weakly correlated (Baranyi et al., 2021) and each indicator likely makes substantively different contributions to the neighbourhood disadvantage—MWB relationship. Objective indicators of crime may reflect the lack of health-influencing structural aspects (i.e., resources and amenities) of the neighbourhood that the residents may not or cannot perceive (Weden et al., 2008) whereas perceptions of crime reflects emotional, behavioural, and cognitive responses to crime and crime risk cues (Hart et al., 2022; Chataway and Hart, 2016; Jackson, 2005), such as media reports of crime (Jahiu and Cinnamon, 2022), physical (Lorenc et al., 2013; Chataway and Hart, 2016; Di Rocco et al., 2023) and social disorder (Kuen et al., 2022), or social disorganisation (i.e., lack of positive social relationships, trust in others and feelings of belonging (Jones et al., 2014)). Therefore, neither indicator should be treated as a substitute for the other. Yet, a complex relationship exists between the indicators. As objective crime is partially a basis for perceptions to form (Weden et al., 2008), objective crime may indirectly affect MWB through partial mediation by perceptions of crime (Lorenc

et al., 2012).

Second, we considered measurement challenges previously associated with objective and perceptions of crime measurement. Current literature highlights the need for greater precision of conceptual and spatial measurement of objective crime (Baranyi et al., 2021). Our study used three distinct types of police-reported crime counts at the sub-neighbourhood level. While the ideal spatial unit for crime measurement (neighbourhood, sub-neighbourhood, or street) to examine relationships with health outcomes is unclear, the street level has been argued to be an important unit because it offers greater enhanced spatial specificity of exposure than the neighbourhood level (Jones and Pride-more, 2018). MWB may be more sensitive to objective crime exposure at the street level than at the neighbourhood level as used for this study, which might explain our lack of finding. Previous studies have tended to use a single item to measure participants' perceptions of crime without reference to a specific geographic location (Hart et al., 2022). Our study used a valid (Cerin et al., 2006) and reliable (Turrell et al., 2011) multi-item indicator of perceptions about crime and safety within a specific geographic location (i.e., the participant's neighbourhood).

Third, neighbourhood self-selection bias was examined to avoid over- or under-estimating the effects of residents' desire to move to their current neighbourhood because they perceived the new neighbourhood offered safety from crime (McCormack and Shiell, 2011) or they relocated to their neighbourhood due to their improving or worsening mental health (van Lenthe et al., 2007; Boderie et al., 2023). Studies rarely adjust for neighbourhood self-selection, and of those that do examine results without, then with, adjustment, the impact of adjustment is often not reported (Lamb et al., 2020). In our study, MWB estimates did not attenuate after adjusting for neighbourhood self-selection, which suggests that neighbourhood self-selection may be inconsequential for studies of the association between crime and MWB or of associations between neighbourhood disadvantage, crime, and MWB, in older populations.

Another important finding of our study is that greater concerns about crime and safety, but not objective crime, is associated with poorer MWB over time. No prior studies concurrently examine both objective crime and perceptions of crime and MWB. However, we can compare our findings to a recent HABITAT cross-sectional study, which found that participants most concerned about crime were more lonely, an aspect of poor MWB (Jamalishahni et al., 2024). The similarity in findings might reflect that perceptions of crime are sensitive to social factors

Table 4

Modelling the association between neighbourhood disadvantage and mental well-being, without and with adjustment for neighbourhood self-selection in 2007, and modelled separately for each objective crime and perceptions of crime indicator, 2009–2016.^a

		Neighbourhood disadvantage				
		β (95% CI)				
		Q1 (Least disadvantaged)	Q2	Q3	Q4	Q5 (Most disadvantaged)
Unadjusted for neighbourhood self-selection						
Model 1: Baseline model ^b	Ref		−0.07 (−0.24, 0.10)	−0.13 (−0.33, 0.07)	−0.24 (−0.45, −0.03)	−0.50 (−0.74, −0.25)
Model 2: Adjusted for crime against the person ^c	Ref		−0.07 (−0.24, 0.09)	−0.14 (−0.34, −0.06)	−0.26 (−0.47, −0.04)	−0.51 (−0.77, −0.26)
Model 3: Adjusted for social incivilities ^d	Ref		−0.07 (−0.24, 0.09)	−0.13 (−0.33, 0.07)	−0.24 (−0.46, −0.27)	−0.49 (−0.75, −0.24)
Model 4: Adjusted for unlawful entry ^e	Ref		−0.07 (−0.24, 0.09)	−0.13 (−0.32, 0.07)	−0.23 (−0.45, −0.18)	−0.48 (−0.73, −0.24)
Model 5: Adjusted for perceptions of crime ^f	Ref		−0.01 (−0.17, 0.16)	−0.01 (−0.20, 0.19)	−0.03 (−0.24, 0.18)	−0.18 (−0.42, 0.07)
Adjusted for neighbourhood self-selection ^g						
Model 6: Baseline model	Ref		−0.05 (−0.22, 0.11)	−0.10 (−0.30, 0.10)	−0.20 (−0.41, 0.01)	−0.43 (−0.70, −0.18)
Model 7: Adjusted for crime against the person	Ref		−0.05 (−0.22, 0.11)	−0.11 (−0.31, 0.09)	−0.22 (−0.44, −0.01)	−0.46 (−0.71, −0.20)
Model 8: Adjusted for social incivilities	Ref		−0.05 (−0.22, 0.11)	−0.10 (−0.30, 0.10)	−0.20 (−0.42, 0.01)	−0.44 (−0.69, −0.19)
Model 9: Adjusted for unlawful entry	Ref		−0.05 (−0.21, 0.10)	−0.09 (−0.29, 0.10)	−0.19 (−0.41, 0.02)	−0.43 (−0.70, −0.18)
Model 10: Adjusted for perceptions of crime	Ref		0.01 (−0.15, 0.17)	0.02 (−0.17, 0.21)	0.00 (−0.21, 0.21)	−0.12 (−0.37, 0.12)

Notes: Boldface indicates statistical significance ($p < 0.05$); A negative beta coefficient represents the estimated decrease in mean MWB score for a one-unit increase in objective crime counts; Q1: Quartile 1 denotes the 20 % least disadvantaged areas in Brisbane; Q5: Quartile 5 denotes the 20 % most disadvantaged areas in Brisbane; Ref: Reference category.

^a Objective crime counts have been rescaled for interpretability; a one unit increase in crime count represents an additional 100 additional crimes in the study year.

^b Model 1, baseline model: neighbourhood disadvantage and mental well-being, adjusted for age, gender, education, occupation, and household income.

^c Model 2: Model 1, additionally adjusted for crime against the person.

^d Model 3: Model 1, additionally adjusted for social incivilities.

^e Model 4: Model 1, additionally adjusted for unlawful entry.

^f Model 5: Model 1, additionally adjusted for perceptions of crime.

^g Models 6–10: Models 1–5, respectively, additionally adjusted for neighbourhood self-selection in 2007.

influencing both loneliness and MWB. In the earlier study, residents of neighbourhoods with the most social incivilities and unlawful entry crimes were lonelier than residents of neighbourhoods with the least crime. Different findings between the two studies may reflect varied methods of analysis. Unlike [Jamalishahni et al. \(2024\)](#), we used continuous indicators of objective crime as categorisation may have distorted a graded effect, and stratification into quintiles (least to most) seemed arbitrary due to the lack of prior literature discussing meaningful categorisation criteria. Other reasons explaining the perceptions of crime—MWB relationship may be determined by the street-level, social criminogenic environment ([Kuen et al., 2022](#)). Street-level exposures are more proximal to an individual's perceptions than the neighbourhood-level, thus a more likely source of crime risk cues. In turn, perceptions of crime are more strongly related to MWB than objective indicators ([Weden et al., 2008](#)), possibly through compromised social functioning (i.e., avoidance behaviour, lack of sense of belonging to the community) ([Cornaglia et al., 2014](#)). Findings of several cross-sectional studies that examined perceptions of crime indicate an association between greater concerns about crime and safety and poorer MWB ([Gale et al., 2014](#); [Toma et al., 2015](#)). Longitudinal evidence supports these findings by showing that a reduction in concerns about neighbourhood characteristics over a 4-year period slows declines in MWB ([Webb et al., 2011](#)).

This study has several strengths. We used a multi-level, longitudinal design to understand the link between neighbourhood-level disadvantage and individual-level MWB, and the contributions of multiple indicators of crime, neighbourhood self-selection, and time varying covariates. Several limitations need to be acknowledged. Our findings may not be generalisable to populations of younger or older age groups, or places with less or more crime on average. The effect of perceptions of

crime may be overestimated due to same-source bias from correlated measurement error resulting from participants' self-reporting both perceptions of crime and MWB in the same study ([Diez Roux, 2007](#); [Chum et al., 2019](#)). The effect of objective crime may be underestimated from underreporting of offenses, especially in disadvantaged neighbourhoods ([Queensland Treasury, 2021](#)). Additionally, the study-defined geographic scale used to aggregate crime incidents may not reflect a participant's self-defined neighbourhood ([Diez Roux, 2007](#)), nor does it reflect the non-uniform spatial distribution of neighbourhood crime (i.e., crime theory posits that 80% of crime is concentrated at the street level ([Jones and Pridemore, 2018](#))).

Future research could consider the separate and simultaneous contribution of neighbourhood social and physical criminogenic features mediating the relationship between neighbourhood disadvantage, neighbourhood crime, and MWB. Furthermore, to support standardising methods to enable meta-analysis of the impact of crime on mental health, future studies should include both objective crime and perceptions of crime indicators. Also, perceptions could be aggregated by adding an independent neighbourhood-level indicator to reduce same-source bias ([Chum et al., 2019](#)). To better understand if crime spatial specificity matters to MWB, associations between objective crime using geocoded crime data at the neighbourhood, sub-neighbourhood, and street levels and MWB could be compared. This would also help guide researchers to recognise if objective crime—MWB associations are being over- or under-estimated. Perceptions of crime indicators could be adapted to include crime types and personal emotions that capture *frequency* with which neighbourhood residents are fearful of crime and the *intensity* with which these emotions are felt, in addition to cognitive judgements ([Hale, 1996](#); [Hart et al., 2022](#)). Advancing action on neighbourhood crime requires a health-in-all-policies approach

buttressed with multi-level interventions and practices. Given that the impact of objective crime on MWB is likely mediated by perceptions of crime (Baranyi et al., 2021; Lorenc et al., 2012; Pak and Gannon, 2023), both macro-level policies targeting socioeconomic determinants of crime (Jones and Pridemore, 2018; Lorenc et al., 2012) and community-based prevention interventions and practices are needed to target both aspects of neighbourhood crime. Community-based interventions may include targeted hot spot policing infused with informal social control (Weisburd et al., 2021) and implementing strategies that aim to increase residents' sense of safety, such as improving infrastructure or creating safer public spaces (i.e., street lighting) (White et al., 2017).

5. Conclusion

Neighbourhood disadvantage *gets into the mind*. We demonstrated that perceptions of crime, but not objective crime contributes to neighbourhood socioeconomic inequities in MWB, over 7 years in mid-to older-aged adults, after accounting for individual-level socioeconomic position and neighbourhood self-selection. This study adds to the understanding of the mechanisms contributing to neighbourhood socioeconomic inequities in MWB and provides justification to further explore the contribution of perceptions of crime and objective crime and their antecedents to inform neighbourhood-level intervention opportunities.

CRedit authorship contribution statement

Emily M. Davis: Writing – review & editing, Writing – original draft, Software, Project administration, Methodology, Funding acquisition, Formal analysis, Conceptualization. **Kristiann C. Heesch:** Writing – review & editing, Supervision. **Jerome N. Rachele:** Writing – review & editing, Supervision. **Nicola W. Burton:** Writing – review & editing, Investigation, Funding acquisition. **Gavin Turrell:** Writing – review & editing, Supervision, Resources, Methodology, Investigation, Funding acquisition, Conceptualization.

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Ethics declaration

This study received ethics approval from the Queensland University of Technology Human Research Ethics Committee (Ref. No. 3967H & 1300000161).

Declaration of competing interest

None to declare.

Data availability

Data will be made available on request.

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