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Neighbourhood characteristics and socioeconomic inequalities in child mental health: Cross-sectional and longitudinal findings from the Growing Up in Ireland study

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ABSTRACT

This study examined the role of neighbourhood characteristics in explaining socioeconomic inequalities in child mental health (the total difficulties score from the Strengths and Difficulties Questionnaire) using data from Cohort '08 of Growing Up in Ireland Waves 3 (age 5; baseline) and 5 (age 9; follow-up). Twenty neighbourhood items were grouped into neighbourhood safety, built environments, cohesion, interaction, and disorder. Data were analysed using regression, single and multiple mediation, and network psychometric analyses. We found that neighbourhood safety, cohesion, interaction, and disorder were associated with child mental health. These four domains separately (by up to 18 %) or in concert (by up to 23 %) partially explained socioeconomic inequalities in child mental health. Built environments may explain socioeconomic inequalities in mental health in urban children only. Findings from network analysis indicated that specific concerns over "people being drunk or taking drugs in public" and "this is a safe neighbourhood" had the strongest connections with child mental health. Improving neighbourhood characteristics may be important to reduce socioeconomic inequalities in child mental health in Ireland.

1. Introduction

The School Children Mental Health Europe study, a cross-sectional study of school-going children aged 6–11 years in Europe, indicated that 13% of children had a probable mental health disorder. This was measured using the Strength and Difficulties Questionnaire (SDQ), which is commonly used to screen mental health problems in children aged 2–17 years (Kovess-Masfety et al., 2016). The prevalence of elevated SDQ scores in Ireland was 7% in children aged 9 years old based on data from the Growing Up in Ireland Study, with children from the lowest family income quintiles affected the most compared to the highest (12% vs. 4%) (Lynch et al., 2023; Williams et al., 2009). Socioeconomic inequalities in child mental health problems, whereby children of lower family socioeconomic status (SES) are more likely to have worse mental health outcomes compared to those of higher socioeconomic status, are evident and widely reported (Reiss, 2013). Mental health problems that disproportionally affect children from lower SES may compound this disadvantage given that childhood mental health problems often persist into later life (Mulraney et al., 2021; Supke et al., 2021) and are followed by subsequent adverse impacts (e.g., negative financial and health outcomes, and increased risk of mortality) (Copeland et al., 2015; Egan et al., 2015; Ploubidis et al., 2021). In line with this, socioeconomic inequalities in mental health problems in childhood may contribute to wider disparities in morbidity and mortality in adulthood (Cohen et al., 2010; Warren, 2016). Therefore, reducing socioeconomic inequalities in mental health problems in childhood may prevent adverse future health impacts and improve the socioeconomic gradient in adult health. Understanding pathways of how socioeconomic disadvantage leads to child mental health problems will be key to targeted public health intervention and reducing socioeconomic inequalities in health.

There are some studies that provide evidence on the factors which play a role in how socioeconomic circumstances may shape child mental health and well-being, including through maternal mental health (de Laat et al., 2018; Lai et al., 2020; Rutherford et al., 2019), perinatal factors (e.g., smoking or alcohol use during pregnancy, gestational age,

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birth weight) (Lai et al., 2020; Straatmann et al., 2019), and stressful life events (e.g., parental mental illness, financial crisis) (Reiss et al., 2019). Social and physical contexts of neighbourhoods are also thought to contribute to the development of socioeconomic inequalities in child mental health. This notion is supported by evidence that children from disadvantaged SES may reside in neighbourhoods with low-quality built environments (e.g., lack of green space) and other unfavourable conditions (e.g., less safety) (Putra et al., 2021, 2022). Inequality in neighbourhood built environments (e.g., green space quality) has been reported (Hoffimann et al., 2017) and this may further contribute to SES-based inequalities in health (Gordon-Larsen et al., 2006). There is strong evidence that neighbourhoods with more favourable environments are associated with better child mental health outcomes. For instance, a study from the US using data from the Adolescent Brain Cognitive Development (ABCD) study found that a higher average score of neighbourhood safety reported by caregivers was associated with a lower score of internalising symptoms in children (β = - 0.91) (Assari, 2021). Furthermore, neighbourhoods with favourable built environments (e.g., more green space) (Franklin et al., 2020; McCormick, 2017), higher cohesion or trust (Butler et al., 2012; Dahal et al., 2018; Eijgermans et al., 2022), and lower social disorder (Sim and Georgiades, 2022) are also associated with better child mental health and well-being. In addition, neighbourhood characteristics, including safety (Cho, 2023), built environments (e.g., green space) (Feng and Astell-Burt, 2017), and social disorder (Sim and Georgiades, 2022) have been reported to be consistently associated with different child mental health symptoms, such as both internalising and externalising symptoms. Taking all this together, neighbourhood characteristics may play an important, but yet to be fully investigated, role in the development of socioeconomic inequalities in child mental health.

To date, there is a dearth of evidence on the extent to which a wide range of neighbourhood characteristics may in part explain socioeconomic inequalities in child mental health. Previous studies mostly examined neighbourhood characteristics (e.g., built environments) as an effect modifier of the association between SES and health (Andersen et al., 2022; Rigolon et al., 2021), and did not explore their relative contributions to the development of socioeconomic inequalities in health. One previous study, using nationally representative data from a UK birth cohort, found that caregiver-reported neighbourhood problems and safety explained 17% of the association between family SES and socioemotional behavioural problems at age 14 (Straatmann et al., 2019). However, a range of other relevant neighbourhood characteristics, such as built environments, safety, cohesion, interaction, and disorder are yet to be tested. Therefore, in this present study, our main aim was to examine the role of diverse neighbourhood characteristics in explaining socioeconomic inequalities in child mental health using data from a nationally representative cohort study, Growing Up in Ireland. We hypothesised that characteristics of neighbourhoods would explain socioeconomic differences in child mental health assessed using the total difficulties score (TDS) from the SDQ. Building on this, our secondary aim, after having confirmed the importance of neighbourhoods in explaining SES inequalities in child mental, was to explore the relationships between neighbourhood characteristic items and childhood mental health (two subscales from TDS) using network psychometric analysis. This statistical approach has been widely used in psychology to create network models of the connections between items, both within and across different psychometric assessments (Jones et al., 2021; McInerney et al., 2022). Network analysis allows for the measures of strength (i.e., how strongly connected an item is to others within a network of items) (Epskamp et al., 2018), and bridge strength (i.e., how strongly connected an item is to items of another psychological concept) (Jones et al., 2021). In this study, we used network psychometric analysis to model a network of neighbourhood characteristic items and identify the neighbourhood characteristic items highest in strength and bridge strength (i.e., strongest connections to child mental health).

2. Materials and methods

2.1. Study design and sample

This study uses data from Cohort '08 (formerly the Infant Cohort) of the Growing Up in Ireland (GUI) study, the first nationally representative longitudinal study of children in Ireland. The data collection for this cohort commenced in 2008–2009 (Wave 1) by recruiting 11,134 children aged 9 months born between December 1, 2007 and 30th June 2008 and their families. Children were sampled from the Child Benefit Register, an administrative database with a comprehensive up-to-date listing of eligible children. A systematic probability sampling procedure, taking into account stratifications by county, nationality of the payee, caregiver marital status, and the number of children in the claim, was used to select the children (Quail et al., 2011). Biennial follow-up interviews have been conducted at age 3 years (Wave 2), 5 years (Wave 3), 7/8 years (Wave 4), and 9 years (Wave 5). Primary caregivers (i.e., a person in the family who provided most care to the child; >95% were mothers) mostly supplied the information collected through home-based fieldwork. From Wave 3, the fieldwork also took place at the children's school (Murray et al., 2015). The Research Ethics Committee convened by the Department of Health and Children provided ethical approval for GUI. Written informed consent for the study children was obtained from caregivers.

For the present study, we used data from Wave 3 (5 years of age) as the baseline due to a wide range of newly available information on caregiver-perceived neighbourhood characteristics (e.g., safety, cohesion), described below. Wave 5 (9 years of age) was selected as the follow-up because of home-based fieldwork implemented in this wave, resulting in more children from Wave 3 being retained compared to Wave 4 (7/8 years) where caregivers completed only a brief postal questionnaire (McNamara et al., 2018; Quail et al., 2019). Previous work using GUI data indicated a slight increase in the prevalence of elevated TDS (cut off +17 out of 40) from 6% to 8% between ages 5 and 9, and socioeconomic inequalities in child mental health were also observed in this period (Swift et al., 2021). This period, at the age of 5–9, also coincides with children's transition into primary schooling in Ireland, as children can begin primary school from age 4 and must have begun their formal education by the age of 6. A previous analysis using GUI data revealed that approximately 50% of children aged 5 years engage in outdoor activities, such as playing chase, biking, or playing ball, on a daily basis (Egan and Pope, 2019). Children in Ireland usually attend their local school (the average distance to primary school is 1.5 km) (Central Statistics Office, 2019) and neighbourhood environments (e.g., safety, public transport, sidewalk) also may influence how children commute to school. In a survey of Irish children aged 10–17 years, 25% of them walked to school, 3% cycled, 25% used public transportation, and 46% commuted by private vehicle (Költő et al., 2021).

Out of 9001 participants at Wave 3, we restricted our sample to those children whose teachers also completed information on a measure of child mental health (TDS) (628 participants (7%) whose teachers did not complete questionnaires were excluded). The maximum analytical sample size for the cross-sectional analysis of Wave 3 was $n = 8373$. For the longitudinal analyses predicting child mental health at Wave 5 based on sociodemographic status and neighbourhood characteristics at Wave 3 (4-year follow-up period), we limited the sample to children whose 1) baseline and follow-up data were available, and 2) caregivers reported that they lived in the same neighbourhood for at least four years to allow for the longitudinal impact of neighbourhood characteristics across the follow-up period (720 participants did not live in the same neighbourhood for the follow-up duration). There were $n = 6349$ children eligible for the longitudinal analysis.

2.2. Independent variables: socioeconomic status

Three indicators of socioeconomic status (SES) were used in this

study, consisting of caregiver education, occupation, and household income. The highest reported education level by caregivers was classified into primary (lower secondary level or less; 11 years of education or less excluding two preschool years), secondary (upper secondary level, technical or vocational level; 13–16 years of education), and tertiary education (diploma and degree qualification level; 18 years of education or more) (e.g., as in McCrory et al. (2017)). Occupational status was classified using the Irish Central Statistics (CSO) Standard Classification of Occupations to indicate household social classes (Keane et al., 2012; Murray et al., 2015). Five occupational groups (OGs) (OG1: professional managers; OG2: managerial and technical; OG3: non-manual; OG4: skilled manual; OG5: semi-skilled, unskilled, unclassified) were used (e.g., as in Walsh and Cullinan (2015)). For both education and occupation, the highest group or class was selected for families with two caregivers (main caregiver and partner) from different groups or classes. Disposable household income was weighted by household size and composition to generate household equivalised income (Murray et al., 2015). Following previous work (Keane et al., 2012; Walsh and Cullinan, 2015), we used the quintiles equivalised household income (Q1: the lowest to Q5: the highest) available in the dataset as an SES indicator.

2.3. Dependent variable: child mental health

In both Waves 3 and 5, child mental health was assessed using the SDQ (Goodman, 1997). The SDQ is a common tool to screen for mental health problems in childhood and has been widely considered a validated measure in multicultural settings (Croft et al., 2015; Goodman and Goodman, 2009; Hall et al., 2019). The SDQ consists of five domains: emotional symptoms, conduct problems, peer problems, hyperactivity, and prosocial behaviour. Each domain has five items (e.g., "Many worries, often seems worried", "Often fights with other children or bullies them") with a 3-point Likert scale (0 = "not true", 1 = "somewhat true", 2 = "certainly true"; scores are reverse coded for the prosocial behaviour). TDS was calculated by adding together four deficit-focused domains (emotional symptoms, conduct problems, peer problems, hyperactivity), resulting in a total score ranging from 0 to 40 with a higher score indicating more negative or worse outcome (e.g., as in Reynolds et al. (2014)). For the main analysis, we decided to examine overall TDS instead of separating out its two subscales as internalising (emotional symptoms, peer problems) and externalising symptoms (conduct problems, hyperactivity) because TDS was found to be a valid tool to identify psychosocial problems in children (Crone et al., 2008; Theunissen et al., 2013) and has been used to assess mental health problems in children and adolescents (Ahmad et al., 2022; Kovess-Masfety et al., 2016; Lynch et al., 2023). Following a previous approach (de Laat et al., 2018; Robinson et al., 2020), we averaged primary caregiver- and teacher-reported TDS to account for possible same-source bias due to the reliance on only one reporter.

2.4. Candidate mediators: neighbourhood characteristics

Primary caregivers were asked 20 items about their perceptions of the neighbourhood they lived in. Some of the items were previously used in different study contexts to assess the associations between neighbourhoods and children's health and behaviour (Kingsbury et al., 2015; McEvoy et al., 2022; Putra et al., 2022). To reduce the number of analyses, we used exploratory factor analysis (EFA) to identify if a collection of neighbourhood items formed an underlying latent construct. Findings showed that more than one factor had Eigenvalue >1.0, indicating that all the items cannot be combined into a single factor. We developed five neighbourhood domains in which items were combined into the same domain if they were theoretically meaningful and loaded into a single factor (the item had a factor loading ≥0.55) (Cleare et al., 2018): safety (e.g., "This is a safe neighbourhood."), built environments (e.g., "There are good parks, playgrounds and play spaces."), cohesion (e.g., "You feel a strong sense of identity with your neighbourhood."), social interactions (e.g., "Visit each other's houses."), and disorder (e.g., "People being drunk or taking drugs in public."). Caregivers' responses were re-coded to indicate better or favourable neighbourhood conditions by a higher value. The items that formed the same domain were then added together. For the analysis, we transformed the total scores of neighbourhood domains into z-scores to allow comparison across different metrics. Table S1 presents how neighbourhood domains were determined.

2.5. Covariates

All the associations were adjusted for covariates, including the study child's sex (male, female), language spoken by the child at home which could be considered as a proxy of ethnicity (Irish/English, other), whether children had siblings (yes, no), family type (one-caregiver, two-caregiver families), and residential location (rural, urban) as were informed by previous studies (Keane et al., 2012; Putra et al., 2022).

2.6. Data analysis

2.6.1. Main analysis

We incorporated baseline sample weights in the analysis to account for non-response characteristics (see Quail et al. (2019)). We presented weighted percentages for categorical variables, and weighted means and standard deviations for continuous variables. Linear regression models were used to examine cross-sectional and longitudinal associations between each SES indicator, in separate analyses, and TDS at Waves 3 and 5, controlling for covariates including child's sex, language spoken at home, having siblings, family type, and residential location. To examine whether SES indicators predicted longitudinal changes in TDS over time, we used a similar approach as above, predicting follow-up TDS by controlling baseline TDS (e.g., as in Robinson et al. (2020)). Following a previous study (Demakakos et al., 2016), we did not control other SES indicators when examining an association between an SES indicator and child mental health to avoid over-adjustment due to the correlation between SES indicators. In addition, SES indicators, such as occupation and income may be a mediator for the pathways from caregiver education to mental health (e.g., as in Katikireddi et al. (2016)). Furthermore, we developed regression models to examine the extent to which neighbourhood characteristics were associated with child mental health. We controlled all the SES indicators and covariates to assess the associations between neighbourhood characteristics and child mental health.

Following evidence of the association between an SES indicator and child mental health, mediation analysis by each neighbourhood domain was conducted for that association. The Karlson-Holm-Breen (KHB) method available in STATA was used to conduct mediation analysis (Kohler et al., 2011). This method allows categorical independent variables with more than two categories to be fitted and supports multiple mediation models. First, we conducted single mediation models by fitting each neighbourhood domain separately. Multiple mediation models were produced if we found evidence of more than one neighbourhood domains mediating the associations in single mediation models. Similar to the previous approach, covariates were controlled in mediation analyses.

In this study, the proportion of missing observations from eligible participants for cross-sectional analysis was 8%. We conducted a complete-case analysis (listwise deletion) for cross-sectional analysis as less than 10% missingness is less likely to yield biased estimates (Bennett, 2001; Dong and Peng, 2013). However, for longitudinal analysis, the proportion of missingness was 14% from eligible participants. In addition to complete-case analysis, we also conducted additional analysis in which an inverse probability weighting (IPW) approach (Chesnaye et al., 2022; Mansournia and Altman, 2016) was used to address missing observations for longitudinal analysis. We also used IPW to minimise selection bias by taking into account differences in

characteristics of participants being included in the longitudinal analysis. Children who were female, spoke English or Irish at home, had siblings, lived with two caregivers, were from rural areas, and from higher family SES (e.g., caregivers completed secondary or tertiary education, worked in professional and managerial/technical sectors, and from higher household quintile groups) were more likely to be retained in the longitudinal analysis. We estimated the probability of having complete observations for longitudinal analysis based on baseline sociodemographic variables. New weights were then calculated as the inverse probability of retention. These weights were also combined with baseline sample weights to accurately account for differences in missingness and baseline non-response characteristics.

2.6.2. Additional analysis

As current evidence indicates rural-urban differences in the associations between neighbourhood environments and health (Browning et al., 2022; Fan et al., 2017), we examined the role of residential location (urban vs. rural) as a potential moderating variable. A two-way interaction term between neighbourhood domain and residential location (urban vs. rural) was fitted into separate regression models. If we found a statistically significant interaction between neighbourhood domain and residential location, we further conducted stratified analysis to explore in which residential location (urban or rural) that neighbourhood domain was strongly associated with child mental health. Following evidence of the aforementioned association in subsample analysis, we conducted moderated or stratified mediation analysis for that neighbourhood domain. We set $p < 0.01$ for these additional analyses to account for multiple testing.

To identify the most central neighbourhood items associated with child mental health at Waves 3 and 5, we used network analysis (Epskamp et al., 2018; Epskamp and Fried, 2018; Jones et al., 2021; McInerney et al., 2022) (See supplementary materials). First, a network of neighbourhood items (20 items) was modelled. In this network, the network index of strength (i.e., the sum of absolute positive and negative connections with a higher value indicating the more highly connected an item is to the others) was examined (Epskamp et al., 2018; Epskamp and Fried, 2018). Further two networks were modelled (one for baseline and one for follow-up child mental health), combining both neighbourhood characteristic items and the two subscales of TDS. Here we explored potential bridge symptoms (i.e., neighbourhood characteristic items with the strongest connections to TDS subscales) using the index of bridge strength. We fitted two main subscales of TDS: internalising (sum of emotional symptoms and peer problems) and externalising subscales (sum of conduct problems and hyperactivity) instead of overall TDS because we used network analysis to identify individual items of neighbourhood characteristics and components (subscales) of TDS that can be conceptually defined as a bridge between both constructs. Supplementary materials provide detailed information on network analysis and how this was conducted in R Studio.

3. Results

3.1. Characteristics of participants

Table 1 presents the sociodemographic characteristics of children at 5 years old (Wave 3). Balanced proportions of boys and girls and between those residing in urban and rural areas were included in this study. Most children spoke English or Irish at home, had at least one sibling, and came from two-caregiver family homes. More than half of caregivers completed tertiary education and around one-third worked in the managerial and technical sector. Children and their families were equally distributed to household income groups. On average, primary caregivers perceived favourable neighbourhood conditions as average scores of all the neighbourhood domains were higher than 50% of their respective possible total scores. Follow-up TDS was slightly lower than baseline TDS.

Table 1
Baseline sociodemographic, neighbourhood characteristics, and child mental health.

Variables	n (%)	Mean (SD)
Sociodemographic characteristics		
Child's sex	8373	
Female	4151 (48.89)	
Male	4222 (51.11)	
Child's language spoken at home	8368	
Other	795 (7.36)	
English/Irish	7573 (92.64)	
Having siblings	8373	
No	928 (11.53)	
Yes	7445 (88.47)	
Family type	8373	
One-caregiver family	1001 (13.65)	
Two-caregiver family	7372 (86.35)	
Caregiver education	8364	
Primary	403 (7.50)	
Secondary	2119 (29.93)	
Tertiary	5842 (62.57)	
Caregiver occupation	8373	
OG1: professional managers	1496 (13.45)	
OG2: managerial and technical	2791 (33.67)	
OG3: non-manual	1394 (17.65)	
OG4: skilled manual	1133 (15.10)	
OG5: semi-skilled, unskilled, unclassified	1559 (20.12)	
Household income	7989	
Q1 (lowest)	1447 (19.35)	
Q2	1510 (20.28)	
Q3	1587 (20.07)	
Q4	1659 (20.08)	
Q5 (highest)	1786 (20.22)	
Residential location	8347	
Rural	5027 (58.90)	
Urban	3320 (41.10)	
Neighbourhood characteristics		
Neighbourhood safety *(a possible range of 1 to 12)*	8354	9.48 (1.66)
Neighbourhood built environments *(a possible range of 1 to 20)*	8337	14.77 (3.41)
Neighbourhood cohesion *(a possible range of 1 to 20)*	8153	16.12 (2.52)
Neighbourhood social interactions *(a possible range of 1 to 9)*	8346	6.55 (1.74)
Neighbourhood disorder *(a possible range of 1 to 16)*	8355	13.19 (2.47)
Child mental health		
TDS at Wave 3 *(a possible range of 0 to 40)*	8352	6.81 (4.22)
TDS at Wave 5 *(a possible range of 0 to 40)*	5860	6.42 (4.72)

n = number of analytical sample size for each variable; % = weighted percentage; SD = standard deviation; OG = occupation group; Q = quintile; TDS = total difficulties score.

Higher scores indicated favourable neighbourhood characteristics (higher or better neighbourhood safety, built environments, cohesion, social interactions, and lower disorder).

3.2. Socioeconomic status, neighbourhood characteristics, and child mental health

Table 2 provides evidence of socioeconomic inequalities in baseline and follow-up child mental health outcomes. Lower family SES was associated with worse child mental health (i.e., higher TDS). SES-based inequalities in longitudinal changes in TDS across four years were also apparent. However, baseline, follow-up, and changes in TDS were not statistically different between children whose caregivers were managerial and technical workers vs. professional managers, and between those from Q4 vs. Q5 household income groups. No differences in follow-up and changes in TDS were also observed between children from Q3 vs. Q5 household income groups. In addition, changes in TDS of children whose caregivers completed secondary vs. tertiary education and worked as non-manual workers vs. professional managers were not statistically different. We also found evidence of socioeconomic inequalities in most of the neighbourhood domains across different SES indicators (Tables S2 and S3). Children from lower SES tended to reside in neighbourhoods with lower neighbourhood safety, cohesion, social interactions, and higher disorder. However, a socioeconomic gradient in the built environments domain was not clear and showed some complexity (e.g., caregivers who completed primary school education had the highest, and those who were from middle groups for occupation and income had the lowest built environment scores).

Table 2
Cross-sectional and longitudinal associations between SES and child mental health.

Variables	TDS at Wave 3[a] (n = 7949)		TDS at Wave 5[a] (n = 5601)		Changes in TDS[b] (n = 5601)	
	β	95 % CI	β	95 % CI	β	95 % CI
Caregiver education (ref: Tertiary)						
Primary	1.98	1.40, 2.57***	1.96	1.14, 2.78***	0.77	0.09, 1.44*
Secondary	1.04	0.78, 1.29***	0.90	0.54, 1.26***	0.21	−0.07, 0.49
Caregiver occupation (ref: OG1: professional managers)						
OG2: managerial and technical	0.09	−0.19, 0.38	0.22	−0.12, 0.56	0.16	−0.13, 0.44
OG3: non-manual	0.53	0.18, 0.87**	0.77	0.31, 1.22**	0.37	−0.01, 0.75
OG4: skilled manual	1.21	0.82, 1.61***	1.63	1.10, 2.15***	0.81	0.40, 1.22***
OG5: semi-skilled/ unskilled/ unclassified	1.57	1.17, 1.96***	1.86	1.31, 2.40***	0.88	0.45, 1.31***
Household income (ref: Q5)						
Q1	1.53	1.15, 1.90***	1.70	1.19, 2.20***	0.65	0.24, 1.06**
Q2	1.21	0.87, 1.56***	1.33	0.85, 1.81***	0.57	0.19, 0.95**
Q3	0.63	0.31, 0.95***	0.43	−0.01, 0.86	0.07	−0.29, 0.42
Q4	0.29	−0.02, 0.60	0.05	−0.34, 0.44	−0.07	−0.39, 0.25

*p < 0.05; **p < 0.01; ***p < 0.001.
β = regression coefficient; CI = confidence interval; ref = reference group; OG = occupation group; Q = quintile; TDS = total difficulties score.
[a] Separate regression models were developed for three SES indicators (caregiver education, occupation, household income), adjusting for child's sex, language spoken at home, having siblings, family type, and residential location.
[b] Separate regression models were developed for three SES indicators (caregiver education, occupation, household income) predicting follow-up TDS, adjusting for baseline TDS, child's sex, language spoken at home, having siblings, family type, and residential location.

Based on Table 3, favourable conditions of neighbourhood domains were associated with better child mental health (i.e., lower TDS) at baseline and follow-up, except for neighbourhood built environments. However, the aforementioned associations attenuated when changes in TDS were fitted as the outcome, with only neighbourhood safety, cohesion, and disorder associated with changes in TDS at $p < 0.05$. Intriguingly, we found an interaction between neighbourhood built environments and residential location in predicting baseline TDS ($p < 0.01$) (Table S4). Children living in urban areas tended to benefit more from living in neighbourhood with favourable built environments in respect of their mental health at baseline ($p < 0.01$) (Table S5).

3.3. Findings from mediation analyses

Single mediation models were developed if we found statistically significant associations between SES and TDS (Table 4). All neighbourhood domains except for neighbourhood built environments explained socioeconomic differences in baseline and follow-up TDS, but not longitudinal changes in TDS. Neighbourhood safety explained a small part (3%–5%) of differences in baseline TDS only based on caregiver education and household income. Neighbourhood cohesion explained 3%–7% of the associations between SES indicators and baseline and follow-up TDS. In addition, 3%–6% of the associations between SES indicators and TDS at baseline and follow-up were explained by neighbourhood social interactions. Neighbourhood disorder domain was the strongest mediator which explained socioeconomic inequalities in baseline and follow-up child mental health by 10 %–18 %. While neighbourhood built environments did not significantly explain socioeconomic inequalities in the full-sample analysis, this neighbourhood domain partly explained the cross-sectional association between SES indicators and mental health in children living in urban areas by 5 %–11 % ($p < 0.05$) (Table S6).

As we found four neighbourhood domains (safety, cohesion, social interaction, disorder) explained to some degree socioeconomic inequalities in baseline and/or follow-up child mental health in the full-sample analysis, we developed multiple mediation models by including these four domains together (Table 5). These four neighbourhood domains in concert explained socioeconomic inequalities in baseline and follow-up child mental health by 12%–23%. As the neighbourhood built environments domain was not a significant mediator in single mediation models of the full-sample analysis, adding this domain into above multiple mediation models did not change the interpretation of the results (*findings are not presented)*. Moreover, we found consistent findings when IPW was used to address missing observations and minimise selection bias for longitudinal analysis (Tables S7–S9).

3.4. Findings from network analysis

Fig. 1 presents a network model of 20 neighbourhood items. Blue (solid) edges indicate positive relationships and red (dashed) edges denote negative relationships. The thicker the edges are, the stronger the relationships between the nodes (i.e., variables) are. The centrality index of node strength represents the sum of absolute positive and negative connections, with a higher value indicating the more highly connected a node or item is to the others. Based on node strength, neighbourhood trust (N10), people are willing to help their neighbours (N9), and vandalism and deliberate damage to property (N19) were the items highest in node strength in the network, meaning they had the most connections with other neighbourhood items. The bootstrapped CIs for estimated edge-weights were wide and overlapping, indicating the order of edge weights should be interpreted with caution. Node strength was highly stable as correlation-stability (CS) coefficient (CS [cor = 0.7]) was 0.75.

Fig. 2 provides the interplay between neighbourhood items and

Table 3
Associations between neighbourhood characteristics and child mental health.

Variables	TDS at Wave 3[a]			TDS at Wave 5[a]			Changes in TDS[b]		
	n	β	95 % CI	n	β	95 % CI	n	β	95 % CI
Neighbourhood safety	7937	−0.39	−0.51, −0.27***	5597	−0.41	−0.55, −0.26***	5597	−0.13	−0.25, −0.01*
Neighbourhood built environments	7925	−0.10	−0.22, 0.01	5585	−0.07	−0.22, 0.08	5585	−0.03	−0.16, 0.09
Neighbourhood cohesion	7752	−0.37	−0.49, −0.25***	5496	−0.37	−0.52, −0.22***	5496	−0.14	−0.27, −0.02*
Neighbourhood social interactions	7930	−0.34	−0.45, −0.22***	5596	−0.25	−0.40, −0.10**	5596	−0.02	−0.15, 0.10
Neighbourhood disorder	7937	−0.56	−0.68, −0.44***	5595	−0.56	−0.72, −0.40***	5595	−0.16	−0.29, −0.02*

*p < 0.05; **p < 0.01; ***p < 0.001.
β = regression coefficient; CI = confidence interval; TDS = total difficulties score.
[a] Separate regression models were developed for five neighbourhood domains, adjusting for child's sex, language spoken at home, having siblings, family type, residential location, caregiver education, caregiver occupation, and household income.
[b] Separate regression models were developed for five neighbourhood domains predicting follow-up TDS, adjusting for baseline TDS, child's sex, language spoken at home, having siblings, family type, residential location, caregiver education, caregiver occupation, and household income.

baseline (a) and follow-up (b) TDS subscales along with bridge strength (i.e., the sum of absolute edge weights that exist between a subscale and a group of neighbourhood items or between a neighbourhood item and TDS subscales). A higher bridge strength for internalising subscale suggests that this subscale had more connections with neighbourhood items than externalising subscale. Perceptions of people being drunk or taking drugs in public (N20) and having a safe neighbourhood (N1) had the highest bridge strengths among neighbourhood items, indicating that these neighbourhood items had the strongest connections with TDS subscales and may conceptually act as bridges between neighbourhood characteristics and TDS. The bootstrapped CIs for estimated edge-weights for baseline and follow-up TDS analyses were also large and overlapping. CS coefficient (CS[cor = 0.7]) for node strength across analyses was 0.75.

4. Discussion

In the present study we observed socioeconomic inequalities in child mental health problems in Ireland. Better neighbourhood conditions (more safety, cohesion, social interactions, and lower disorder) were associated with lower baseline and follow-up child mental health problems. Neighbourhood with more safety, cohesion, and lower disorder were also associated with longitudinal decrease in child mental health problems between baseline and follow-up. Notably, favourable neighbourhood built environments were mainly associated with baseline mental health in children living in urban areas. Findings from single mediation models indicated four neighbourhood domains (safety, cohesion, social interactions, and disorder) may partly explain the associations between SES and baseline and follow-up mental health. These four neighbourhood domains in concert explained the association between SES and baseline and follow-up mental health by 12%–23%. However, neighbourhood domains did not explain socioeconomic inequalities in longitudinal changes in mental health from baseline to follow-up. Having confirmed neighbourhood domains may play an important role in explaining socioeconomic inequalities in child mental health, network analysis was used to better understand the most central neighbourhood items associated with different aspects of child mental health using two subscales of TDS: internalising and externalising subscales. Across 20 individual neighbourhood items tested in network analysis, items "people being drunk or taking drugs in public" and "this is a safe neighbourhood" had the strongest connections with TDS subscales.

Individuals with lower SES may have restricted ability to move into affluent neighbourhoods and may also tend to move into disadvantaged neighbourhoods with low quality environments when their current neighbourhoods experience gentrification (Fransham, 2020; Qiang et al., 2021). Therefore, children from lower family SES are more likely to reside in less affluent neighbourhoods. For example, disadvantaged neighbourhoods in Ireland are characterised by a higher proportion of children from families at risk of poverty (i.e., equivalised household income at or below 60% of the median income) and with material deprivation (i.e., inadequate material living standard) (Department of Children and Youth Affairs, 2020). Across different study contexts, disadvantaged neighbourhoods are more likely to be presented with lower quality neighbourhood built environments (Putra et al., 2022), more safety concerns (Jakobsen et al., 2022; Putra et al., 2022), weaker cohesion (Méndez et al., 2021), less social interactions (Jakobsen et al., 2022), and more disorder (Fong et al., 2019). Living in unfavourable neighbourhood conditions associated with lower family SES may further lead to worse mental health outcomes in children.

Findings indicated that perceived neighbourhood disorder was the strongest mediator of the association between SES and child mental health and "people being drunk or taking drugs in public" appeared as the strongest item that may link between neighbourhood cluster and TDS. A previous study in UK adults reported similar findings that drunken behaviour was influential within a network of neighbourhood social environments and mental health (e.g., depressive symptoms, anxiety) (McElroy et al., 2019). Disruptive behaviours in public and other social and physical disorders in the neighbourhood may increase safety concerns among caregivers regarding children's outdoor activities (Molnar et al., 2004; Visser and van Aalst, 2022) that can lead to fewer opportunities for children to interact with peers and develop socio-emotional skills (Herrington and Brussoni, 2015). In line with this, neighbourhood safety partly explained socioeconomic inequalities in child mental health and an item of "this is a safe neighbourhood" also had a strong connection with TDS subscales. Previous studies suggested that both neighbourhood disorder and neighbourhood safety were associated with mental health and well-being in children and adolescents (Miliauskas et al., 2022; Visser et al., 2021). In addition to fewer opportunities for children's outdoor activities as a possible mechanism, living in neighbourhoods with more disorder or less safety for caregivers may increase their psychological distress (Galster, 2012; Roberts et al., 2021) and parenting stress (Lamis et al., 2014), and this may further impact children's mental health (Li et al., 2017).

Other neighbourhood domains, such as neighbourhood cohesion (e.g., trust, belonging) have been shown to benefit mental health in children and adolescents (Breedvelt et al., 2022). Social cohesion is associated with perceived safety (De Jesus et al., 2010). Caregivers who perceive their neighbourhoods as more cohesive may be more likely to allow their older children to engage in less supervised mobile trips that can have benefits on children's health and well-being (Lin et al., 2017). In addition, neighbourhood social interactions (e.g., higher social support, networks, and interactions) reported by caregivers have been found to be associated with better child mental health through improving caregivers' mental health and their relationships with children (Koyama et al., 2020; Yan et al., 2023). Furthermore, the neighbourhood built environments domain was associated with mental health in children living in urban areas. A previous study suggested that living in urban areas is associated with higher psychotic symptoms in children which may be due to lower social cohesion and higher crime (Newbury

Table 4
Single mediation models by neighbourhood characteristics.

Variables	TDS at Wave 3[a]			TDS at Wave 5[a]			Changes in TDS[b]		
	Indirect effect	95 % CI	%	Indirect effect	95 % CI	%	Indirect effect	95 % CI	%
Mediator: Neighbourhood safety	***n* = 7937**			***n* = 5597**			***n* = 5597**		
Caregiver education (ref: Tertiary)									
Primary	0.07	0.01, 0.13*	3.4 %	0.03	−0.05, 0.10		0.00	−0.02, 0.03	
Secondary	0.03	−0.03, 0.08		0.03	−0.05, 0.10		NA		
Caregiver occupation (ref: OG1: professional managers)									
OG3: non-manual	−0.00	−0.07, 0.07		−0.01	−0.09, 0.08		NA		
OG4: skilled manual	0.02	−0.06, 0.09		−0.00	−0.09, 0.08		−0.01	−0.03, 0.02	
OG5: semi-skilled/unskilled/unclassified	0.07	−0.00, 0.14		0.07	−0.02, 0.16		0.02	−0.01, 0.05	
Household income (ref: Q5)									
Q1	0.07	0.00, 0.14*	4.8 %	0.05	−0.03, 0.14		0.01	−0.02, 0.04	
Q2	0.04	−0.03, 0.11		0.02	−0.06, 0.10		0.00	−0.02, 0.03	
Q3	0.01	−0.05, 0.08		NA			NA		
Mediator: Neighbourhood built environments	***n* = 7925**			***n* = 5585**			***n* = 5585**		
Caregiver education (ref: Tertiary)									
Primary	−0.00	−0.02, 0.01		−0.01	−0.03, 0.01		−0.00	−0.02, 0.01	
Secondary	0.01	−0.01, 0.03		0.01	−0.01, 0.03		NA		
Caregiver occupation (ref: OG1: professional managers)									
OG3: non-manual	0.01	−0.01, 0.04		0.01	−0.01, 0.03		NA		
OG4: skilled manual	0.01	−0.01, 0.03		0.01	−0.02, 0.04		0.00	−0.02, 0.02	
OG5: semi-skilled/unskilled/unclassified	0.01	−0.01, 0.04		0.01	−0.01, 0.03		0.00	−0.01, 0.02	
Household income (ref: Q5) rowhead									
Q1	0.02	−0.01, 0.04		0.01	−0.02, 0.04		0.01	−0.02, 0.03	
Q2	0.02	−0.01, 0.04		0.01	−0.02, 0.04		0.01	−0.02, 0.03	
Q3	0.02	−0.01, 0.05		NA			NA		
Mediator: Neighbourhood cohesion	***n* = 7752**			***n* = 5496**			***n* = 5496**		
Caregiver education (ref: Tertiary)									
Primary	0.07	0.01, 0.13*	3.4 %	0.05	−0.03, 0.12		0.01	−0.02, 0.04	
Secondary	0.04	−0.02, 0.10		0.03	−0.05, 0.10		NA		
Caregiver occupation (ref: OG1: professional managers)									
OG3: non-manual	0.00	−0.07, 0.07		0.01	−0.07, 0.08		NA		
OG4: skilled manual	0.01	−0.06, 0.08		0.01	−0.07, 0.09		0.00	−0.03, 0.03	
OG5: semi-skilled/unskilled/unclassified	0.08	0.01, 0.15*	5.2 %	0.08	−0.00, 0.16		0.03	−0.01, 0.06	
Household income (ref: Q5)									
Q1	0.11	0.04, 0.18**	7.3 %	0.10	0.02, 0.18*	6.0 %	0.03	−0.01, 0.07	
Q2	0.07	−0.00, 0.13		0.05	−0.03, 0.13		0.02	−0.02, 0.05	
Q3	0.06	−0.01, 0.12		NA			NA		
Mediator: Neighbourhood social interactions	***n* = 7930**			***n* = 5596**			***n* = 5596**		
Caregiver education (ref: Tertiary)									
Primary	0.07	0.02, 0.13*	3.6 %	0.06	−0.00, 0.12		0.01	−0.02, 0.03	
Secondary	0.06	0.01, 0.12*	5.8 %	0.05	−0.01, 0.10		NA		
Caregiver occupation (ref: OG1: professional managers)									
OG3: non-manual	0.05	−0.02, 0.11		0.04	−0.02, 0.10		NA		
OG4: skilled manual	0.06	−0.00, 0.13		0.05	−0.01, 0.12		0.00	−0.02, 0.03	
OG5: semi-skilled/unskilled/unclassified	0.09	0.02, 0.15*	5.5 %	0.08	0.01, 0.14*	4.1 %	0.01	−0.03, 0.04	
Household income (ref: Q5)									
Q1	0.09	0.02, 0.15*	5.6 %	0.08	0.01, 0.14*	4.4 %	0.01	−0.02, 0.04	
Q2	0.07	0.01, 0.13*	5.6 %	0.05	−0.01, 0.11		0.01	−0.02, 0.03	
Q3	0.05	−0.01, 0.11		NA			NA		
Mediator: Neighbourhood disorder	***n* = 7937**			***n* = 5595**			***n* = 5595**		
Caregiver education (ref: Tertiary)									
Primary	0.26	0.16, 0.37***	13.2 %	0.23	0.10, 0.37**	11.9 %	0.05	−0.00, 0.11	
Secondary	0.11	0.02, 0.21*	10.6 %	0.10	−0.02, 0.23		NA		
Caregiver occupation (ref: OG1: professional managers)									
OG3: non-manual	0.08	−0.02, 0.19		0.09	−0.03, 0.21		NA		
OG4: skilled manual	0.06	−0.05, 0.17		0.03	−0.09, 0.15		0.00	−0.03, 0.03	
OG5: semi-skilled/unskilled/unclassified	0.20	0.09, 0.32**	12.9 %	0.20	0.07, 0.33**	10.7 %	0.05	−0.00, 0.09	
Household income (ref: Q5)									
Q1	0.21	0.10, 0.31***	13.4 %	0.18	0.06, 0.30**	10.6 %	0.04	−0.01, 0.09	
Q2	0.16	0.05, 0.26**	12.8 %	0.14	0.02, 0.26*	10.4 %	0.03	−0.01, 0.07	
Q3	0.11	0.01, 0.21*	17.6 %	NA			NA		

*p < 0.05; **p < 0.01; ***p < 0.001.
CI = confidence interval; ref = reference group; OG = occupation group; Q = quintile; TDS = total difficulties score; NA = not applicable due to no evidence of the association between an SES indicator and child mental health at p < 0.05 (see Table 2).
% = Proportion mediated by each neighbourhood domain was calculated as the indirect effect divided by the total effect. Only mediated proportion for statistically significant indirect effect is presented.
Categories of caregiver occupation (OG2: managerial and technical) and household income (Q4) are not presented due to TDS were not different when compared to the respective reference group (see Table 2).
[a] Separate single mediation models were developed for three SES indicators (caregiver education, occupation, household income), adjusting for child's sex, language spoken at home, having siblings, family type, and residential location.

[b] Separate single mediation models were developed for three SES indicators (caregiver education, occupation, household income) predicting follow-up TDS, adjusting for baseline TDS, child's sex, language spoken at home, having siblings, family type, and residential location.

Table 5
Multiple mediation models by neighbourhood characteristics.

Variables	TDS at Wave 3			TDS at Wave 5		
	Indirect effect	95 % CI	%	Indirect effect	95 % CI	%
Mediators: Neighbourhood safety + cohesion + social interactions + disorder	***n = 7732***			***n = 5488***		
Caregiver education (ref: Tertiary)						
Primary	0.31	0.19, 0.42***	15.7 %	0.25	0.10, 0.39**	12.0 %
Secondary	0.16	0.05, 0.26**	14.8 %	0.13	−0.00, 0.26	
Caregiver occupation (ref: OG1: professional managers)						
OG3: non-manual	0.10	−0.02, 0.23		0.09	−0.05, 0.23	
OG4: skilled manual	0.10	−0.02, 0.22		0.05	−0.08, 0.19	
OG5: semi-skilled/ unskilled/ unclassified	0.27	0.14, 0.40***	17.5 %	0.26	0.11, 0.41**	14.2 %
Household income (ref: Q5)						
Q1	0.28	0.16, 0.41***	18.6 %	0.24	0.10, 0.38**	14.8 %
Q2	0.21	0.08, 0.33**	16.7 %	0.16	0.03, 0.30*	12.5 %
Q3	0.14	0.02, 0.26*	23.4 %	NA		

*p < 0.05; **p < 0.01; ***p < 0.001.
CI = confidence interval; ref = reference group; OG = occupation group; Q = quintile; TDS = total difficulties score; NA = not applicable due to no evidence of the association between an SES indicator and child mental health at p < 0.05 (see Table 2).
% = Proportion mediated by each neighbourhood domain was calculated as as the indirect effect divided by the total effect. Only mediated proportion for statistically significant indirect effect is presented.
Separate multiple mediation models were developed for three SES indicators (caregiver education, occupation, household income), adjusting for child's sex, language spoken at home, having siblings, family type, and residential location. Categories of caregiver occupation (OG2: managerial and technical) and household income (Q4) are not presented due to TDS were not different when compared to the respective reference group (see Table 2).

et al., 2016). The presence of favourable built environments, such as green space may help alleviate chronic stressors and attention demands (Browning et al., 2022), as well as facilitate neighbourhood social cohesion in the urban setting (Wan et al., 2021). In addition, other positive qualities of built environments such as street connectivity and sidewalk presence can promote more opportunities for active transportation and physical activity and support mental health in urban young people (Buttazzoni et al., 2021).

In this present study, we found evidence of mediation by neighbourhood domains for baseline and follow-up TDS, but not for longitudinal changes in TDS. This aligns with other findings for a smaller magnitude for the associations between neighbourhood domains and longitudinal changes in TDS compared to baseline and follow-up TDS. Neighbourhood characteristics are a distal determinant of health (Diez Roux and Mair, 2010) and may less predict changes in TDS compared to individual or family-level factors, and here did not adequately explain socioeconomic inequalities in changes in TDS. In addition, there may be less variability in changes in TDS and/or smaller effect sizes of change. For example, we found some indirect effects of neighbourhood domains for changes in TDS were marginally significant ($p < 0.1$) and therefore future work with larger and more adequately powered sample sizes would now be valuable. It is important to also note that participants may have lived in the same neighbourhood for most of their lives (e.g., significantly longer than the follow-up period of this study). Therefore, neighbourhood characteristics may have causally impacted their baseline TDS as measured in the present study, but beyond this had minimal influence on further change. In this case, baseline TDS may also serve as a mediator when examining the association between baseline neighbourhood characteristics and follow-up TDS (Lydersen and Skovlund, 2021).

Our findings on stronger associations between baseline neighbourhood characteristics and both baseline and follow-up TDS, but not changes in TDS from baseline to follow-up, are of note. This pattern of results may indicate that exposure to favourable neighbourhood conditions in early childhood may have benefits for early childhood mental health that may persist into mid-childhood, but not shape changes in mental health during this period. Given socioeconomic inequalities emerge as early as 5 years old, interventions to improve neighbourhood characteristics in early childhood would be important to buffer the negative effects of growing up in socioeconomic disadvantage. However, future research is warranted to confirm the current findings. In addition, due to weak prospective relationships between neighbourhood characteristics and change in mental health, further research examining evidence for a possible causal relationship between neighbourhood characteristics and child mental health will be valuable.

4.1. Strengths and limitations

This is the first study that comprehensively assessed the contribution of a wide range of neighbourhood characteristics in explaining socioeconomic inequalities in child mental health, cross-sectionally and longitudinally. We used measures of caregiver-reported neighbourhood characteristics that are relevant for young children given their outdoor activities are regulated by caregivers, and perceptions of neighbourhood characteristics reported by caregivers can largely have direct influences on children's access to neighbourhood resources (Kalish et al., 2010; Putra et al., 2021).

The present study has limitations. The longitudinal analysis was restricted to participants who lived in the same neighbourhood for at least four years. Sociodemographic characteristics (e.g., higher family SES) were associated with being included in the longitudinal analysis and this may introduce selection bias. However, we conducted additional analysis using an IPW approach to minimise this bias by creating new sample weights as the inverse probability of being retained in the longitudinal analysis. Findings were similar to the main analysis without using IPW.

An important study limitation was that neighbourhood SES (e.g., the deprivation index as a measure of material deprivation in small area) was not examined. Findings from previous studies suggested the presence of neighbourhood SES-based inequalities in mental health in adult participants and the role of some neighbourhood characteristics in explaining these inequalities (Fong et al., 2019; Jakobsen et al., 2022). However, the dataset we used for the present study did not have information on neighbourhood SES or postcode (or local area) that we can link to multiple deprivation measures. Future studies will benefit from exploring neighbourhood SES-based inequalities in mental health in Irish children and relative contribution of neighbourhood characteristics. Furthermore, based on collective resource model, individuals from lower SES may be more aware and dependent on locally available resources in their neighbourhoods (Stafford and Marmot, 2003). Therefore, children from lower family SES living in affluent neighbourhoods may have better mental health due to more exposure to favourable

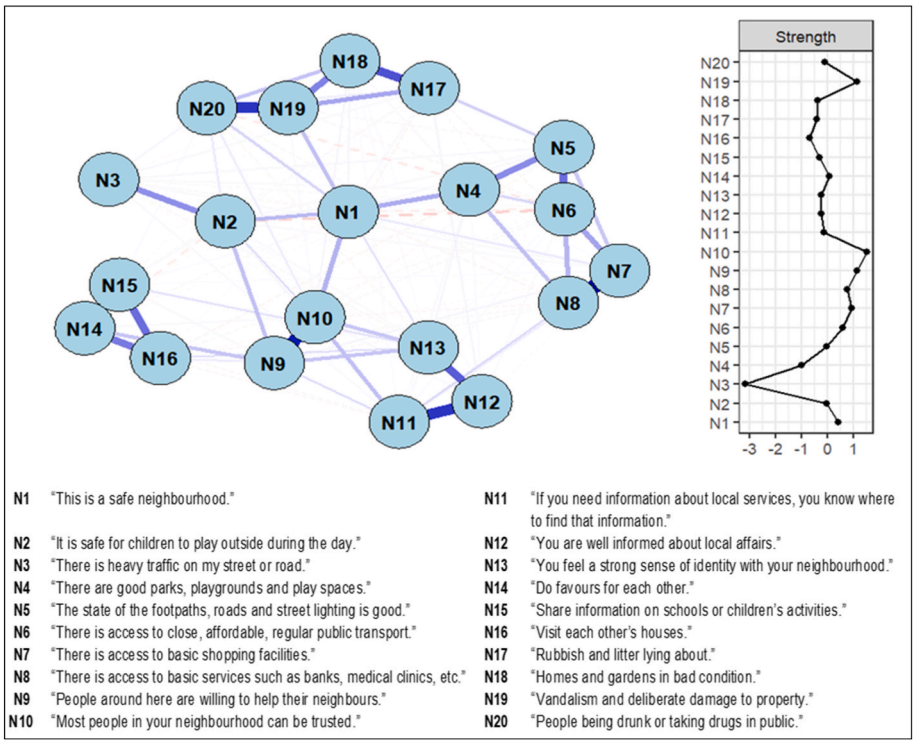

Fig. 1. Estimated network with 20 neighbourhood items.

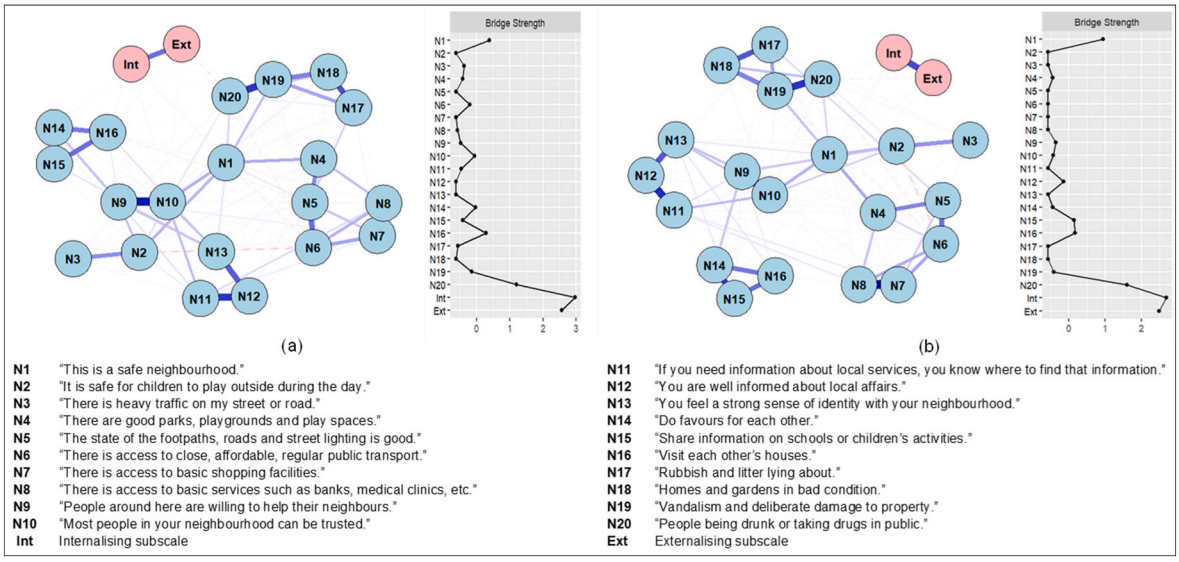

Fig. 2. Estimated networks with 20 neighbourhood items and a) baseline and b) follow-up two main TDS subscales.

neighbourhood characteristics compared to similar lower-SES children living in disadvantaged neighbourhoods. Alternatively, the potential stigma of living in a more affluent neighbourhood as a less affluent family could have detrimental effects on mental health. This provides an important avenue for further inquiry on how interactions between neighbourhood and family SES shape child mental health. In addition, future research should also explore the extent to which neighbourhood SES may moderate the role of neighbourhood characteristics in explaining family-SES based inequalities in child mental health through moderated mediation analysis.

Even though caregiver-reported measures have some strengths, caregivers' perceptions of neighbourhood characteristics may also be contingent upon several factors and be prone to reporting bias. For example, caregivers' definition of a neighbourhood that is safe or safe for children to play may vary by children's sex. Gendered playing activities in which boys tend to participate in outdoor activities (Eriksson et al., 2019) and more safety concerns for girls (Morrongiello et al., 2010) may influence caregivers' judgements on what characteristics of neighbourhoods should have to be suitable for their children. Therefore, future research will benefit from including both subjective and objective measures of neighbourhood characteristics.

5. Conclusion

Socioeconomic inequalities in child mental health in Ireland are evident across different family SES measures. Neighbourhood safety,

cohesion, social interactions, and disorder were associated with child mental health and partly explained socioeconomic inequalities in child mental health. Improving neighbourhood conditions, particularly reducing disruptive behaviours in public and increasing safety may have positive impacts on child mental health. Given children from lower SES are more likely to reside in less affluent neighbourhoods, neighbourhood-level interventions targeting disadvantaged neighbourhoods may benefit public health.

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CRediT authorship contribution statement

I Gusti Ngurah Edi Putra: Writing – original draft, Visualization, Project administration, Methodology, Funding acquisition, Formal analysis, Data curation, Conceptualization. **Amy M. McInerney:** Writing – review & editing, Formal analysis, Data curation. **Eric Robinson:** Writing – review & editing, Supervision, Funding acquisition. **Sonya S. Deschênes:** Writing – review & editing, Supervision, Methodology, Conceptualization.

Declaration of competing interest

The authors declare that there are no competing interests.

Data availability

The authors do not have permission to share data. Growing Up in Ireland data were accessed via the Irish Social Science Data Archive - www.ucd.ie/issda. The codes used to produce the results presented in this study are available at https://doi.org/10.17605/OSF.IO/RMGTK.

Appendix A. Supplementary data

Supplementary data to this article can be found online at https://doi.org/10.1016/j.healthplace.2024.103180.

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