Parent-specific effects of parks accessibility on child resilience: A longitudinal cohort study

Lucas Shen, PhD^{1,*} Michelle Z.L Kee, PhD¹ Jian Huang, PhD¹ Ka Kei Sum, MSc^{1,2} Keri McCrickerd, PhD^{1,3,4,5,6} Gerard Chung, PhD⁷ Evelyn Law, MD⁵ Fabian Yap, MBBS⁸ Yung Seng Lee, PhD, MBBS⁵ Yap Seng Chong, MBBS, MD⁹ Keith M Godfrey, PhD, BM¹⁰ Jonathan Y Huang, PhD^{11,12}

¹ Institute for Human Development and Potential, Agency for Science, Technology and Research.

² Population Health Sciences, Bristol Medical School, University of Bristol.

³ Centre for Behavioural and Implementation Science Interventions, Yong Loo Lin School of Medicine, National University of Singapore.

⁴ Centre for Holistic Initiatives for Learning and Development, Yong Loo Lin School of Medicine, National University of Singapore.

⁵ Paediatrics, Yong Loo Lin School of Medicine, National University of Singapore.

⁶ Human Potential Translational Research Programme, Yong Loo Lin School of Medicine, National University of Singapore.

⁷ Department of Social Work, National University of Singapore.

⁸ KK Women's and Children's Hospital.

⁹ Department of Obstetrics and Gynaecology, Yong Loo Lin School of Medicine, National University of Singapore.

¹⁰ MRC Lifecourse Epidemiology Centre & NIHR Southampton Biomedical Research Centre, University of Southampton & University Hospital Southampton NHS Foundation Trust, Tremona Road, Southampton, SO16 6YD, UK.

¹¹ Centre for Quantitative Medicine, Duke-NUS Medical School, National University of Singapore.

¹² Thompson School of Social Work and Public Health, University of Hawai'i at Mānoa.

* Corresponding author. Institute for Human Development and Potential, Agency for Science, Technology and Research. E-mail: lucas_shen@sics.a-star.edu.sg

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Key points

Guestion At which developmental stages does parent-specific involvement strengthen the association between park access and early adolescent psychological resilience?

Findings In this longitudinal cohort study, having more parks within 15 minutes of the family's residence is weakly associated with increased resilience at age ten. The timing at which parent-specific involvement in a child's everyday activities strengthens this association differs. Paternal (maternal) involvement strengthens the association from birth to toddlerhood (6 years onwards).

Meaning Fathers's early affinity to engage their child, together with child-friendly neighborhood amenities such as parks, can influence socio-emotional outcomes from early developmental stages.

Key words and phrases: Child resilience; Fathers, Urban planning; Accessibility; Built environment; Parks; Early childhood development

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Abstract

Importance Neighborhood environments are increasingly recognized for their impact on children's development. At the same time, children's developmental needs vary widely by parent and across the years, suggesting their ability to benefit from these environments is likely moderated by parent-specific engagement across different developmental stages.

Objective To evaluate whether and when parent-specific measures of parental involvement modify the positive association between the number of parks within 15 minutes of residence and the child's psychological resilience at age ten.

Design, Setting, and Participants This study combines three data sources to create a longitudinal dataset with repeated measures of residential access to parks and parent-child engagement every year from birth to age ten. Outcomes and family-level measures come from the Growing Up in Singapore Towards Healthy Outcomes (GUSTO) cohort study. Five parent-specific measures from GUSTO capture parental involvement in the child's day-to-day activities (primary caregiving, bathing/showering, playing, unstructured outings, and helping with school projects). The environmental exposure measure is the number of parks within 15 minutes of the family's residence, measured by linking high-resolution commute data (walking and public transit) to the cohort residential trail. We analyze yearly data from birth to age ten of the child.

Main Outcomes Main outcome is the child's psychological resilience at age ten, measured using the Connor-Davidson Resilience Scale (CD-RISC).

Results 429 children completed the CD-RISC administration (aged 10.9, SD 0.1), with an average score of 60 (range 0–100, SD 17.1). Having more parks within 15 minutes of residence is weakly associated with increased resilience at age ten. At birth, a standard deviation increase in parks is associated with an increased resilience at age ten of 2.7 points (16% of CD-RISC SD; $\hat{\beta}_1 = 0.23$, 95% CI, 0.02–0.43). More engaged parents, measured by parental involvement in the child's daily activities, strengthen this association. For instance, at Year 3, children of fathers who take them out on unstructured outings have an increased resilience of 3.8 points (22% of CD-RISC SD; $\hat{\gamma} = 0.33$, 95% CI, 0.03–0.62) compared to children whose fathers do not. A critical general finding across the five parental involvement measures is that the paternal vs. maternal modifications differ by timing. Modifications for fathers come earlier in infancy/toddlerhood (birth to 3 years old); modifications for mothers come in later childhood (6 years old onwards).

Conclusions and Relevance Our longitudinal data of built and family environments suggest that child-friendly neighborhood features, such as parks, play an essential role in child development. Furthermore, fathers, in relation to the neighborhood environment, have a crucial early influence on their child's developmental outcomes. These findings are consistent with growing global support for paternity leave and early father-child engagement.

1 Introduction

Neighborhoods, through their built and natural environmental features, are increasingly recognized for their 2 significant role in enhancing the mental, physical, and economic well-being of families and their children. $^{1-12}$ 3 For children, parks are pivotal for early development as green and community spaces are child relevant.^{13,14} 4 Such spaces within the neighborhood help promote physical and social activity as stress relief and as oppor-5 tunities for play and leisure.^{9,14} However, the influence of these neighborhood spaces on children's development is likely moderated by parenting qualities, including the under-explored role of fathers.^{15–18} Moreover, 7 developmental needs vary greatly in the early years, and the influence of parents-including fathers-at var-8 ious ages has an important but understudied role in socio-emotional development. Using a novel geospatial-9 temporal dataset constructed from three distinct data sources, this study evaluates the evidence for how 10 mothers and fathers moderate the association between the child's resilience at age ten and nearby parks 11 from birth to age ten. 12

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Resilience is a multidimensional quality that enables one to thrive in the face of stress and adversity.¹⁹ 13 Many studies of resilience look at adverse impacts or acute negative episodes.^{20–31} On the other hand, studies 14 focusing on the positive augmentation of psychological resilience, including in children, are sparse, ^{32–35} even 15 though associations have been found across various adolescent and adult ages with resilience buffering posttraumatic stress, ^{36–39} quality of life, ⁴⁰ general wellness, ⁴¹ depression, ^{42–46} problem solving, ⁴⁷ self-esteem, ⁴² 17 perceived stress, ¹⁹ and academic achievement.^{48–51} 18

Parents interact with children differently. In turn, children may derive differential benefits (or harms) ¹⁹ in a parent-specific manner. For example, fathers play unique roles in parenting through active play with ²⁰ their children. ^{18,52} Positive paternal involvement is associated with beneficial psycho-social-development ²¹ outcomes from infancy to adolescence. ^{18,53,54} Moreover, fathers typically engage children in physical play, ^{15,17} ²² with links to positive socioemotional development. ¹⁵⁻¹⁸ A corollary is that parks facilitating such active play ²³ may be more salient for children with engaged fathers. ²⁴

We use longitudinal data on caregiver questionnaires to measure parent-child engagement and active ²⁵ caregiving. ^{18,55} From these, we code five parent-specific indicators. Coding these indicators to be parent-²⁶ specific enables us to test the extent to which these parent-child engagements are father-centered versus ²⁷ mother-centered. ^{15,17} Two of the indicators are "play" and "unstructured outings" with the child, connect-²⁸ ing to the rough-and-tumble type of parent-child activity, ^{17,56} with associations to socioemotional compe-²⁹ tence. ¹⁵⁻¹⁷ Each year's indicator is retrieved from the closest observed record to get the best proxies of ³⁰ parental involvement across time. ³¹

The primary environmental exposure in our study is families' residential-based access to nearby parks– those within 15 minutes of public commute (walking and public transit). Research on the built environment and its impact often emphasizes spatial proximity. ^{12,14,57,58} However, in our study, interacting with the neighborhood environment is a discrete decision. ^{59,60} Hence, we measure accessibility instead of physical proximity as travel time more accurately represents the decision to travel out and use nearby neighborhood 36 amenities.61

2 Methods

2.1 Study population

The measures for resilience and family-related characteristics come from the Growing Up in Singapore To-40 wards healthy Outcomes (GUSTO) cohort study. GUSTO follows a nationally representative cohort of 1,450 41 women recruited in 2009–10 during their first-trimester antenatal ultrasound scan at two hospitals (KK 42 Women's and Children's Hospital and National University Hospital) in Singapore.⁶² Participants include 43 healthy women in same-ethnic marriages residing in Singapore without significant medical conditions (e.g., 44 Type 1 Diabetes mellitus, psychosis). Figure 1a shows the geographical distribution of participants. While 45 not designed to be geographically representative, the participants are highly correlated with the census-46 based geographical distribution of women in the same age range (95% bootstrapped CI for r = [.93, .97], 47 Appendix A).¹² 48



Figure 1 Distribution of participants and assessment of spatial correlation in the CD-RISC measure (n = 429). Panel (a) shows the distribution of participants across the city (based on Year 10 residence). Panel (b) summarizes the spatial correlation analysis of the neighborhood-averaged CD-RISC measure across neighborhoods. The map highlights neighborhoods based on their pseudo p-values of spatial correlation from a permutation-derived null hypothesis of spatial randomness (n = 10,000). The colorbar is segmented based on the proportions of neighborhoods in the indicated p-value ranges; p-values below .05 are colored, while p-values above .05 are in grayscale. The left histogram reports the classification of neighborhoods into quadrants representing types of spatial correlation: High-High (hot spots), Low-Low (cold spots), Low-High, and High-Low. The right histogram reports the distribution of p-values.

2.2 Resilience (CD-RISC)

GUSTO measured a child's resilience using the Connor-Davidson Resilience Scale (CD-RISC). The CD-RISC 50 measures the ability to cope with adversities, which is used as a marker of neurological changes and a 51 measure of response to therapy. ¹⁹ This child-reported scale consists of 25 items. Each item is a statement 52

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Figure 2 [City-wide distribution of parks (n = 1425). Parks are in (shaded) green. Legend (top-right) shows the distribution of park area (in '000 m²). To illustrate scale, the three parks with highlighted borders (all on the right of the central figure) are indicated by vertical dashed lines in the legend. The inset figure (bottom left) illustrates the most populated neighborhood in GUSTO (participants' residences in black triangles).

(e.g., [I am] Able to adapt to change, [I] Can deal with whatever comes, [I give my] Best effort no matter what) ⁵³ on a 5-point scale indicating agreement (Table A1). Scores across all items are summed so the CD-RISC ⁵⁴ is from 0–100. ¹⁹ When the GUSTO children were past their tenth birthday, 434 were invited to complete ⁵⁵ the CD-RISC questionnaire. Five did not complete (child refused to respond or mother requested to opt ⁵⁶ out), leaving n = 429 children with the resilience measure (Table A1). GUSTO's CD-RISC has high internal ⁵⁷ consistency (Cronbach's alpha = 0.93). ⁵⁸

2.3 Accessiblity to nearby parks

To quantify the number of parks accessible within 15 minutes of a family's residence, we begin by enumerating a tessellation of hexagon cells (approximately 0.11km²). We then obtain 2.87 million centroid-to-centroid pairs of cells and retrieve their commute times by walking and public transportation using a modern routing service (please see Appendix A).

To link accessibility to parks, we use the official public land use master plans from the Urban Redevelopment Authority. We use the *Park* category, which refers to land parcels assigned for parks or gardens. Figure 2 illustrates the spatial distribution of parks. Many are small neighborhood parks close to residences (Figures A4 to A5). 15 minutes is consistent with how residents view the "boundaries of their neighbor-67



Figure 3 Illustration of quantifying the number of parks within a 15-minute commute to residence (point in the middle of the figure). Purple areas are hexagons within 15 minutes of the residence by public commute, including walking. Land parcels assigned to parks are shaded in green. The dashed black circle demarcates the 500-meter concentric circle around the residence as a reference.

hood", ⁶³ and is approximately a 1 km straight-line leisurely walk. Finally, we merge accessibility to the map of parks to quantify the number of parks within 15 minutes.Figure 3 illustrates this measure for one family.

We use the GUSTO trail of residential records to obtain the geospatial-temporal distribution of park root access over the entire sample period (n = 14,344). We first link the child's birthdate to administrative dates root address updates. For a given year y of the child, we then map to a residential record that is closest to but root before the child's birthdate.¹

2.4 Parental caregiving and involvement modifiers

GUSTO includes caregiving questionnaires across seven waves (years 4-10). These waves provide records for ⁷⁵ the child's primary caregiver.² In addition, waves 4-6 include four active caregiving fields relating to positive ⁷⁶

$$x_y = x_{t^*} \quad s.t. \quad t^* = \arg\min_{t:A_* \le y} |y - A_t|,$$
 (1)

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where x is the environment exposure measure based on year $y \in \{0, \dots, 10\}$, and A_t is the child's precise age in years when the residential record was updated. See also Section 2.5 and Figure A3.

¹The precise method for linking residential records to each year y of a child's age is:

²Having both parents as the primary caregivers is rare (with n = 4 in Year 4, and 0 thereafter, Table A2).

Table 1 | Data summary statistics.

	(1)	(2)	(3)
	Categories	NA	Descriptive statistic
Parks			
Mean number of parks, within 15 mins (s.d.)		13	12.9 (11.5)
At least one park, within 15 mins (%)	Have parks	13	408 (98.1)
	No park		8 (1.9)
Maternal baselines			
Mean age, delivery (s.d.)		6	31.0 (5.1)
Highest education level (%)	Primary	11	16 (3.8)
	Secondary		109 (26.1)
	GCE/diploma		152 (36.4)
	College degree		141 (33.7)
Occupation	Clerical Worker	17	67 (16.3)
	Homemaker		96 (23.3)
	Legislator Senior Official		10 (2.4)
	Others		4 (1.0)
	Plant Machine Operator		7 (1.7)
	Professional		108 (26.2)
	Service Worker		40 (9.7)
	Student		11(2.7)
	Technician Associated Professional		64 (15.5)
	Unemployed		5 (1.2)
Housing type (%)	1/2-room public housing	11	18 (4.3)
8.51	3-room public housing		85 (20.3)
	4/5-room public housing		258 (61.7)
	Public condominium		23 (5.5)
	Others		2 (0.5)
	Condominium		20 (4.8)
	Landed housing		12 (2.9)
Ethnicity (%)	Chinese	6	255 (60.3)
Dufinition (70)	Indian	Ŭ	50 (11.8)
	Malay		117 (27 7)
	Others		1 (0.2)
Child baselines			
Mean resilience score (s.d.)		0	60.0(17.1)
Child's sex (%)	Female	Õ	206 (48.0)
	Male	0	223 (52.0)
Mean child's age. CD-RISC collection (s.d.)	11410	0	10.9(0.1)
Have domestic helper (%)	Ves	Õ	51 (11.9)
	No	Ŭ	378 (88 1)
Child's birth order (%)	let	6	203 (48 0)
	9nd	0	119 (28 1)
	211u 3rd		75 (17 7)
	4th		22 (5.2)
	5th		22 (0.2) 4 (0 0)
	501		+ (0.9)

Notes: For categorical variables, the table reports raw counts (percentage). Education level is grouped into college degree versus others. Housing types are binned into public and private housing. N = 429.

Table 2 | Child active caregiving and parental involvement fields.

Field	Description
Primary caregiver	Mother/father is the primary caregiver of the child.
Bathe/shower	Mother/father bathes/showers their child or keeps their child company during his/her bath/shower most often.
Play	Mother/father plays with their child most of the time.
Unstructured outings	Mother/father takes their child on unstructured outings most of the time.
Schoolwork	Mother/father helps their child with schoolwork, art projects, etc.

Notes: Table lists the active caregiving effect modifiers in Section 2.4 and their description. Each row corresponds to a child caregiving and parental involvement indicator, coded 1 if yes and 0 if no.

engagement activities (Table 2).^{18,55 3} We code these fields to be parent-specific. If the mother plays with the 77 child most often, this is coded as a 1 for the mother (0 otherwise). We repeat this for fathers. This coding 78 allows us to test hypotheses on parent-specific involvement.^{15,17} 79

2.5 Age-specific interactions

For each year y from birth to 10 years old, we retrieve the caregiving field (not the wave) collected closest 81 to the child's birthdate. We emphasize that, for example, the caregiver field at Year 0 is based on the Year 82 4 questionnaire at the earliest.^{4 5} In addition to a closer correspondence between the child's age and their 83 parent's caregiving, this mitigates issues with missing fields at particular waves (Figure A9 and Figure A10). 84

Covariates 2.6

Covariates include parental and child baseline, all collected at recruitment. Maternal characteristics include 86 age at delivery, ethnicity, education level, occupation, and housing type (Table 1). As child baseline measures, 87 we have the child's sex and age when taking the CD-RISC (in precise years), whether the family employs 88 a domestic helper at home, and the child's birth order. Specifically, age, sex, and ethnicity have been 89 linked to CD-RISC.⁶⁴ For example, girls/women tend to have higher CD-RISC scores⁶⁴ and benefit from 90 their neighborhood differently than boys. 2,7,57,65-67 91

2.7 Statistical analyses

The outcome measure is the child's CD-RISC at age ten (Section 2.2). We estimate multivariable regression 93 models with family baselines (Section 2.4, Section 2.6) and hold neighborhood factors constant.¹² Standard 94 errors are clustered at the broader planning areas. We report strata sizes and tables and in text for small 95 strata sizes where applicable.

$$m_y = m_{w^*} \quad s.t. \quad w^* = \arg\min|y - A_w|,$$
 (2)

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³The bathe/shower field extends into year 7.

⁴The precise method to link caregiving fields (not the caregiving survey waves) with each year y of the child's age is:

where m is a caregiver modifier, $y \in \{0, \dots, 10\}$ is the year, A_w is the precise age of the child in years when the caregiving survey was administered, and w is the wave of the survey $-w \in \{4, 5, 6\}$ for the four parental involvement measures, and $w \in \{4, \dots, 10\}$ for child's caregiver (see Section 2.4). Figure A11 and Figure A12 provide alternative visualizations of this linking.

⁵In Appendix A, we examine consistency in the fields across years and find fairly consistent indicators of paternal involvement across time (e.g., of 237 fathers indicated as taking the child on unstructured outings most often in at least one of the three years, 149 also do it in at least one other year, Figure A18). find that a scale on paternal involvement via play sensitivity is highly consistent across four years of their data.

2.7.1 Associations across years of early childhood

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To examine heterogeneities in paternal and maternal caregiving qualities at different points in the child's early years, we link the CD-RISC measure with age-based access to parks (Section 2.3) and age-based caregiving across the years (Section 2.5): 100

$$CD-RISC_{ia}^{(y=10)} = \beta_1^{(y)} Parks_i^{(y)} + \beta_2^{(y)} m_i^{(y)} + \gamma^{(y)} \left(Parks_i^{(y)} \times m_i^{(y)} \right) + \alpha_a + \Gamma \boldsymbol{X}_i + \varepsilon_{ia}$$
(3)

for years $y \in \{0, \dots, 10\}$. Parks is the number of parks within 15 minutes of residence (Section 2.3), *m* is 101 one of the age-based caregiving fields (Table 2) as a parent-specific modifier, α is the neighborhood identifier 102 (Figure 1b), and X_i are baseline adjustments (Section 2.6). While the figures in Section 3 plot coefficients 103 from all years together for comparison, we emphasize that each coefficient is a standalone model for the 104 indicated year, with CD-RISC always at year ten. 105

2.7.2 Sensitivity analyses

In Appendix D, we adjust for additional paternal characteristics (age, occupation, education) and income for 107 both mother and father. These fields have high missingness. Therefore, we implement these adjustments 108 with multiple imputation (Appendix D). Second, to check that the temporal patterns with paternal versus 109 maternal interactions with parks are unlikely to arise by chance, we apply randomization inference. We 110 randomly shuffle the parks measure and re-estimate Equation (3) 1,999 times to generate a reference null 111 distribution for each parent-specific modifier and each year(Appendix E). Third, close to half the participants 112 have relocated by age ten. To allow for a new environment via relocation to interact with the caregiving 113 measures, we also code and adjust for whether the family has moved at a given year through interaction 114 with both access to parks and the caregiving modifiers. Fourth, in Appendix E, we test how sensitive the 115 results are to just the child baselines. Finally, a minority of the caregiver survey respondents are the fathers. 116 In additional tests, we exclude them to rule out self-overstatement of paternal engagement as a competing 117 explanation (Appendix E). 118

3 Results

The average age during the CD-RISC administration is 10.9 years old (SD 0.1, Table 1). The mean CD-RISC 120 is 60.0 (SD 17.1, n = 429). Figure 1b summarizes spatial autocorrelation patterns in CD-RISC, indicating 121 a general lack of across-neighborhood geographical dependence. This does not preclude differences across 122 regions (Figure A2), which we adjust for (Equation (3)). In 2019, there are 1425 parks across the city 123 (Figure 2), which can be very close to residential points (Figures A4 to A5). Figure 2 (inset) and Figure 3 124 illustrate this proximity. The mean number of parks within 15 minutes is 12.9 (SD 11.5, Table 1). On 125 average, parks within 15 minutes are 38.1 m² in size (SD 42.8).



Figure 4 Associations between CD-RISC and Parks within 15 minutes of residence at various years. The horizontal axis indicates the year of measurement for the number of parks within 15 minutes of residence (Section 2.3). Vertical lines are 95% confidence intervals (90% in thicker lines) constructed from geographically clustered standard errors. Table B1 reports exact estimates.

Throughout this section, we will consider a one standard deviation increase in the number of parks ¹²⁷ within 15 minutes to aid assessments of the estimated effect sizes, including those of effect modification. ¹²⁸

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3.1 Main association between child resilience and access to parks

Figure 4 reports the estimated $\beta_1^{(y)}$ coefficients (setting the β_2 's and γ 's to 0) for the main associations between 130 the child's resilience and the number of parks within 15 minutes of residence across the various years. We 131 observe some statistical evidence of association in the earlier years, at Year 0 ($\hat{\beta}_1^0 = 0.23$, p = .03, SE 0.10, 132 95% CI = 0.02–0.43) and Year 1 ($\hat{\beta}_1^1 = 0.18$, p = .08, SE 0.10, 95% CI = -0.03–0.39). At Year 0, the estimated 133 coefficient implies a 2.7-point score increase in resilience (16% of the CD-RISC SD). 134

3.2 Modification by parental-specific involvement

Figure 5 reports how mothers (first column) and, separately, fathers (second column), as primary caregivers ¹³⁶ modify the association between resilience and parks. The first row in Figure 5 reports the additive effect ¹³⁷ (the γ^{y} s in Equation (3)) for each year. The second row reports the underlying associations by the implied ¹³⁸ strata in child caregiving. For mothers, we observe positive interaction effects at years 7 and 8. We note that ¹³⁹ while noisier, with larger standard errors likely arising from a smaller stratum (n = 18 at Year 4 for fathers), ¹⁴⁰ the modification from fathers is larger than that of mothers. The estimate of 0.55 (p < .01, SE 0.15, 95% CI ¹⁴¹ 0.26–0.85, Table B3) for mothers at Year 7 implies that children whose mothers are the primary caregiver ¹⁴² have a 6.3 higher resilience score than children whose mothers are not. In comparison, the estimate of 1.15 ¹⁴³ (p = .03, SE 0.52, 95% CI 0.09–2.21, Table B2) for fathers at Year 1 implies a 13.2 higher resilience score ¹⁴⁴ among children whose fathers are the primary caregiver sas a caveat. Specifically, at Year 4, fathers as the primary ¹⁴⁶



Figure 5 Primary caregiver modifier: Mother/father is the primary caregiver (m = 1 if indicated, 0 if not). First row shows the additive difference (γ^y in Equation (3)). Second row shows the underlying associations by strata (source of difference for the first row). The horizontal axis indicates the year of measurement for parks (Section 2.3) and the caregiving measure Section 2.5. Vertical lines are 95% confidence intervals constructed from geographically clustered standard errors. Common axis scales. See Table B2 and Table B3.

caregivers are only n = 18 and barely increase in later years (n = 21 at Year 10, Table B2). Figures 6 to 9 report the results (same structure as Figure 5) for the four active caregiving qualities 148

relating to parental involvement in the child's daily activities (Table 2).

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In Figure 6 for the bathe modifier, there is no statistical evidence of interaction for mothers for any year $_{150}$ (p > .1, Table B5). For fathers, the bathe modifier strengthens the association between resilience and parks. $_{151}$ At Year 1, the estimate of 0.52 (p = .01, SE 0.19, 95% CI 0.13–0.90, Table B4) for fathers who bathe/shower $_{152}$ their child most often is an additional 6 points in resilience than for fathers who do not. This statistical $_{153}$ association diminishes by Year 3.

For the play modifier in Figure 7, we observe statistical evidence of interaction for mothers starting from $_{155}$ Year 6. At Year 6, the estimate of 0.40 (p = .02, SE 0.16, 95% CI 0.07–0.74, Table B7) for mothers implies $_{156}$ an additional 4.6 points in resilience for children whose mothers play with them the most often than those $_{157}$ whose mothers do not. For fathers, the estimated interaction effect is only weakly positive in the earlier $_{158}$



Figure 6 Bathe/shower modifier: Mother/father bathes/showers the child or keeps child company during bath/shower most often (m = 1 if indicated, 0 if not). First row shows the additive difference (γ^y in Equation (3)). Second row shows the underlying associations by strata (source of difference for the first row). The horizontal axis indicates the year of measurement for parks (Section 2.3) and the caregiving measure Section 2.5. Vertical lines are 95% confidence intervals constructed from geographically clustered standard errors. Common axis scales. See Table B4 and Table B5.

years (p < .1), Table B6).

A related but separate parental involvement to "play" is "unstructured outings" (Figure 8), broadly referring to activities or trips that are not a part of the child's typical schedule (such as commuting to school, tuition, or other extracurricular classes). For mothers, we observe a negative interaction effect with unstructured outings from early years up to Year 4. Conversely, we observe a positive interaction effect for fathers up to Year 3. At Year 3, the estimate of 0.33 (p = .03, SE 0.14, 95% CI 0.03–0.62, Table B8) implies a 3.8 point increase in resilience for children whose fathers who take the child on unstructured outings the most often than those who do not.

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The final modifier we examine is the schoolwork indicator (Figure 9), which captures whether the mother 167 or father helps with schoolwork (and similar activities). For mothers, the interaction term is weakly significant at Year 5, with an estimate of 0.27 (p = .08, SE 0.14, 95% CI -0.03–0.56, Table B11). For fathers, we 169 observe positive interaction effects at years 0 and 2. At Year 2, the estimate of 0.57 (p = .05, SE 0.28, 95% 170



Figure 7 Play modifier: Mother/father plays with the child most of the time (m = 1 if indicated, 0 if not). First row shows the additive difference (γ^y in Equation (3)). Second row shows the underlying associations by strata (source of difference for the first row). The horizontal axis indicates the year of measurement for parks (Section 2.3) and the caregiving measure Section 2.5. Vertical lines are 95% confidence intervals constructed from geographically clustered standard errors. Common axis scales. See Table B6 and Table B7.

3.3 Additional modifiers	178
while maternal modifications appear from Year 6 onwards.	177
Overall, paternal modifications of the association between parks and resilience show up from years 0–3,	176
observe no associations (Appendix B).	175
for fathers taking the child on unstructured outings most of the time in the later years (e.g., Year 8–10), we	174
We also examine associations between CD-RISC and the caregiving fields (without interaction). Except	173
resilience score than those who do not.	172
CI 0.01–1.14) implies that children of fathers who help with schoolwork and projects have a 6.6-point higher	171

We also examine modifications along other dimensions (Appendix C). First, we allow the associations between 179 resilience and parks across the years to differ by the child's sex to allow for sex-based differences.^{2,67} We 180 observe some differences by child's sex in the early years (Figure C1). At Year 1, the estimated association 181



Figure 8 Unstructured outings modifier: Mother/father takes the child on unstructured outings most of the time (m = 1 if indicated, 0 if not). First row shows the additive difference (γ^y in Equation (3)). Second row shows the underlying associations by strata (source of difference for the first row). The horizontal axis indicates the year of measurement for parks (Section 2.3) and the caregiving measure Section 2.5. Vertical lines are 95% confidence intervals constructed from geographically clustered standard errors. Common axis scales. See Table B8 and Table B9.

between resilience and parks for girls is 0.04 (p = .77, SE 0.14, 95% CI -0.24-0.33) as the baseline sex, and boys have an estimated interaction effect of 0.24 (p = .06, SE 0.12, 95% CI -0.01-0.50, Table C1). These estimates translate into boys having a 2.8-point increase in resilience.

Second, we consider similar parental involvement modifiers in the appendix (e.g., reading to the child 185 and having meals with the child, Appendix C). We observe similar patterns regarding the timing of when 186 statistical evidence for interaction arises.

Third, we report modifications by socioeconomic status (income level, education level, and occupation). ¹⁸⁸ While not universal, we observe similar temporal patterns of interaction for paternal versus maternal socioeconomic indicators for higher-income, college degree holder, and PMET professions (Professionals, Managers, ¹⁹⁰ Executives, and Technicians, Appendix C). Fourth, we consider paternal involvement in household tasks and ¹⁹¹ chores. These measures are available in years 1–2, but we observe no statistical evidence of interactions ¹⁹² (Table C2). Finally, we consider parenting styles. While we observe evidence of positive associations from ¹⁹³



Figure 9 Schoolwork modifier: Mother/father helps with schoolwork, art projects, etc. (m = 1 if indicated, 0 if not). First row shows the additive difference (γ^y in Equation (3)). Second row shows the underlying associations by strata (source of difference for the first row). The horizontal axis indicates the year of measurement for parks (Section 2.3) and the caregiving measure Section 2.5. Vertical lines are 95% confidence intervals constructed from geographically clustered standard errors. Common axis scales. See Table B10 and Table B11.

authoritative parenting (both parents at years 4 and 10, Table C3) and negative associations from authoritarian parenting (both parents at years 4 and 8, Table C4), we observe no evidence of interactions with parks.

3.4 Sensitivity analyses

We perform sensitivity analyses, including those that test the robustness of the temporal pattern in paternal ¹⁹⁸ versus maternal interactions (Section 2.7.2)–later for mothers and earlier for fathers. First, we consider ¹⁹⁹ additional paternal characteristics (age, education, occupation, income). These have high missingness (a ²⁰⁰ third of the sample), so we estimate these with multivariate imputation by chained equations. Overall, the ²⁰¹ statistical associations are weaker, but the general temporal pattern in the interactions persists (Appendix ²⁰² D). ²⁰³

Second, we randomly permute the park exposure measure to generate distributions of null effects for all 204

years and all parent-specific modifiers. Comparing the main estimates to these null distributions indicates ²⁰⁵ that the temporal pattern we see in the paternal versus paternal interactions does not arise by chance ²⁰⁶ (Appendix E). ²⁰⁷

Close to half of the participants in our sample have moved residence by year ten. We additionally adjust 208 for having relocated for each year and do not observe any meaningful changes to the results (untabulated). 209 Fourth, the results are unchanged with just the child baselines, indicating that the estimates in Section 3.2 210 are not artifacts of the maternal adjustments (Appendix E). 211

Fifth, we observe no strong patterns of coincidence in the five indicators. Fathers reported as engaged ²¹² in any one of the five activities do not necessarily indicate participation in the others. Only n = 129 (31.2% ²¹³ of those reporting at least one) have at least two indicators reported at Year 5 (Figure A14). Overall, we ²¹⁴ observe scant evidence of reporting biases inflating the degree of paternal involvement in the child's dayto-day activities. Finally, a minority of the caregiving questionnaire respondents are the fathers (3% across ²¹⁶ years 7–10, Figure A13). We exclude observations where the father is the respondent. The findings are ²¹⁷ unchanged, suggesting that we are not simply capturing fathers who overstate their involvement with their ²¹⁸ child (Appendix E).

4 Discussion

This study uses a sample of 10-year-old pre-adolescent children from a national cohort. We combine longitudinal parental caregiving and location measures with primary data on access to nearby parks. With this novel data set, we examine how parent-specific involvement in the child's daily activities modifies the association between parks and the child's psychological resilience at age ten. We model associations every year from birth to age ten. Models adjust for baselines and unobserved differences for families of different neighborhoods. This approach allows us to test if and when mothers and fathers could augment their child's resilience through the interaction with access to parks.

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Examining paternal versus maternal indicators of parent-child engagement over the years reveals differ-228 ences in parent-specific modifications. Overall, paternal modifications arise earlier, while those for mothers 229 arise in later years. Maternal involvement only strengthens the association between resilience and parks 230 from Year 6 onwards. In contrast, paternal involvement strengthens the association between resilience and 231 parks from years 0–3. Using Year 3 unstructured outings as an example, children of fathers who take them 232 on such outings have a resilience score of 3.8 points (22% of CD-RISC SD) higher than those whose fathers 233 do not. Such unstructured outings include trips to local neighborhood amenities like parks. This effect 234 holds for a standard deviation increase in local parks, with all else equal. Besides the five parental care-235 giving qualities, we examine other paternal and maternal qualities, broadly finding statistical evidence for a 236 similar temporal pattern (Section 3.3). We subject our results to sensitivity tests showing that the tempo-237 ral patterns with parent-specific modifications—earlier for fathers and later for mothers—are not arising by 238 chance (Section 3.4).

Our study suggests that the built environment, through its interaction with the parent-child relationship, has a role in developing resilience in young children. ^{68,69} Psychological resilience is a buffer against adverse episodes, ^{36–39} and positively linked to quality of life, ⁴⁰ general wellness, ⁴¹ academic achievement, ^{48–51} problem solving, ⁴⁷ self-esteem, ⁴² and social skills. ⁷⁰ Many studies focus on trauma and decreases in resilience. ^{20–31} Our study hints at factors that may improve a child's resilience. ²⁴⁴

The indicators of play and going on unstructured outings with the child connect to the literature on ²⁴⁵ rough-and-tumble types of physical and leisure activity. ^{17,56} Fathers, in particular, are more likely to engage ²⁴⁶ in those activities ^{15,17} and active play. ^{18,52} Rough-and-tumble play is positively associated with socioemo- ²⁴⁷ tional competence. ^{15–17} Modern parks are child-relevant settings that facilitate such play (Figures A4 to A5). ²⁴⁸ It is worth noting, however, that without the park interaction, there is no statistical evidence that the in- ²⁴⁹ volvement indicators themselves are positively associated with resilience. The exception is when the father ²⁵⁰ is the one who takes the child out on unstructured outings, most often in the later years (Appendix B). ²⁵¹

In observing earlier interaction effects of parks and paternal involvement in the child's daily activities, ²⁵² our findings connect to the early role of fathers in the child's development of positive qualities, such as ²⁵³ psychological resilience through active and physical play. ^{18,52} This finding contributes to the growing consensus on the importance of fathers in early childhood development. ^{69,71} Paternal play sensitivity, including ²⁵⁵ motivating and cooperating with the child during playtime, is correlated with the child's attachment model ²⁵⁶ at age ten. ⁵² Parent-toddler cognitive simulation predicts academic scores at age ten. ⁷² Absent fathers at ²⁵⁷ birth predict developmental disorders (e.g., learning and speech disorders) by the age of 4. ⁷³ Few other studies suggest such benefits of earlier father-child attunement on later developmental milestones, especially in relation to their neighborhood. ²⁶⁰

Many governments are increasingly supportive of paternity leave. In our study context, government-paid 261 paternity leave doubled from two to four weeks, with an additional ten weeks by 2026.⁶ Notwithstanding 262 the take-up rate from cultural constraints, such policies support paternal engagement in the early years of 263 children's development. Our findings suggest that these policies are an essential step forward. 264

4.1 Limitations

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Commute times are estimated on mapped networks with assumptions about typical walking speeds and ²⁶⁶ public transit timetables. Idioscyncratic weather shocks or walking speeds may result in measurement ²⁶⁷ errors. However, these errors are unlikely to be differential based on geography. Assumed walking speeds ²⁶⁸ are conservative, aligning with a child's pace. Additionally, using 15-minutes to define access squares with ²⁶⁹ modern conceptions of the "15-minute city". ⁷⁴⁻⁷⁶ The spatial constructs lack qualitative aspects of parks. ²⁷⁰ Future studies may explore the degree of child relevance (e.g., uniqueness of playgrounds). ²⁷¹

⁶Announced at time of writing. Please see: https://web.archive.org/web/20240819010530/https://www.channelnewsasia.com/singapore/shared-parental-leave-paternity-faq-ndr-national-day-rally-2024-4553121.

Only one wave of CD-RISC is available, given the young age (see Appendix A). This restricts adjustments of 272 time-invariant factors. While we used multiple measures of parental involvement across the years, we have 273 few measures of interest in the early years. Despite this, we systematically mapped to the best available 274 proxies of parental involvement over time. Finally, the sample size is modest. This makes strata-based 275 analyses, including effect modifications, susceptible to skew. For the same reason, we leave an additional 276 interaction with the child's sex for studies with larger samples. 277

5 Conclusion

In a longitudinal study with repeated measures of park access and parent-child engagement, we find evidence 279 that access to parks in early years is weakly associated with increased resilience measured at age ten. Only 280 parents who engaged their child more (measured by various activities) generally have an observed positive 281 effect. Moreover, the timing of the parent-specific interactions differs, with children of engaged fathers 282 benefiting from parks in infancy/toddlerhood (birth to 3 years old). In contrast, children of engaged mothers 283 see a benefit in older childhood. This novel, parent-specific finding requires further research into which 284 modifiable behaviors and mechanisms may give rise to such benefits. Future work may also investigate which 285 aspects of the neighborhood are child-relevant. Overall, our findings support early father-child bonding 286 advocated by paternity leaves. 287

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A. Data Descriptives

Connor-Davidson Resilience (CD-RISC)



Girls Boys **Figure A1** [CD-RISC by child's sex (n = 223 boys, 206 girls). Points are individual observations. P-value is from a simple t-test of differences in means (unequal variances).

	(1)	(2)	(3)	(4)	(5)	(6)	(7)	(8)	(9)	(10)
	Summary			Reliability						
Connor-Davidson 25-Item Resilience Scale	n	Mean	S.D.	Min.	Max.	Sign	Item-test correlation	Corrected item-total correlation	Average Inter-item correlation	alpha
1. I am able to adapt when changes occur.	431	2.3	1.1	0	4	+	.625	.582	.33	.922
2. I have at least one close and secure relationship that helps me when I am stressed.	430	3.1	1.2	0	4	+	.476	.421	.338	.925
3. When there are no clear solutions to my problems, sometimes fate or God can help.	431	2.2	1.4	0	4	+	.323	.262	.346	.927
4. I can deal with whatever comes my way.	431	2.2	1.1	0	4	+	.626	.582	.33	.922
5. Past successes give me confidence in dealing with new challenges and difficulties.	430	2.5	1.2	0	4	+	.704	.667	.326	.921
6. I try to see the humorous side of things when I am faced with problems.	431	2.1	1.1	0	4	+	.519	.468	.336	.924
7. Having to cope with stress can make me stronger.	430	1.8	1.2	0	4	+	.566	.518	.333	.923
8. I tend to bounce back after illness, injury, or other hardships.	430	2.3	1.3	0	4	+	.537	.487	.335	.923
9. Good or bad, I believe that most things happen for a reason.	430	2.8	1.1	0	4	+	.545	.495	.334	.923
10. I give my best effort no matter what the outcome may be.	431	2.7	1	0	4	+	.676	.637	.327	.921
11. I believe I can achieve my goals, even if there are obstacles.	430	2.6	1	0	4	+	.753	.721	.323	.92
12. Even when things look hopeless, I don't give up.	431	2.4	1.1	0	4	+	.667	.627	.327	.921
13. During times of stress/crisis, I know where to turn for help.	430	2.7	1.2	0	4	+	.579	.532	.332	.923
14. Under pressure, I stay focused and think clearly.	431	2.2	1.1	0	4	+	.675	.636	.327	.921
15. I prefer to take the lead in solving problems rather than letting others make all the decisions.	430	2.2	1.2	0	4	+	.516	.465	.336	.924
16. I am not easily discouraged by failure.	431	2.3	1.1	0	4	+	.681	.643	.327	.921
17. I think of myself as a strong person when dealing with life's challenges and difficulties.	430	2.3	1.1	0	4	+	.701	.664	.326	.921
18. I can make unpopular or difficult decisions that affect other people, if it is necessary.	430	2	1.1	0	4	+	.434	.377	.34	.925
19. I am able to handle unpleasant or painful feelings like sadness, fear, and anger.	431	2.4	1.1	0	4	+	.536	.486	.335	.923
20. In dealing with life's problems, sometimes you have to act on a hunch without knowing why.	431	2.1	1.1	0	4	+	.531	.48	.335	.924
21. I have a strong sense of purpose in life.	431	2.5	1.2	0	4	+	.712	.676	.325	.92
22. I feel in control of my life.	430	2.4	1.3	0	4	+	.609	.564	.331	.922
23. I like challenges.	431	2.2	1.4	0	4	+	.588	.541	.332	.923
24. I work to attain my goals no matter what roadblocks I encounter along the way.	431	2.5	1.1	0	4	+	.734	.701	.324	.92
25. I take pride in my achievements.	430	2.9	1.1	0	4	+	.654	.613	.328	.921
Overall	429	60	17.1	5	100	_	_	_	.331	.925

Table A1 | CD-RISC 25-item scale data summary and reliability measures.

Note: Tabulation of data summary and reliability measures of the 25-item Connor-Davidson Resilience Scale. All 25 items are on a 5-point Likert scale (0–4). Observations for items where the child refused to respond or caregiver accompanying the child requested to opt out are dropped. Item-test correlation is the correlation between the row item and the total score. Corrected item-total correlation is the correlation between the row item and the total score (excluding that row item). Column (10) reports the Cronbach's alpha. Last row reports the relevant overall scores for all 25 items.

The Connor-Davidson Resilience scale was initially developed in adult cohorts, but ⁵⁵⁷ many studies use the scale given to children as young as ten⁶⁴, including GUSTO. Our ⁵⁵⁸ study has no earlier measures of the same scale because of comprehensibility. The Flesch ⁵⁵⁹ readability score for the CD-RISC scale is 75–77 (variation might depend on string preprocessing convention), a score widely accepted as "readable" (or comprehensible) to a ⁵⁶¹ child of the US 7th grade (12 years old). The related Flesch-Kincaid Grade score for the ⁵⁶² CD-RISC scale is 5.1, indicating suitability for US 5th graders⁶⁴. We also note that not all ⁵⁶³ children took the scale at the same time. The CD-RISC instrument was administered over ⁵⁶⁴ 17 months. In the analyses, we compute and adjust for the child's age at the CD-RISC ⁵⁶⁵ administering date by taking the difference between the recorded date of the CD-RISC ⁵⁶⁶ and their birthdates. ⁵⁶⁷



Residence and parks



Figure A3 Grid of histograms of child's age at closest recorded residence, by year. Each subfigure shows the distribution of the child's age at the administrative date of the closest recorded residence update before the child's birth date at the year indicated in the corresponding caption. The precise method for linking residential data to each year y of a child's age involves:

$$x_y = x_{t^*} \quad s.t. \quad t^* = \arg\min_{t:A_t \le y} |y - A_t|,$$
 (A1)

where x is the environment exposure measure based on year $y \in \{0, \dots, 10\}$, and A_t is the precise age of the child in years when the residential record was updated. Subfigures have different y-axis scales.





(c) (d) **Figure A4**|Illustrating examples of neighborhood/community parks using street-level images. *Source:* Google Photos.





Figure A6 Grid of hexagon cells. Each cell is $\sim 0.11 \text{km}^2$.

A core piece of our study is in constructing primary data on residence-based access, 570 by public transportation and walking, to parks within and around the neighborhood. The 571 starting point for the commute time data starts with enumerating a grid of equal-sized 572 hexagons (H3 hexagonal hierarchical geospatial indexing system) across the island (Fig-573 ure A6). At resolution 9 (H3-9), each cell is approximately 0.11km² (0.04mi²) with average 574 hexagonal side length of 200 meters (656 feet). Each cell has only one-type of neighbor as 575 defined by the centroid-to-centroid euclidean distance (GeoHash rectangles also have ver-576 tex neighbors). In total, there are around 9k H3-9 cells in Singapore (Figure A6). Most of 577 these hexagons overlay with the sea, water catchment, and nature reserves (Figure A7b). 578 Some also overlay with areas with low residential count. We focus on only H3-9 hexag-579 onal grids of overlaying with areas with dense residence—retaining only H3-9 hexagons 580 where their centroid falls within planning areas with at least 10,000 residents (unless 581 the planning area is central), and within subzones with at least 5,000 residents (unless 582 the subzone is central). This yields the 2.4k cells (Figure A7b). From this, we get around 583 2.87 million pairs of H3-9 cells. We then query HERE Technologies to get commute time 584 between each of the 2.87 million hexagon-pairs. From this, we can characterize walk-585 ing and public transit accessibility for any given point (map to a hexagon). Figure A8 586 illustrates disparities in travel time at 20, 40, and 60 minutes (the columns) for three 587 different points (the rows). 588



(a) Grid of selected hexagons overlaid with buildings and roads



(b) Grid of selected hexagons overlaid with non-residential areas **Figure A7** [Grid of hexagon cells. Each cell is ~ 0.11 km². Subfigure (a) shows buildings and road networks (from official and publicly-available vectors) as built environment. Subfigure (b) shows nature reserves, water bodies, and water catchment areas (from official and publicly-available vectors) with white areas mostly as non-residential spaces.



(g) Dhoby Ghaut–20 mins (h) Dhoby Ghaut–40 mins (i) Dhoby Ghaut–60 mins Figure A8 Illustration: Travel time for three points of origin. Rows one and two are for two residential points. Row three shows the Dhoby Ghaut MRT, one of the most connected transit station, for comparison.

Age-based caregiving and involvement



Age of child (in years) at PCQ administration **Figure A9** Distribution of child's age in years at administrative date of the Primary Caregiver Questionnaires (PCQ) for the caregiving/parental engagement fields. Each subfigure corresponds to one of the three waves from Years 4–6. Child's age is precisely computed from taking time deltas (units in days) of child's birth date and survey administrative date. Wave sample size (n) indicated on top right. Common axis scales.



Figure A10 Distribution of child's age in years at administrative date of the Primary Caregiver Questionnaires (PCQ) for percentage of time the child spends with parents. Each subfigure corresponds to one of the four waves from Years 7–10. Child's age is precisely computed from taking time deltas (units in days) of child's birth date and survey administrative date. Wave sample size (n) indicated on top right. Common axis scales.


Figure A11 [Grid of histograms of child's age at closest record of caregiver field, by year. Each subfigure shows the distribution of the child's age at the Primary Caregiver Questionnaire (PCQ) administrative date with non-missing *caregiver* field (who is the caregiver?) closest to the child's birth date at the year indicated in the corresponding caption. The precise method to link caregiving fields (not the caregiving survey waves) with each year *y* of the child's age involves:

$$m_y = m_{w^*} \quad s.t. \quad w^* = \arg\min|y - A_w|,$$
 (A2)

where m is a caregiver modifier, $y \in \{0, \dots, 10\}$ is the year, A_w is the precise age of the child in years when the caregiving survey was administered, and $w \in \{4, \dots, 10\}$. Common axis scales.



Figure A12 Grid of histograms of child's age at closest record of caregiver field, by year. Each subfigure shows the distribution of the child's age at the Primary Caregiver Questionnaire (PCQ) administrative date with non-missing *parental involvement* fields (e.g., who plays with child most often?) closest to the child's birth date at the year indicated in the corresponding caption. The precise method to link caregiving fields (not the caregiving survey waves) with each year *y* of the child's age involves:

$$m_y = m_{w^*} \quad s.t. \quad w^* = \arg\min_w |y - A_w|,$$
 (A3)

where *m* is a caregiver modifier, $y \in \{0, \dots, 10\}$ is the year, A_w is the precise age of the child in years when the caregiving survey was administered, and $w \in \{4, 5.6\}$. Common axis scales.

Concordance in paternal caregiving and involvement

We also examine the extent of agreement among fathers in the five caregiving modifiers $_{591}$ (Table 2) in Appendix A. The major underlying common denominator is taking the child $_{592}$ on unstructured outings (Figure A14). 168 children in the sample (N = 429) have fathers $_{593}$ who take their children out on unstructured outings. In comparison, the next most $_{594}$ common paternal engagement is playing with the child (n = 117). Paternal involvement $_{595}$ in unstructured outings coincides the most with the other four activities, with n = 112 $_{596}$ (67% of 168) also being engaged in at least one of the other four.

590

Otherwise, we observe no strong patterns of coincidence in the five indicators. Fathers reported as engaged in any one of the five activities do not necessarily indicate participation in the others. Only n = 129 (31.2% of those reporting at least one) have at least two indicators reported at Year 5 (Figure A14). Overall, we observe scant evidence of reporting biases inflating the degree of paternal involvement in the child's day-to-day activities.



Figure A13|Obseravtions are stacked across waves 7–10 of the GUSTO Primary Caregiver Questionnaire (PCQ) surveys. See also Figure A10.

(1)	(2)	(3)	(4)
Both parents	Father only	Mother only	Neither parents
4 (0.93%)	21 (4.90%)	288 (67.13%)	123 (28.67%)
4 (0.93%)	21 (4.90%)	288 (67.13%)	123 (28.67%)
4 (0.93%)	21 (4.90%)	288 (67.13%)	123 (28.67%)
4 (0.93%)	21 (4.90%)	288 (67.13%)	123 (28.67%)
4 (0.93%)	21 (4.90%)	288 (67.13%)	123 (28.67%)
0 (0.00%)	15 (3.50%)	310 (72.26%)	103 (24.01%)
0 (0.00%)	9 (2.10%)	313 (72.96%)	106 (24.71%)
0 (0.00%)	9 (2.10%)	344 (80.19%)	75 (17.48%)
0 (0.00%)	9 (2.10%)	347 (80.89%)	72 (16.78%)
0 (0.00%)	14 (3.26%)	349 (81.35%)	65 (15.15%)
0 (0.00%)	21 (4.90%)	340 (79.25%)	67 (15.62%)
	 (1) Both parents 4 (0.93%) 4 (0.93%) 4 (0.93%) 4 (0.93%) 4 (0.93%) 0 (0.00%) 	(1)(2)Both parentsFather only4 (0.93%)21 (4.90%)4 (0.93%)21 (4.90%)4 (0.93%)21 (4.90%)4 (0.93%)21 (4.90%)4 (0.93%)21 (4.90%)0 (0.00%)15 (3.50%)0 (0.00%)9 (2.10%)0 (0.00%)9 (2.10%)0 (0.00%)9 (2.10%)0 (0.00%)14 (3.26%)0 (0.00%)21 (4.90%)	(1)(2)(3)Both parentsFather onlyMother only4 (0.93%)21 (4.90%)288 (67.13%)4 (0.93%)21 (4.90%)288 (67.13%)4 (0.93%)21 (4.90%)288 (67.13%)4 (0.93%)21 (4.90%)288 (67.13%)4 (0.93%)21 (4.90%)288 (67.13%)0 (0.00%)15 (3.50%)310 (72.26%)0 (0.00%)9 (2.10%)313 (72.96%)0 (0.00%)9 (2.10%)344 (80.19%)0 (0.00%)14 (3.26%)349 (81.35%)0 (0.00%)21 (4.90%)340 (79.25%)

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Table A2 | Coincidence in which parent is the primary caregiver to the child.

Notes: Table reports whether both parents (1), only the father (2), only the mother (3), or neither parents (4), are reported as the primary caregiver across the years in the sample (N = 492). Parentheses report the count as a percentage of the sample (N = 492).



Figure A14 [Concordance in paternal involvement indicators at Year 5. Panel (a) reports concordance across the five parental involvement indicators for fathers (see Table 2). The lower panel indicates (i) the involvement indicators, (ii) the total number of fathers indicated (e.g., 168 fathers take the child on unstructured outings the most often), and (iii) various intersecting sets (e.g., 40 fathers both play with their child the most often and takes the child on unstructured outings the most often). Panel (b) reports the pooled version of concordance, with the sample size of fathers with at least 1, 2, ..., 5 of the involvement indicators coded as True. Percentages in the parentheses have n = 413 as the base (for the participants in the CD-RISC sample with at least one of the five paternal engagement indicated as True). See also Figures A15 to A19.



Figure A15 | Concordance in the "Primary Caregiver" indicator (Table 2) across years. Only years in which the indicator is originally available are shown. See Figure A14 for concordance in the involvement indicators within Year 5.



At Least 1 True At Least 2 True At Least 3 True At Least 4 True (b) Pooled years Figure A16 | Concordance in the "Bathe/shower" indicator (Table 2) across years. Only years in which the indicator is originally available are shown. See Figure A14 for concordance in the involvement indicators within Year 5.



At Least 1 True At Least 2 True At Least 3 True (b) Pooled years Figure A17 | Concordance in the "Play" indicator (Table 2) across years. Only years in which the indicator is originally available are shown. See Figure A14 for concordance in the involvement indicators within Year 5.



At Least 1 True At Least 2 True At Least 3 True (b) Pooled years Figure A18 | Concordance in the "Unstructured outing" indicator (Table 2) across years. Only years in which the indicator is originally available are shown. See Figure A14 for concordance in the involvement indicators within Year 5.



At Least 1 True At Least 2 True At Least 3 True (b) Pooled years Figure A19|Concordance in the "Schoolwork" indicator (Table 2) across years. Only years in which the indicator is originally available are shown. See Figure A14 for concordance in the involvement indicators within Year 5.

Census and study population



(a) Correlation between GUSTO participants and census-based population numbers



Figure A20 Correlation between the number of GUSTO participants with the number of census-based women of the same age at the planning area level. Panel (a) also reports the the bootstrapped (with replacement) confidence interval for the correlation coefficient (n = 10,000). Ten bins represent ten equal-interval bins of the planning areas by size of census female population aged 20–50. Solid vertical lines are standard deviations of the number of GUSTO participants in each bin. Panel (b) plots all bootstrapped correlation coefficients. Dashed vertical lines are the lower and upper limit of the bootstrapped confidence interval.



(a) Correlation between GUSTO participants and census-based population numbers



Figure A21 Correlation between the number of GUSTO participants with the number of census-based women of the same age at the subzone (neighborhood) level. Panel (a) also reports the the bootstrapped (with replacement) confidence interval for the correlation coefficient (n = 10,000). Ten bins represent ten equal-interval bins of the subzones by size of census female population aged 20–50. Solid vertical lines are standard deviations of the number of GUSTO participants in each bin. Panel (b) plots all bootstrapped correlation coefficients. Dashed vertical lines are the lower and upper limit of the bootstrapped confidence interval.

B. Supplementary Tables & Figures of Main Results

Table DI [Dabei	ine ass	Sciation.	Detwee		ube un	uranc	, within	10 1111	iute of	conden	
	(1)	(2)	(3)	(4)	(5)	(6)	(7)	(8)	(9)	(10)	(11)
				Outco	me variable:	Resilience (C	D-RISC) at Y	ear 10			
			Parl	ks within 15-	minute of res	idence based	l on residenti	ial record at y	/ear:		
	YO	Y1	Y2	Y3	Y4	Y5	Y6	Y7	Y8	Y9	Y10
Parks within 15-min	0.23^{b}	0.18^{c}	0.08	0.08	0.08	0.08	0.09	0.09	0.05	0.04	0.02
	(0.10)	(0.10)	(0.10)	(0.12)	(0.12)	(0.12)	(0.12)	(0.13)	(0.12)	(0.12)	(0.12)
	[0.02 - 0.43]	[-0.03 - 0.39]	[-0.14 - 0.29]	[-0.17 - 0.33]	[-0.16 - 0.32]	[-0.15 - 0.32]	[-0.16 - 0.34]	[-0.17 - 0.35]	[-0.20-0.30]	[-0.21 - 0.28]	[-0.22-0.27]
			< p=0.48>			< p=0.49>	< p=0.46>			< p=0.75>	< p=0.87>
R^2	0.440	0.432	0.443	0.438	0.489	0.442	0.407	0.445	0.471	0.482	0.501
Baseline (mother)	Х	х	х	х	х	Х	Х	х	х	Х	х
Baseline (child)	Х	х	х	х	х	Х	Х	х	х	Х	х
Areal effects: Neighborhood	Х	х	х	х	х	Х	х	х	х	х	х
Mean of outcome	59.9	59.9	59.9	59.9	59.8	59.8	59.9	59.9	59.9	59.9	59.9
Std. dev. X	11.6	11.7	11.9	12.0	11.2	11.2	11.3	10.7	10.7	10.5	10.5
Clusters	29	29	28	28	28	28	28	29	30	30	30
N	400	399	400	402	402	403	405	407	406	404	403

Table B1	Baseline	association	between	CD-RISC	and Parks	within	15-minute	of residence.
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Note: Table reports baseline associations between CD-RISC (always at Year 10) and Parks within 15-minute of residence based on residence at different age of the child. See Figure 4 for an alternate visualization of the estimated coefficients across years. Other variables are not reported for brevity. Maternal baselines include (i) mother age at delivery (quadratic), (ii) ethnicity, (iii) mother university degree, (iv) occupation, and (v) public housing. Child baselines include child's sex, age at time of CD-RISC collection (in years), birth order, and employment of domestic helper. Standard errors are clustered at planning areas. Parentheses: standard errors. Square brackets: 95% confidence intervals. Angle brackets: p-values. Significance levels: ^c 0.1 ^b 0.05 ^a 0.01.

Table B2 | Differences in association between CD-RISC and Parks within 15-minute of residence, by Father as the Primary Caregiver.

	-	-									
	(1)	(2)	(3)	(4)	(5)	(6)	(7)	(8)	(9)	(10)	(11)
				Ou	tcome variable	e: Resilience (CD-RISC) at Ye	ar 10			
			:	Parks within	15-minute of r	esidence base	d on residentia	al record at ye	ar:		
	YO	Y1	Y2	Y3	Y4	Y5	Y6	Y7	Y8	Y9	Y10
Parks within 15-min	0.21 ^c	0.16	0.06	0.08	0.07	0.08	0.08	0.08	0.05	0.05	0.05
	(0.10)	(0.10)	(0.11)	(0.11)	(0.12)	(0.11)	(0.12)	(0.13)	(0.12)	(0.11)	(0.10)
	[-0.01-0.42]	[-0.05-0.38]	[-0.16-0.28]	[-0.15-0.32]	[-0.17-0.31]	[-0.15 - 0.30]	[-0.17-0.32]	[-0.18-0.33]	[-0.19-0.28]	[-0.18 - 0.27]	[-0.16-0.26]
Caregiver modifier	-11.81^{c}	-11.48^{c}	-4.03	-1.55	-1.39	-10.98	-5.95	5.11	-33.21^{c}	-1.28	1.32
	(6.18)	(6.30)	(6.82)	(4.89)	(7.32)	(8.10)	(8.26)	(13.88)	(18.75)	(20.82)	(7.45)
	[-24.47-0.86]	[-24.39 - 1.44]	[-18.02 - 9.96]	[-11.58 - 8.47]	[-16.40 - 13.62]	[-27.60-5.65]	[-22.89 - 10.99]	[-23.32 - 33.53]	[-71.56-5.14]	[-43.87 - 41.30]	[-13.91 - 16.55]
(Parks within 15-min) × (Caregiver modifier)	1.17^{b}	1.15^{b}	0.27	-0.03	0.32	0.29	0.78	0.31	1.86^{b}	-0.08	-0.36
	(0.51)	(0.52)	(0.69)	(0.59)	(0.46)	(0.44)	(0.52)	(0.65)	(0.76)	(0.85)	(0.31)
	[0.12 - 2.22]	[0.09 - 2.21]	[-1.15-1.69]	[-1.24 - 1.19]	[-0.63 - 1.27]	[-0.62 - 1.19]	[-0.28 - 1.84]	[-1.02-1.64]	[0.31 - 3.41]	[-1.82 - 1.66]	[-1.00-0.27]
						< p=0.52>				< p=0.93>	
R ²	0.447	0.439	0.444	0.438	0.491	0.446	0.411	0.450	0.481	0.483	0.505
Baseline (mother)	х	х	х	х	х	х	х	х	х	х	х
Baseline (child)	х	х	х	х	х	х	х	х	х	х	х
Areal effects: Neighborhood	х	х	х	х	х	х	х	х	х	х	х
Mean of outcome	59.9	59.9	59.9	59.9	59.8	59.8	59.9	59.9	59.9	59.9	59.9
Std. dev. X	11.6	11.7	11.9	12.0	11.2	11.2	11.3	10.7	10.7	10.5	10.5
$N(Modifier^* = 1)$	18	18	18	18	18	14	9	9	9	14	21
Clusters	29	29	28	28	28	28	28	29	30	30	30
N	400	200	400	40.9	409	40.2	405	407	406	40.4	40.9

Note: Caregiver modifier is: Father as the Primary Caregiver. Baseline associations are between CD-RISC (always at Year 10) and Parks within 15-minute of residence based on residence at different age of the child. See Figure 5 for an alternate visualization of the estimated coefficients across years. Other variables are not reported for brevity. Maternal baselines include (i) mother age at delivery (quadratic), (ii) ethnicity, (iii) mother university degree, (iv) occupation, and (v) public housing. Child baselines include child's sex, age at time of CD-RISC collection (in years), birth order, and employment of domestic helper. Standard errors are clustered at planning areas. Parentheses: standard errors. Square brackets: 95% confidence intervals. Angle brackets: p-values. Significance levels: ^c 0.1 ^b 0.05 ^a 0.01.

Table B3 Differences in associ	ation between CD-F	RISC and Parks	within 15-m	inute of resid	dence,
by Mother as the Primary Care	giver.				

	(1)	(2)	(3)	(4)	(5)	(6)	(7)	(8)	(9)	(10)	(11)
				Outc	ome variable:	Resilience (O	CD-RISC) at Y	ear 10			
			Pa	rks within 15	5-minute of re	sidence base	d on residenti	al record at yea	r:		
	YO	Y1	Y2	Y3	Y4	Y5	Y6	Y7	Y8	Y9	Y10
Parks within 15-min	0.20	0.11	-0.13	-0.11	0.03	0.01	-0.03	-0.33^{b}	-0.26	-0.12	0.00
	(0.23)	(0.24)	(0.18)	(0.19)	(0.20)	(0.20)	(0.14)	(0.14)	(0.19)	(0.14)	(0.30)
	[-0.27-0.68]	[-0.37 - 0.60]	[-0.50-0.25]	[-0.50-0.28]	[-0.38-0.44]	[-0.40-0.42]	[-0.31 - 0.25]	[-0.62 - 0.04]	[-0.65-0.13]	[-0.41-0.18]	[-0.62-0.63]
Caregiver modifier	-1.31	-2.09	-4.66	-5.38	-1.20	1.02	-0.91	-8.94^{a}	-4.47	1.04	-1.07
	(4.75)	(4.86)	(4.82)	(4.44)	(4.80)	(4.73)	(3.71)	(3.21)	(4.67)	(4.25)	(3.91)
	[-11.04 - 8.41]	[-12.05 - 7.87]	[-14.55 - 5.23]	[-14.49 - 3.73]	[-11.06 - 8.66]	[-8.69 - 10.73]	[-8.53-6.71]	[-15.51 - 2.37]	[-14.01 - 5.07]	[-7.65 - 9.73]	[-9.06-6.92]
(Parks within 15-min) × (Caregiver modifier)	0.03	0.10	0.31	0.28	0.08	0.11	0.18	0.55^{a}	0.44^{b}	0.22	0.02
	(0.25)	(0.26)	(0.23)	(0.22)	(0.25)	(0.21)	(0.12)	(0.15)	(0.21)	(0.18)	(0.25)
	[-0.48 - 0.55]	[-0.43 - 0.64]	[-0.15 - 0.78]	[-0.17 - 0.72]	[-0.43 - 0.59]	[-0.33 - 0.55]	[-0.07-0.42]	[0.26 - 0.85]	[0.01 - 0.87]	[-0.14 - 0.59]	[-0.49 - 0.53]
			< p=0.18>	< p=0.21>	< p=0.75>	< p=0.63>	< p=0.15>			< p=0.22>	< p=0.93>
R ²	0.441	0.433	0.449	0.445	0.490	0.445	0.410	0.460	0.481	0.490	0.501
Baseline (mother)	х	х	Х	Х	х	х	х	х	х	х	х
Baseline (child)	X	х	Х	Х	Х	х	х	х	х	X	х
Areal effects: Neighborhood	х	х	Х	Х	х	х	х	х	х	х	х
Mean of outcome	59.9	59.9	59.9	59.9	59.8	59.8	59.9	59.9	59.9	59.9	59.9
Std. dev. X	11.6	11.7	11.9	12.0	11.2	11.2	11.3	10.7	10.7	10.5	10.5
$N(Modifier^* = 1)$	269	268	268	270	270	291	297	327	330	330	320
Clusters	29	29	28	28	28	28	28	29	30	30	30
N	400	399	400	402	402	403	405	407	406	404	403

Note: Caregiver modifier is: Mother is the Primary Caregiver. Baseline associations are between CD-RISC (always at Year 10) and Parks within 15-minute of residence based on residence at different age of the child. See Figure 5 for an alternate visualization of the estimated coefficients across years. Other variables are not reported for brevity. Maternal baselines include (i) mother age at delivery (quadratic), (ii) ethnicity, (iii) mother university degree, (iv) occupation, and (v) public housing. Child baselines include child's sex, age at time of CD-RISC collection (in years), birth order, and employment of domestic helper. Standard errors are clustered at planning areas. Parentheses: standard errors. Square brackets: 95% confidence intervals. Angle brackets: p-values. Significance levels: ^{*c*} 0.1 ^{*b*} 0.05 ^{*a*} 0.01.

Table B4 | Differences in association between CD-RISC and Parks within 15-minute of residence, by Father bathes/shower child most often.

-											
	(1)	(2)	(3)	(4)	(5)	(6)	(7)	(8)	(9)	(10)	(11)
				Outco	me variable: R	esilience (CD-	RISC) at Year	10			
			Par	ks within 15-	minute of resid	lence based or	n residential r	ecord at year:			
	YO	Y1	Y2	Y3	Y4	Y5	Y6	¥7	Y8	Y9	Y10
Parks within 15-min	0.16	0.12	0.03	0.05	0.10	0.11	0.12	0.10	0.07	0.06	0.05
	(0.12)	(0.12)	(0.10)	(0.12)	(0.12)	(0.11)	(0.15)	(0.13)	(0.12)	(0.12)	(0.12)
	[-0.08 - 0.40]	[-0.13 - 0.36]	[-0.17 - 0.23]	[-0.19 - 0.28]	[-0.15 - 0.34]	[-0.12 - 0.35]	[-0.19-0.43]	[-0.16 - 0.36]	[-0.17 - 0.32]	[-0.18 - 0.31]	[-0.20-0.29]
Caregiver modifier	-9.33^{b}	-9.52^{b}	-7.57^{c}	-6.25	-1.88	2.13	-1.45	0.62	4.29	4.45	4.48
-	(4.13)	(4.28)	(4.23)	(4.53)	(5.80)	(4.41)	(6.17)	(5.69)	(6.02)	(5.87)	(5.89)
	[-17.79 - 0.87]	[-18.29 - 0.76]	[-16.26 - 1.11]	[-15.54 - 3.05]	[-13.78 - 10.03]	[-6.92 - 11.18]	[-14.10 - 11.20]	[-11.03 - 12.27]	[-8.02 - 16.59]	[-7.55 - 16.45]	[-7.56 - 16.52]
(Parks within 15-min) × (Caregiver modifier)	0.49^{b}	0.52^{b}	0.39^{b}	0.29	-0.03	-0.12	0.00	-0.05	-0.14	-0.13	-0.12
-	(0.18)	(0.19)	(0.17)	(0.18)	(0.25)	(0.27)	(0.26)	(0.23)	(0.23)	(0.23)	(0.24)
	[0.11-0.87]	[0.13-0.90]	[0.04-0.73]	[-0.08-0.67]	[-0.55-0.50]	[-0.67-0.44]	[-0.53-0.53]	[-0.52 - 0.42]	[-0.60-0.33]	[-0.61-0.35]	[-0.60-0.36]
R ²	0.451	0.444	0.451	0.443	0.491	0.443	0.411	0.448	0.474	0.485	0.504
Baseline (mother)	Х	х	х	х	х	х	х	х	х	х	х
Baseline (child)	Х	х	х	х	х	х	х	х	х	х	х
Areal effects: Neighborhood	Х	х	х	х	х	х	х	х	х	х	х
Mean of outcome	59.9	59.9	59.9	59.9	59.8	59.8	59.9	59.9	59.9	59.9	59.9
Std. dev. X	11.6	11.7	11.9	12.0	11.3	11.3	11.3	10.7	10.7	10.6	10.5
$N(Modifier^* = 1)$	45	45	46	47	47	50	50	34	35	35	35
Clusters	29	29	28	28	28	28	28	29	30	30	30
N	398	397	398	400	400	401	403	405	404	402	401

Note: Caregiver modifier is: Father bathes/showers child or keeps child company during bath/shower most often. Baseline associations are between CD-RISC (always at Year 10) and Parks within 15-minute of residence based on residence at different age of the child. See Figure 6 for an alternate visualization of the estimated coefficients across years. Other variables are not reported for brevity. Maternal baselines include (i) mother age at delivery (quadratic), (ii) ethnicity, (iii) mother university degree, (iv) occupation, and (v) public housing. Child baselines include child's sex, age at time of CD-RISC collection (in years), birth order, and employment of domestic helper. Standard errors are clustered at planning areas. Parentheses: standard errors. Square brackets: 95% confidence intervals. Angle brackets: p-values. Significance levels: $^{\circ} 0.1^{b} 0.05^{a} 0.01$.

Table B5 | Differences in association between CD-RISC and Parks within 15-minute of residence, by Mother bathes/shower child most often.

	(1)	(2)	(3)	(4)	(5)	(6)	(7)	(8)	(9)	(10)	(11)
				Oute	come variable	: Resilience	(CD-RISC) at Yea	ar 10			
	-		Pa	arks within 15	5-minute of r	esidence bas	ed on residentia	l record at ye	ar:		
	YO	Y1	Y2	Y3	Y4	Y5	Y6	Y7	Y8	Y9	Y10
Parks within 15-min	0.21^{b}	0.15	0.04	-0.01	0.02	0.18	-0.07	0.01	-0.03	-0.05	-0.04
	(0.09)	(0.10)	(0.14)	(0.16)	(0.15)	(0.20)	(0.19)	(0.20)	(0.20)	(0.19)	(0.18)
	[0.02 - 0.40]	[-0.05-0.34]	[-0.25-0.32]	[-0.32 - 0.31]	[-0.29-0.34]	[-0.22 - 0.59]	[-0.47 - 0.33]	[-0.40-0.43]	[-0.44 - 0.39]	[-0.44 - 0.34]	[-0.42 - 0.33]
Caregiver modifier	-1.06	-1.89	-2.64	-4.71^{c}	-3.18	1.92	-6.97^{a}	-2.40	-1.76	-0.65	0.78
	(3.18)	(3.14)	(2.94)	(2.62)	(3.20)	(2.96)	(2.45)	(3.86)	(4.33)	(4.05)	(4.12)
	[-7.58-5.46]	[-8.31 - 4.54]	[-8.68 - 3.39]	[-10.09 - 0.67]	[-9.75 - 3.38]	[-4.14 - 7.99]	[-12.00 - 1.95]	[-10.31 - 5.51]	[-10.62 - 7.09]	[-8.93 - 7.63]	[-7.65 - 9.22]
(Parks within 15-min) × (Caregiver modifier)	0.02	0.06	0.07	0.15	0.12	-0.21	0.32	0.22	0.22	0.23	0.15
	(0.19)	(0.19)	(0.16)	(0.15)	(0.20)	(0.28)	(0.25)	(0.30)	(0.30)	(0.28)	(0.27)
	[-0.37-0.40]	[-0.32-0.44]	[-0.27-0.40]	[-0.15-0.45]	[-0.30-0.54]	[-0.79-0.36]	[-0.18 - 0.83]	[-0.39-0.83]	[-0.39-0.82]	[-0.35-0.82]	[-0.39-0.69]
			< p=0.69>		< p=0.57>	< p=0.45>		< p=0.46>	< p=0.47>	< p=0.42>	< p=0.58>
R ²	0.441	0.433	0.445	0.444	0.492	0.445	0.421	0.451	0.475	0.489	0.507
Baseline (mother)	х	х	х	х	х	х	Х	х	х	х	х
Baseline (child)	х	х	х	х	х	х	Х	х	х	х	х
Areal effects: Neighborhood	х	х	х	х	х	х	Х	х	х	х	х
Mean of outcome	59.9	59.9	59.9	59.9	59.8	59.8	59.9	59.9	59.9	59.9	59.9
Std. dev. X	11.6	11.7	11.9	12.0	11.3	11.3	11.3	10.7	10.7	10.6	10.5
$N(Modifier^* = 1)$	248	248	247	248	247	235	228	143	142	141	141
Clusters	29	29	28	28	28	28	28	29	30	30	30
N	398	397	398	400	400	401	403	405	404	402	401

Note: Caregiver modifier is: Mother bathes/showers child or keeps child company during bath/shower most often. Baseline associations are between CD-RISC (always at Year 10) and Parks within 15-minute of residence based on residence at different age of the child. See Figure 6 for an alternate visualization of the estimated coefficients across years. Other variables are not reported for brevity. Maternal baselines include (i) mother age at delivery (quadratic), (ii) ethnicity, (iii) mother university degree, (iv) occupation, and (v) public housing. Child baselines include child's sex, age at time of CD-RISC collection (in years), birth order, and employment of domestic helper. Standard errors are clustered at planning areas. Parentheses: standard errors. Square brackets: 95% confidence intervals. Angle brackets: p-values. Significance levels: c 0.1 b 0.05 a 0.01.

Table B6|Differences in association between CD-RISC and Parks within 15-minute of residence, by Father plays with child most often.

	(1)	(2)	(3)	(4)	(5)	(6)	(7)	(8)	(9)	(10)	(11)
				Outco	ome variable:	Resilience (C	D-RISC) at Y	ear 10			
			Par	ks within 15-	minute of re	sidence based	l on residenti	al record at y	ear:	-	
	YO	Y1	Y2	Y3	Y4	Y5	Y6	Y7	Y8	Y9	Y10
Parks within 15-min	0.12	0.09	-0.00	0.01	0.05	0.16	0.14	0.11	0.11	0.09	0.07
	(0.12)	(0.12)	(0.11)	(0.12)	(0.11)	(0.14)	(0.14)	(0.15)	(0.17)	(0.17)	(0.16)
	[-0.12 - 0.35]	[-0.15 - 0.34]	[-0.23-0.23]	[-0.25-0.26]	[-0.18 - 0.28]	[-0.12-0.43]	[-0.14-0.42]	[-0.20-0.42]	[-0.25-0.46]	[-0.26-0.44]	[-0.25-0.40]
Caregiver modifier	-5.50	-3.84	-3.84	-3.54	-2.01	3.87	3.88	1.96	5.24	4.52	2.69
	(3.24)	(3.22)	(3.31)	(3.43)	(3.35)	(2.32)	(4.65)	(3.99)	(4.01)	(4.19)	(4.56)
	[-12.14 - 1.14]	[-10.43 - 2.76]	[-10.62 - 2.95]	[-10.58 - 3.50]	[-8.89 - 4.87]	[-0.88 - 8.63]	[-5.66 - 13.43]	[-6.22 - 10.14]	[-2.97 - 13.45]	[-4.05 - 13.09]	[-6.63 - 12.01]
(Parks within 15-min) \times (Caregiver modifier)	0.26	0.17	0.22	0.18	0.07	-0.23	-0.20	-0.09	-0.28	-0.25	-0.13
	(0.16)	(0.17)	(0.21)	(0.20)	(0.23)	(0.19)	(0.27)	(0.24)	(0.28)	(0.29)	(0.30)
	[-0.07-0.59]	[-0.18 - 0.53]	[-0.22 - 0.66]	[-0.24 - 0.60]	[-0.39-0.54]	[-0.61-0.15]	[-0.75-0.35]	[-0.59-0.41]	[-0.85 - 0.28]	[-0.85 - 0.35]	[-0.75-0.48]
						< p=0.23>	< p=0.46>	< p=0.72>		< p=0.40>	
R ²	0.457	0.447	0.456	0.449	0.499	0.451	0.417	0.456	0.485	0.496	0.517
Baseline (mother)	х	х	х	х	х	х	х	х	х	х	х
Baseline (child)	X	х	X	х	х	х	х	х	Х	х	х
Areal effects: Neighborhood	X	х	X	х	х	х	х	х	Х	х	х
Mean of outcome	60.1	60.1	60.0	60.0	60.0	60.0	60.1	60.1	60.1	60.1	60.1
Std. dev. X	11.6	11.7	12.0	12.0	11.3	11.3	11.4	10.7	10.8	10.6	10.6
$N(Modifier^* = 1)$	100	100	101	102	102	114	99	100	100	99	99
Clusters	29	29	28	28	28	28	28	29	30	30	30
N	207	0.07	0.077	200	200	200	200	20.4	202	201	200

Note: Caregiver modifier is: Father plays with child most of the time. Baseline associations are between CD-RISC (always at Year 10) and Parks within 15-minute of residence based on residence at different age of the child. See Figure 7 for an alternate visualization of the estimated coefficients across years. Other variables are not reported for brevity. Maternal baselines include (i) mother age at delivery (quadratic), (ii) ethnicity, (iii) mother university degree, (iv) occupation, and (v) public housing. Child baselines include child's sex, age at time of CD-RISC collection (in years), birth order, and employment of domestic helper. Standard errors are clustered at planning areas. Parentheses: standard errors. Square brackets: 95% confidence intervals. Angle brackets: p-values. Significance levels: c 0.1 b 0.05 a 0.01.

Table B7 | Differences in association between CD-RISC and Parks within 15-minute of residence, by Mother plays with child most often.

	(1)	(2)	(3)	(4)	(5)	(6)	(7)	(8)	(9)	(10)	(11)
				Outco	ome variable:	Resilience (CD-RISC) at Y	ear 10			
			Par	ks within 15	minute of re	sidence base	d on residenti	al record at y	ear:		
	YO	Y1	Y2	Y3	Y4	Y5	Y6	¥7	Y8	Y9	Y10
Parks within 15-min	0.22	0.16	0.16	0.12	0.12	-0.01	-0.16	-0.15	-0.20	-0.12	-0.16
	(0.13)	(0.15)	(0.16)	(0.17)	(0.16)	(0.16)	(0.20)	(0.19)	(0.19)	(0.22)	(0.19)
	[-0.06-0.49]	[-0.15-0.46]	[-0.17 - 0.50]	[-0.22-0.47]	[-0.20-0.44]	[-0.34 - 0.32]	[-0.56-0.24]	[-0.54-0.24]	[-0.58-0.19]	[-0.56-0.32]	[-0.54 - 0.23]
Caregiver modifier	3.40	3.28	5.18 ^c	2.75	3.30	0.25	-4.92	-4.16	-3.30	-1.25	-2.24
	(2.79)	(2.84)	(2.85)	(3.02)	(2.96)	(2.62)	(3.87)	(3.90)	(3.43)	(3.98)	(4.07)
	[-2.32-9.12]	[-2.54 - 9.10]	[-0.66 - 11.02]	[-3.44 - 8.95]	[-2.77 - 9.36]	[-5.13-5.64]	[-12.85 - 3.01]	[-12.15 - 3.84]	[-10.31 - 3.72]	[-9.40-6.90]	[-10.58 - 6.09]
(Parks within 15-min) × (Caregiver modifier)	-0.07	-0.05	-0.21	-0.12	-0.10	0.11	0.40^{b}	0.39^{b}	0.39^{b}	0.26	0.32^{c}
	(0.17)	(0.18)	(0.20)	(0.17)	(0.18)	(0.17)	(0.16)	(0.15)	(0.14)	(0.18)	(0.17)
	[-0.42 - 0.27]	[-0.42 - 0.32]	[-0.62 - 0.20]	[-0.46 - 0.23]	[-0.46 - 0.26]	[-0.24 - 0.46]	[0.07 - 0.74]	[0.08 - 0.70]	[0.10 - 0.68]	[-0.12 - 0.63]	[-0.02 - 0.66]
	< p=0.67>	< p=0.79>	< p=0.31>	< p=0.49>	< p=0.58>		< p=0.02>		< p=0.01>	< p=0.18>	
R ²	0.455	0.447	0.458	0.448	0.501	0.450	0.423	0.463	0.489	0.498	0.522
Baseline (mother)	х	X	Х	X	х	х	х	х	х	х	х
Baseline (child)	х	X	Х	X	х	х	х	х	х	х	х
Areal effects: Neighborhood	х	х	X	х	х	х	х	х	X	х	x
Mean of outcome	60.1	60.1	60.0	60.0	60.0	60.0	60.1	60.1	60.1	60.1	60.1
Std. dev. X	11.6	11.7	12.0	12.0	11.3	11.3	11.4	10.7	10.8	10.6	10.6
$N(Modifier^* = 1)$	217	217	218	219	222	238	248	249	249	248	247
Clusters	29	29	28	28	28	28	28	29	30	30	30
N	387	387	387	389	389	390	392	394	393	391	390

Note: Caregiver modifier is: Mother plays with child most of the time. Baseline associations are between CD-RISC (always at Year 10) and Parks within 15-minute of residence based on residence at different age of the child. See Figure 7 for an alternate visualization of the estimated coefficients across years. Other variables are not reported for brevity. Maternal baselines include (i) mother age at delivery (quadratic), (ii) ethnicity, (iii) mother university degree, (iv) occupation, and (v) public housing. Child baselines include child's sex, age at time of CD-RISC collection (in years), birth order, and employment of domestic helper. Standard errors are clustered at planning areas. Parentheses: standard errors. Square brackets: 95% confidence intervals. Angle brackets: p-values. Significance levels: a 0.1 b 0.05 a 0.01.

Table B8|Differences in association between CD-RISC and Parks within 15-minute of residence, by Father takes child on unstructured outings most often.

-				-							
	(1)	(2)	(3)	(4)	(5)	(6)	(7)	(8)	(9)	(10)	(11)
				Oute	ome variable	Resilience (CD-RISC) at Y	'ear 10		-	
			Par	rks within 15	-minute of re	sidence base	d on resident	ial record at y	/ear:		
	YO	Y1	Y2	Y3	Y4	Y5	Y6	Y7	Y8	Y9	Y10
Parks within 15-min	0.01	-0.02	-0.07	-0.07	0.02	0.03	0.14	0.13	0.08	0.08	0.08
	(0.11)	(0.11)	(0.11)	(0.12)	(0.11)	(0.16)	(0.16)	(0.17)	(0.16)	(0.16)	(0.16)
	[-0.21-0.24]	[-0.25-0.22]	[-0.30-0.16]	[-0.32-0.19]	[-0.22-0.25]	[-0.29-0.36]	[-0.19-0.46]	[-0.22-0.47]	[-0.26-0.41]	[-0.26-0.41]	[-0.24-0.40]
Caregiver modifier	-4.21	-3.38	-2.50	-3.03	0.55	0.54	5.10	4.90	5.62	6.54^{c}	5.44
	(2.94)	(3.01)	(2.89)	(3.07)	(3.17)	(2.74)	(3.81)	(3.40)	(3.39)	(3.71)	(4.12)
	[-10.23 - 1.80]	[-9.56-2.79]	[-8.43 - 3.42]	[-9.33 - 3.27]	[-5.96-7.06]	[-5.09-6.17]	[-2.73 - 12.92]	[-2.06-11.86]	[-1.31 - 12.54]	[-1.04-14.12]	[-2.98 - 13.85]
(Parks within 15-min) \times (Caregiver modifier)	0.37^{a}	0.31^{b}	0.30^{c}	0.33^{b}	0.12	0.07	-0.12	-0.13	-0.13	-0.15	-0.12
	(0.12)	(0.13)	(0.15)	(0.14)	(0.19)	(0.18)	(0.25)	(0.23)	(0.21)	(0.22)	(0.23)
	[0.12 - 0.62]	[0.04 - 0.59]	[-0.00-0.61]	[0.03 - 0.62]	[-0.27-0.51]	[-0.30-0.44]	[-0.63 - 0.39]	[-0.61-0.34]	[-0.57-0.31]	[-0.60-0.30]	[-0.60-0.35]
		< p=0.03>	< p=0.05>		< p=0.52>	< p=0.69>	< p=0.64>	< p=0.57>		< p=0.51>	
R ²	0.461	0.451	0.460	0.455	0.502	0.449	0.421	0.461	0.488	0.503	0.523
Baseline (mother)	х	х	х	х	х	х	Х	х	х	х	Х
Baseline (child)	х	х	х	х	х	х	X	х	X	X	X
Areal effects: Neighborhood	х	х	х	х	х	х	X	х	X	X	X
Mean of outcome	60.1	60.1	60.0	60.0	60.0	60.0	60.1	60.1	60.1	60.1	60.1
Std. dev. X	11.6	11.7	12.0	12.0	11.3	11.3	11.4	10.7	10.8	10.6	10.6
$N(Modifier^* = 1)$	154	154	152	153	152	161	131	132	132	131	131
Clusters	29	29	28	28	28	28	28	29	30	30	30
N	387	387	387	389	389	390	392	394	393	391	390

Note: Caregiver modifier is: Father takes child on unstructured outings most of the time. Baseline associations are between CD-RISC (always at Year 10) and Parks within 15-minute of residence based on residence at different age of the child. See Figure 8 for an alternate visualization of the estimated coefficients across years. Other variables are not reported for brevity. Maternal baselines include (i) mother age at delivery (quadratic), (ii) ethnicity, (iii) mother university degree, (iv) occupation, and (v) public housing. Child baselines include child's sex, age at time of CD-RISC collection (in years), birth order, and employment of domestic helper. Standard errors are clustered at planning areas. Parentheses: standard errors. Square brackets: 95% confidence intervals. Angle brackets: p-values. Significance levels: $^{a} 0.1^{b} 0.05^{a} 0.01$.

Table B9|Differences in association between CD-RISC and Parks within 15-minute of residence, by Mother takes child on unstructured outings most often.

	(1)	(2)	(3)	(4)	(5)	(6)	(7)	(8)	(9)	(10)	(11)
	-			Outcome	e variable: Resi	ilience (CD-RI	SC) at Year 1	0			
			Parks	s within 15-mi	nute of resider	ice based on i	esidential re	cord at year:			
	YO	Y1	Y2	¥3	Y4	Y5	Y6	Y7	Y8	Y9	Y10
Parks within 15-min	0.44^{a}	0.42^{a}	0.35 ^c	0.30	0.45^{b}	0.32	-0.20	-0.12	-0.18	-0.14	-0.14
	(0.13)	(0.13)	(0.17)	(0.19)	(0.17)	(0.20)	(0.15)	(0.22)	(0.22)	(0.28)	(0.27)
	[0.18 - 0.70]	[0.15 - 0.68]	[-0.00-0.70]	[-0.09-0.70]	[0.09-0.80]	[-0.09-0.74]	[-0.51-0.12]	[-0.57 - 0.33]	[-0.64 - 0.28]	[-0.70-0.43]	[-0.70-0.42]
Caregiver modifier	7.63^{b}	8.53^{a}	6.77^{b}	6.11^{b}	6.76 ^c	2.81	-4.21	-3.24	-3.33	-2.35	-3.10
	(3.14)	(3.01)	(2.75)	(2.88)	(3.66)	(3.64)	(2.78)	(3.09)	(2.66)	(3.64)	(3.81)
	[1.19 - 14.07]	[2.37 - 14.69]	[1.12-12.41]	[0.21 - 12.01]	[-0.74 - 14.27]	[-4.66 - 10.29]	[-9.92 - 1.50]	[-9.56 - 3.08]	[-8.77-2.12]	[-9.79-5.09]	[-10.89 - 4.70]
(Parks within 15-min) × (Caregiver modifier)	-0.40^{b}	-0.44^{a}	-0.40^{b}	-0.34^{b}	-0.45^{a}	-0.30	0.40^{a}	0.28	0.29	0.23	0.25
	(0.16)	(0.15)	(0.16)	(0.16)	(0.16)	(0.22)	(0.13)	(0.20)	(0.18)	(0.25)	(0.26)
	[-0.72 - 0.07]	[-0.75 - 0.14]	[-0.72 - 0.08]	[-0.67 - 0.01]	[-0.78 - 0.13]	[-0.76-0.15]	[0.13 - 0.67]	[-0.12 - 0.68]	[-0.07-0.65]	[-0.28 - 0.74]	[-0.27-0.77]
								< p=0.16>	< p=0.11>	< p=0.37>	< p=0.34>
R ²	0.464	0.459	0.463	0.454	0.508	0.452	0.422	0.458	0.484	0.495	0.518
Baseline (mother)	х	х	х	х	Х	х	х	х	х	х	х
Baseline (child)	х	х	х	х	х	х	х	х	х	х	х
Areal effects: Neighborhood	х	х	х	х	х	х	х	х	х	х	х
Mean of outcome	60.1	60.1	60.0	60.0	60.0	60.0	60.1	60.1	60.1	60.1	60.1
Std. dev. X	11.6	11.7	12.0	12.0	11.3	11.3	11.4	10.7	10.8	10.6	10.6
$N(Modifier^* = 1)$	278	278	279	281	280	287	289	291	290	288	288
Clusters	29	29	28	28	28	28	28	29	30	30	30
N	387	387	387	389	389	390	392	394	393	391	390

Note: Caregiver modifier is: Mother takes child on unstructured outings most of the time. Baseline associations are between CD-RISC (always at Year 10) and Parks within 15-minute of residence based on residence at different age of the child. See Figure 8 for an alternate visualization of the estimated coefficients across years. Other variables are not reported for brevity. Maternal baselines include (i) mother age at delivery (quadratic), (ii) ethnicity, (iii) mother university degree, (iv) occupation, and (v) public housing. Child baselines include child's sex, age at time of CD-RISC collection (in years), birth order, and employment of domestic helper. Standard errors are clustered at planning areas. Parentheses: standard errors. Square brackets: 95% confidence intervals. Angle brackets: p-values. Significance levels: $^{c} 0.1^{b} 0.05^{a} 0.01$.

Table B10 | Differences in association between CD-RISC and Parks within 15-minute of residence, by Father helps with schoolwork, art projects, etc.

	(1)	(2)	(3)	(4)	(5)	(6)	(7)	(8)	(0)	(10)	(11)
		(2)	(0)	(4)	(3)	(0)	(7)	(0)	(3)	(10)	(11)
				Outeo	me variable:	Resilience (C	D-RISC) at Ye	ear 10			
			Par	ks within 15-	minute of res	idence based	on residentia	al record at y	ear:		
	YO	Y1	Y2	Y3	Y4	Y5	Y6	Y7	Y8	Y9	Y10
Parks within 15-min	0.10	0.07	-0.03	-0.03	0.04	0.06	0.13	0.05	0.05	0.04	0.05
	(0.12)	(0.12)	(0.10)	(0.12)	(0.12)	(0.12)	(0.13)	(0.12)	(0.12)	(0.13)	(0.12)
	[-0.15 - 0.36]	[-0.18 - 0.32]	[-0.24-0.18]	[-0.28-0.22]	[-0.20-0.28]	[-0.19-0.31]	[-0.14-0.40]	[-0.20-0.30]	[-0.20-0.31]	[-0.23-0.31]	[-0.20-0.30]
Caregiver modifier	-5.97	-3.53	-6.09	-5.70	-2.75	-2.79	5.71	1.61	3.99	3.33	3.44
	(4.88)	(4.98)	(4.43)	(4.34)	(5.04)	(3.09)	(4.15)	(3.98)	(3.86)	(4.20)	(4.39)
	[-15.98 - 4.03]	[-13.73 - 6.66]	[-15.19 - 3.00]	[-14.61 - 3.21]	[-13.08 - 7.58]	[-9.12 - 3.54]	[-2.80-14.22]	[-6.54 - 9.76]	[-3.91 - 11.88]	[-5.26 - 11.91]	[-5.54-12.43]
(Parks within 15-min) \times (Caregiver modifier)	0.61^{b}	0.41	0.57^{b}	0.52^{c}	0.22	0.13	-0.15	0.18	-0.01	0.01	0.04
	(0.27)	(0.30)	(0.28)	(0.27)	(0.34)	(0.22)	(0.22)	(0.19)	(0.22)	(0.23)	(0.26)
	[0.05 - 1.17]	[-0.21-1.03]	[0.01 - 1.14]	[-0.04 - 1.08]	[-0.47-0.91]	[-0.32-0.57]	[-0.61-0.30]	[-0.21-0.57]	[-0.47-0.44]	[-0.46-0.48]	[-0.49-0.57]
	< p=0.03>	< p=0.19>				< p=0.56>				< p=0.96>	
R ²	0.468	0.453	0.468	0.459	0.500	0.449	0.420	0.462	0.485	0.497	0.521
Baseline (mother)	х	х	х	х	х	х	х	х	х	х	х
Baseline (child)	х	х	х	х	х	х	х	х	х	х	х
Areal effects: Neighborhood	Х	х	X	х	х	х	Х	х	X	х	х
Mean of outcome	60.1	60.1	60.0	60.0	60.0	60.0	60.1	60.1	60.1	60.1	60.1
Std. dev. X	11.6	11.7	12.0	12.0	11.3	11.3	11.4	10.7	10.8	10.6	10.6
$N(Modifier^* = 1)$	56	56	55	55	55	66	82	82	82	82	82
Clusters	29	29	28	28	28	28	28	29	30	30	30
N	297	207	207	200	200	200	209	20.4	202	201	200

Note: Caregiver modifier is: Father helps with schoolwork, art projects, etc. Baseline associations are between CD-RISC (always at Year 10) and Parks within 15-minute of residence based on residence at different age of the child. See Figure 9 for an alternate visualization of the estimated coefficients across years. Other variables are not reported for brevity. Maternal baselines include (i) mother age at delivery (quadratic), (ii) ethnicity, (iii) mother university degree, (iv) occupation, and (v) public housing. Child baselines include child's sex, age at time of CD-RISC collection (in years), birth order, and employment of domestic helper. Standard errors are clustered at planning areas. Parentheses: standard errors. Square brackets: 95% confidence intervals. Angle brackets: p-values. Significance levels: c 0.1 b 0.05 a 0.01.

Table B11 | Differences in association between CD-RISC and Parks within 15-minute of residence, by Mother helps with schoolwork, art projects, etc.

	(1)	(2)	(3)	(4)	(5)	(6)	(7)	(8)	(9)	(10)	(11)
		Outcome variable: Resilience (CD-RISC) at Year 10									
			Park	s within 15-	minute of res	idence based	on residenti	al record at y	ear:		
	YO	Y1	Y2	Y3	Y4	Y5	Y6	Y7	Y8	Y9	Y10
Parks within 15-min	0.30^{b}	0.26^{c}	0.07	0.03	-0.08	-0.16	0.07	0.06	0.03	0.03	0.10
	(0.14)	(0.15)	(0.19)	(0.18)	(0.12)	(0.15)	(0.18)	(0.18)	(0.21)	(0.24)	(0.24)
	[0.01 - 0.58]	[-0.04-0.55]	[-0.31-0.46]	[-0.34-0.40]	[-0.33-0.17]	[-0.47-0.14]	[-0.30-0.44]	[-0.32-0.44]	[-0.40-0.46]	[-0.46 - 0.53]	[-0.39-0.58]
					< p=0.51>	< p=0.29>			< p=0.88>	< p=0.89>	
Caregiver modifier	5.10	4.89	3.63	0.74	0.08	0.69	3.23	2.67	2.18	3.49	4.21
	(3.31)	(3.48)	(2.73)	(2.23)	(3.38)	(2.39)	(3.26)	(3.03)	(2.68)	(2.92)	(2.94)
	[-1.67 - 11.87]	[-2.25-12.02]	[-1.98 - 9.23]	[-3.83-5.30]	[-6.85 - 7.00]	[-4.21-5.59]	[-3.47 - 9.92]	[-3.53-8.88]	[-3.31-7.67]	[-2.48 - 9.45]	[-1.81 - 10.23]
	< p=0.13>			< p=0.74>		< p=0.77>			< p=0.42>	< p=0.24>	< p=0.16>
(Parks within 15-min) \times (Caregiver modifier)	-0.21	-0.22	-0.04	0.05	0.22	0.27^{c}	0.05	0.05	0.02	-0.01	-0.09
	(0.18)	(0.18)	(0.18)	(0.16)	(0.19)	(0.14)	(0.20)	(0.20)	(0.20)	(0.24)	(0.25)
	[-0.58-0.16]	[-0.58-0.15]	[-0.41-0.34]	[-0.28-0.38]	[-0.16-0.60]	[-0.03-0.56]	[-0.36-0.47]	[-0.37-0.46]	[-0.39-0.44]	[-0.49-0.48]	[-0.59-0.42]
	< p=0.26>	< p=0.24>		< p=0.76>	< p=0.24>		< p=0.79>	< p=0.82>	< p=0.91>	< p=0.98>	< p=0.73>
R ²	0.457	0.449	0.456	0.448	0.504	0.458	0.422	0.460	0.484	0.498	0.520
Baseline (mother)	х	х	х	X	х	х	X	X	х	х	х
Baseline (child)	х	х	х	X	х	х	X	X	х	х	х
Areal effects: Neighborhood	х	х	х	X	х	х	X	X	х	х	х
Mean of outcome	60.1	60.1	60.0	60.0	60.0	60.0	60.1	60.1	60.1	60.1	60.1
Std. dev. X	11.6	11.7	12.0	12.0	11.3	11.3	11.4	10.7	10.8	10.6	10.6
$N(Modifier^* = 1)$	222	222	224	224	224	253	273	275	274	273	272
Clusters	29	29	28	28	28	28	28	29	30	30	30
N	387	387	387	389	389	390	392	394	393	391	390

Note: Caregiver modifier is: Mother helps with schoolwork, art projects, etc. Baseline associations are between CD-RISC (always at Year 10) and Parks within 15-minute of residence based on residence at different age of the child. See Figure 9 for an alternate visualization of the estimated coefficients across years. Other variables are not reported for brevity. Maternal baselines include (i) mother age at delivery (quadratic), (ii) ethnicity, (iii) mother university degree, (iv) occupation, and (v) public housing. Child baselines include child's sex, age at time of CD-RISC collection (in years), birth order, and employment of domestic helper. Standard errors are clustered at planning areas. Parentheses: standard errors. Square brackets: 95% confidence intervals. Angle brackets: p-values. Significance levels: a 0.1 b 0.05 a 0.01.



Figure B1 Figure reports the association between CD-RISC and the primary caregiver modifier (Mother/father is the primary caregiver, m = 1 if indicated, 0 if not) without interacting with access to parks. Baselines are otherwise the same as those in Section 3.



Figure B2 Figure reports the association between CD-RISC and the bathe/shower modifier (Mother/father bathe/shower child or keep child company during bath/shower most often, m = 1 if indicated, 0 if not) without interacting with access to parks. Baselines are otherwise the same as those in Section 3.



Figure B3 Figure reports the association between CD-RISC and the play modifier (Mother/father play with child most of the time, m = 1 if indicated, 0 if not) without interacting with access to parks. Baselines are otherwise the same as those in Section 3.



Figure B4 Figure reports the association between CD-RISC and the unstructured outings modifier (Mother/father take child on unstructured outings most of the time, m = 1 if indicated, 0 if not) without interacting with access to parks. Baselines are otherwise the same as those in Section 3.



Figure B5 Figure reports the association between CD-RISC and the schoolwork modifier (Mother/father helps with schoolwork, art projects, etc., m = 1 if indicated, 0 if not) without interacting with access to parks. Baselines are otherwise the same as those in Section 3.

C. Additional Modifiers

Child's sex



Figure C1 | Differences in association by gender. Each year is a separate model estimated from Equation (3). Left subfigure shows association by gender strata. Right subfigure shows the additive effect of boys (girls as baseline). Vertical lines are 95% confidence intervals constructed from geographically clustered standard errors. See also Table C1.

	(1)	(2)	(3)	(4)	(5)	(6)	(7)	(8)	(9)	(10)	(11)
				Outco	me variable:	Resilience (C	D-RISC) at Y	ear 10			
			Park	s within 15-	minute of res	idence based	on residenti	al record at y	'ear:		
	YO	Y1	Y2	Y3	Y4	Y5	Y6	Y7	Y8	Y9	Y10
Parks within 15-min	0.07	0.04	0.06	0.15	0.17	0.16	0.08	0.03	-0.01	0.00	-0.02
	(0.14)	(0.14)	(0.10)	(0.11)	(0.12)	(0.12)	(0.11)	(0.14)	(0.13)	(0.14)	(0.13)
	[-0.21-0.35]	[-0.24-0.33]	[-0.14-0.25]	[-0.08-0.38]	[-0.08-0.42]	[-0.08-0.39]	[-0.15-0.31]	[-0.25-0.31]	[-0.28-0.27]	[-0.28-0.28]	[-0.28-0.24]
Boy	-3.46	-2.99	-0.75	1.36	1.93	2.61	0.52	-0.84	0.29	0.47	0.83
-	(3.61)	(3.50)	(2.85)	(3.20)	(3.06)	(2.93)	(3.09)	(2.89)	(2.50)	(2.47)	(2.31)
	[-10.85 - 3.94]	[-10.17 - 4.18]	[-6.60-5.11]	[-5.20-7.92]	[-4.36 - 8.22]	[-3.39 - 8.61]	[-5.83-6.87]	[-6.75 - 5.07]	[-4.82 - 5.39]	[-4.59-5.52]	[-3.90-5.56]
(Parks within 15-min) \times Boy	0.26^{c}	0.24^{c}	0.03	-0.11	-0.15	-0.13	0.01	0.10	0.08	0.05	0.06
	(0.13)	(0.12)	(0.14)	(0.20)	(0.19)	(0.18)	(0.17)	(0.19)	(0.17)	(0.16)	(0.15)
	[-0.01-0.53]	[-0.01-0.50]	[-0.26-0.33]	[-0.52-0.30]	[-0.53-0.24]	[-0.51-0.25]	[-0.34-0.37]	[-0.28-0.48]	[-0.26-0.43]	[-0.27-0.37]	[-0.25-0.37]
			< p=0.82>	< p=0.59>	< p=0.44>					< p=0.75>	
R ²	0.445	0.436	0.443	0.439	0.491	0.443	0.407	0.446	0.472	0.482	0.501
Baseline (mother)	х	х	х	х	х	х	х	х	х	х	х
Baseline (child)	х	х	х	х	х	х	х	х	х	х	х
Areal effects: Neighborhood	х	х	х	х	х	х	х	х	х	х	х
Mean of outcome	59.9	59.9	59.9	59.9	59.8	59.8	59.9	59.9	59.9	59.9	59.9
Std. dev. X	11.6	11.7	11.9	12.0	11.2	11.2	11.3	10.7	10.7	10.5	10.5
N(Boy = 1)	208	207	208	209	210	211	211	213	212	210	210
Clusters	29	29	28	28	28	28	28	29	30	30	30
N	400	300	400	402	402	403	405	407	406	404	403

Table C1 | Differences in association between CD-RISC and Parks within 15-minute of residence, by gender.

Note: Table reports differences in association by gender. Baseline associations are between CD-RISC (always at Year 10) and Parks within 15-minute of residence based on residence at different age of the child. See Figure C1 for an alternate visualization of the estimated coefficients across years. Other variables are not reported for brevity. Maternal baselines include (i) mother age at delivery (quadratic), (ii) ethnicity, (iii) mother university degree, (iv) occupation, and (v) public housing. Child baselines include child's sex, age at time of CD-RISC collection (in years), birth order, and employment of domestic helper. Standard errors are clustered at planning areas. Parentheses: standard errors. Square brackets: 95% confidence intervals. Angle brackets: p-values. Significance levels: ^c 0.1 ^b 0.05 ^a 0.01.



Involvement with child's day-to-day activities

Figure C2 Read modifier: Mother/father reads to child most of the time (m = 1 if indicated, 0 if not). First row shows the additive difference (γ^y in Equation (3)). Second row shows the underlying associations by strata (source of difference for the first row). The horizontal axis indicates the year of measurement for parks (Section 2.3) and the caregiving measure Section 2.5. Vertical lines are 95% confidence intervals constructed from geographically clustered standard errors. Common axis scales.



Figure C3 Breakfast modifier: Mother/father eats breakfast with child (m = 1 if indicated, 0 if not). First row shows the additive difference (γ^y in Equation (3)). Second row shows the underlying associations by strata (source of difference for the first row). The horizontal axis indicates the year of measurement for parks (Section 2.3) and the caregiving measure Section 2.5. Vertical lines are 95% confidence intervals constructed from geographically clustered standard errors. Common axis scales.



Figure C4 [Lunch modifier: Mother/father eats lunch with child (m = 1 if indicated, 0 if not). First row shows the additive difference (γ^y in Equation (3)). Second row shows the underlying associations by strata (source of difference for the first row). The horizontal axis indicates the year of measurement for parks (Section 2.3) and the caregiving measure Section 2.5. Vertical lines are 95% confidence intervals constructed from geographically clustered standard errors. Common axis scales.



Figure C5 Dinner modifier: Mother/father eats dinner with child (m = 1 if indicated, 0 if not). First row shows the additive difference (γ^y in Equation (3)). Second row shows the underlying associations by strata (source of difference for the first row). The horizontal axis indicates the year of measurement for parks (Section 2.3) and the caregiving measure Section 2.5. Vertical lines are 95% confidence intervals constructed from geographically clustered standard errors. Common axis scales.

Socio-economic status

Figure C6 Lower income modifier: Mother/father is from lower income group (m = 1 if indicated, 0 if not). First row shows the additive difference (γ^y in Equation (3)). Second row shows the underlying associations by strata (source of difference for the first row). The horizontal axis indicates the year of measurement for parks (Section 2.3) and the caregiving measure Section 2.5. Vertical lines are 95% confidence intervals constructed from geographically clustered standard errors. Common axis scales.

Figure C7 [Higher income modifier: Mother/father is from higher income group (m = 1 if indicated, 0 if not). First row shows the additive difference (γ^y in Equation (3)). Second row shows the underlying associations by strata (source of difference for the first row). The horizontal axis indicates the year of measurement for parks (Section 2.3) and the caregiving measure Section 2.5. Vertical lines are 95% confidence intervals constructed from geographically clustered standard errors. Common axis scales.

Figure C8 [College modifier: Mother/father has college degree (m = 1 if indicated, 0 if not). First row shows the additive difference (γ^y in Equation (3)). Second row shows the underlying associations by strata (source of difference for the first row). The horizontal axis indicates the year of measurement for parks (Section 2.3) and the caregiving measure Section 2.5. Vertical lines are 95% confidence intervals constructed from geographically clustered standard errors. Common axis scales.

Figure C9 [PMET modifier: Mother/father is in the PMET (Professionals, Managers, Executives, and Technicians) occupation classification (m = 1 if indicated, 0 if not). First row shows the additive difference (γ^y in Equation (3)). Second row shows the underlying associations by strata (source of difference for the first row). The horizontal axis indicates the year of measurement for parks (Section 2.3) and the caregiving measure Section 2.5. Vertical lines are 95% confidence intervals constructed from geographically clustered standard errors. Common axis scales.

Father helps with HH tasks or chores

	(1)	(2)
	Year 1	Year 2
Parks within 15-min	0.182	0.171
	(0.250)	(0.156)
	[-0.330 - 0.694]	[-0.149 - 0.490]
Father helps with household tasks/chores	-1.300	2.179
	(3.544)	(4.062)
	[-8.560-5.960]	[-6.156 - 10.514]
(Parks within 15-min) \times (Father helps with household tasks/chores)	0.021	-0.098
	(0.273)	(0.231)
	[-0.539 - 0.581]	[-0.571 - 0.376]
\mathbb{R}^2	0.533	0.551
Baseline (mother)	Х	Х
Baseline (child)	Х	Х
Areal effects: Neighborhood	Х	Х
Mean of outcome	60.1	60.1
Std. dev. X	11.1	11.6
N(Father helps with household tasks/chores = 1)	178	168
Clusters	29	28
N	299	298

Table C2 | Differences in association between CD-RISC and Parks within 15-minute of residence, by father's involvement with household tasks/chores.

Note: Table reports differences in association by the father's involvement with household tasks/chores. The *household tasks* modifier comes from the Year 1 and Year 2 (Month 12 and Month 24) Lydon Maternal Health and Well Being questionnaires. The relevant item is "During the past THREE MONTHS, have you received help with your household tasks or chores?". We code whether the respondent (always the mother) included her partner as one of the people who have helped with household tasks or chores. If the field is missing in Year 1, the value in Year 2 is used, if available, and vice versa (results unchanged without this). The table reports the number of fathers in each year that have helped the mother with household tasks/chores. Baseline associations are between CD-RISC (always at Year 10) and Parks within 15-minute of residence based on residence at the indicated age of the child. Other variables are not reported for brevity. Maternal baselines include (i) mother age at delivery (quadratic), (ii) ethnicity, (iii) mother university degree, (iv) occupation, and (v) public housing. Child baselines include child's sex, age at time of CD-RISC collection (in years), birth order, and employment of domestic helper. Standard errors are clustered at planning areas. Parentheses: standard errors. Square brackets: 95% confidence intervals. Angle brackets: p-values. Significance levels: $^{\circ} 0.1^{b} 0.05^{a} 0.01$.

Parenting styles

Table	C3 Parks	within	15-minute	of residence	and	Authoritative	parenting	•

				1	-			
	(1)	(2)	(3)	(4)	(5)	(6)		
		Outcome	variable: Resilie	nce (CD-RISC) :	at Year 10			
	Matern	Maternal Authoritative Style at Paternal Authoritative Style						
	Y4	Y8	Y10	Y4	Y8	Y10		
Parks within 15-min	1.095	-0.198	0.746	0.707	0.163	0.267		
	(0.834)	(0.776)	(0.496)	(0.469)	(0.383)	(0.232)		
	[-0.617 - 2.806]	[-1.787 - 1.391]	[-0.267 - 1.760]	[-0.255 - 1.669]	[-0.622 - 0.947]	[-0.208 - 0.741]		
Authoritative parenting	7.856^{b}	0.246	5.207^{c}	7.359^{a}	0.481	3.503^{a}		
	(3.654)	(3.148)	(2.551)	(2.340)	(1.650)	(1.044)		
	[0.359 - 15.354]	[-6.203 - 6.694]	[-0.011 - 10.426]	[2.556 - 12.161]	[-2.898 - 3.860]	[1.367 - 5.639]		
(Parks within 15-min) \times (Authoritative parenting)	-0.237	0.034	-0.181	-0.160	-0.058	-0.073		
	(0.209)	(0.169)	(0.129)	(0.138)	(0.089)	(0.060)		
	[-0.666-0.193]	[-0.312 - 0.381]	[-0.445 - 0.084]	[-0.443 - 0.122]	[-0.240-0.123]	[-0.195 - 0.050]		
R ²	0.642	0.553	0.536	0.658	0.553	0.541		
Baseline (mother)	Х	Х	Х	Х	Х	Х		
Baseline (child)	Х	Х	Х	Х	Х	Х		
Areal effects: Neighborhood	Х	Х	Х	Х	Х	Х		
Mean of outcome	60.8	60.3	59.9	60.8	60.3	60.0		
Std. dev. X	11.5	10.7	10.4	11.5	10.7	10.4		
Std. dev. Authoritative	0.6	0.5	0.6	0.8	0.9	1.0		
Clusters	28	29	30	28	29	30		
N	271	303	379	271	303	377		

Note: Table reports associations between CD-RISC (always at Year 10) and the interaction of (i) Parks within 15-minute of residence and (ii) reported parenting Authoritative parenting at years 4. 8, and 10. All parenting style measures, including for fathers, are based off reports by the mother. Other variables are not reported for brevity. Standard errors are clustered at planning areas. Parentheses: standard errors. Square brackets: 95% confidence intervals. Angle brackets: p-values. Significance levels: c 0.1 b 0.05 a 0.01.

Table	C4 Parks	within	15-minute of	residence and	l Authoritarian	parenting.
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	(1)	(2)	(3)	(4)	(5)	(6)	
	Materna	Outcome var d Authoritarian Sty	iable: Resilienc de at	e (CD-RISC) at Y Paternal	(CD-RISC) at Year 10 Paternal Authoritarian Style at		
	Y4	Y8	Y10	Y4	Y8	¥10	
Parks within 15-min	-0.996^{c}	-0.469^{c}	-0.068	-0.546	-0.040	0.289	
	(0.570)	(0.257)	(0.290)	(0.438)	(0.315)	(0.230)	
	[-2.166 - 0.173]	[-0.996 - 0.057]	[-0.660 - 0.525]	[-1.445 - 0.353]	[-0.686 - 0.606]	[-0.181 - 0.758]	
Authoritarian parenting	-8.516^{b}	-6.423^{a}	-1.902	-6.110^{c}	-0.656	1.393	
	(3.801)	(2.249)	(2.071)	(3.450)	(2.797)	(2.807)	
	[-16.315 - 0.716]	[-11.030 - 1.817]	[-6.137 - 2.334]	[-13.188 - 0.969]	[-6.387 - 5.074]	[-4.348 - 7.135]	
(Parks within 15-min) × (Authoritarian parenting)	0.541^{c}	0.198^{c}	0.037	0.326^{c}	-0.007	-0.162	
	(0.281)	(0.104)	(0.126)	(0.186)	(0.157)	(0.132)	
	[-0.036 - 1.117]	[-0.016 - 0.412]	[-0.221 - 0.295]	[-0.056 - 0.707]	[-0.328 - 0.315]	[-0.432 - 0.108]	
R ²	0.641	0.562	0.527	0.636	0.553	0.530	
Baseline (mother)	Х	Х	Х	Х	Х	Х	
Baseline (child)	Х	Х	Х	Х	Х	Х	
Areal effects: Neighborhood	Х	Х	Х	Х	Х	Х	
Mean of outcome	60.8	60.3	59.9	60.8	60.3	60.0	
Std. dev. X	11.5	10.7	10.4	11.5	10.7	10.4	
Std. dev. Authoritarian	0.6	0.6	0.6	0.6	0.6	0.6	
Clusters	28	29	30	28	29	30	
N	271	303	379	271	303	377	

Note: Table reports associations between CD-RISC (always at Year 10) and the interaction of (i) Parks within 15-minute of residence and (ii) reported parenting Authoritarian parenting at years 4, 8, and 10. All parenting style measures, including for fathers, are based off reports by the mother. Other variables are not reported for brevity. Standard errors are clustered at planning areas. Parentheses: standard errors. Square brackets: 95% confidence intervals. Angle brackets: p-values. Significance levels: c 0.1 b 0.05 a 0.01.

	(1)	(2)	(3)	(4)	(5)	(6)				
		Outcome variable: Resilience (CD-RISC) at Year 10								
	Matern	al Permissive S	tyle at	Paternal Permissive Style at						
	Y4	Y8	Y10	Y4	Y8	Y10				
Parks within 15-min	-0.418	0.177	0.129	-0.511	-0.196	0.236				
	(0.457)	(0.169)	(0.321)	(0.467)	(0.388)	(0.277)				
	[-1.356-0.519]	[-0.170 - 0.524]	[-0.528 - 0.787]	[-1.469-0.447]	[-0.991 - 0.599]	[-0.331 - 0.803]				
Permissive parenting	-6.021	-0.350	-0.046	-5.858	-3.166	0.540				
	(3.539)	(2.495)	(2.386)	(4.382)	(2.889)	(2.245)				
	[-13.282 - 1.241]	[-5.461 - 4.761]	[-4.926 - 4.834]	[-14.849 - 3.132]	[-9.083 - 2.751]	[-4.051 - 5.131]				
(Parks within 15-min) \times (Permissive parenting)	0.263	-0.102	-0.054	0.296	0.070	-0.111				
	(0.208)	(0.096)	(0.145)	(0.205)	(0.167)	(0.109)				
	[-0.164 - 0.691]	[-0.297 - 0.094]	[-0.352 - 0.243]	[-0.124 - 0.717]	[-0.272 - 0.413]	[-0.333-0.112]				
	< p=0.217>									
R^2	0.635	0.556	0.526	0.637	0.557	0.530				
Baseline (mother)	Х	Х	Х	Х	Х	Х				
Baseline (child)	Х	Х	Х	Х	Х	Х				
Areal effects: Neighborhood	Х	Х	Х	Х	Х	Х				
Mean of outcome	60.8	60.3	59.9	60.8	60.3	60.0				
Std. dev. X	11.5	10.7	10.4	11.5	10.7	10.4				
Std. dev. Permissive	0.6	0.6	0.6	0.7	0.7	0.7				
Clusters	28	29	30	28	29	30				
N	271	303	379	271	303	377				

Table C5 | Parks within 15-minute of residence and Permissive parenting.

Note: Table reports associations between CD-RISC (always at Year 10) and the interaction of (i) Parks within 15-minute of residence and (ii) reported parenting Permissive parenting at years 4, 8, and 10. All parenting style measures, including for fathers, are based off reports by the mother. Other variables are not reported for brevity. Standard errors are clustered at planning areas. Parentheses: standard errors. Square brackets: 95% confidence intervals. Angle brackets: p-values. Significance levels: c 0.1 b 0.05 a 0.01.

D. MICE

In the main analyses, we use nine variables (rows 2–10 in Table D1), with missing data 614 proportions in the range of 0–3.9%. Other variables not included have high missingness. 615 In total, there are 14 variables, with additionally variables from fathers including father's 616 age at delivery, father's education level, and father's occupation. In addition, there are 617 also fields for mother's and father's monthly income. These have missing data proportions 618 in the range of 5.6–26.1%. Table D1 summarizes the overall missingness. As part of the 619 sensitivity analyses, we perform multiple imputation with chained equations with all 620 variables in Table D1 to generate multiple filled-in data sets, each containing different 621 estimates of the missing variable values, before replicating the main conclusions. 622

The Multiple Imputation by Chained Equations (MICE) does not assume that the vari-623 ables with missing observations have a joint multivariate normal distribution, and allows 624 for imputation of binary and categorical variables. The ignorability assumption applies, 625 allowing missingness to be correlated with other observed variables while being indepen-626 dent of the unobserved values. We emphasize that MICE-derived replication of estimates 627 is remains biased if the original model is incorrect. We implement MICE using Stata 628 13 mi command with the following parameters—linear regressions for continuous vari-629 ables, predictive mean matching to five nearest neighbors for categorical variables, 100 630 burn-in, and 100 imputations. Pooling of estimations from the 100 imputations adjusts 631 coefficient and standard errors for the between-imputation variation using Rubin's com-632 bination rules. 633

The occupation field for mothers and fathers have multiple categories. To avoid different iterations of post-imputation estimation having different saturation of the occupation categories, we bin minority occupation groups with few observations together as follows. For mothers, we collapse the occupation groups of Others, Agriculture, and Production Craftsmen into one group. For fathers, we collapse Agricultural and Fishery, Craftsmen and Related Trade, and Cleaners, Labourers, and Related Workers. 638

	Field	Total	Missing	Percentage missing
1	CD-RISC score	429	0	0
2	Child's age at CD-RISC administration	429	0	0
3	Child's birth order	429	6	1.4
4	Child's sex	429	0	0
5	Live-in domestic helper	429	0	0
6	Mother's age at delivery	429	6	1.4
7	Mother's ethnicity	429	6	1.4
8	Mother's education level	429	11	2.56
9	Mother's occupation	429	17	3.96
10	Housing type	429	11	2.56
11	Father's age at delivery	429	91	21.21
12	Father's occupation	429	82	19.11
13	Father's education level	429	82	19.11
14	Mother's monthly income	429	24	5.59
15	Father's monthly income	429	112	26.11

 Table D1 | Summary of missing observations by fields.

Figure D1 Primary caregiver modifier: Mother/father is the primary caregiver (m = 1 if indicated, 0 if not). First row shows the additive difference (γ^y in Equation (3)). Second row shows the underlying associations by strata (source of difference for the first row). The horizontal axis indicates the year of measurement for parks (Section 2.3) and the caregiving measure Section 2.5. Vertical lines are 95% confidence intervals constructed from geographically clustered standard errors. Common axis scales.

Figure D2 Bathe/shower modifier: Mother/father bathe/shower child or keep child company during bath/shower most often (m = 1 if indicated, 0 if not). First row shows the additive difference (γ^y in Equation (3)). Second row shows the underlying associations by strata (source of difference for the first row). The horizontal axis indicates the year of measurement for parks (Section 2.3) and the caregiving measure Section 2.5. Vertical lines are 95% confidence intervals constructed from geographically clustered standard errors. Common axis scales.

Figure D3 Play modifier: Mother/father play with child most of the time (m = 1 if indicated, 0 if not). First row shows the additive difference (γ^y in Equation (3)). Second row shows the underlying associations by strata (source of difference for the first row). The horizontal axis indicates the year of measurement for parks (Section 2.3) and the caregiving measure Section 2.5. Vertical lines are 95% confidence intervals constructed from geographically clustered standard errors. Common axis scales.


Figure D4 Unstructured outings modifier: Mother/father take child on unstructured outings most of the time (m = 1 if indicated, 0 if not). First row shows the additive difference (γ^{y} in Equation (3)). Second row shows the underlying associations by strata (source of difference for the first row). The horizontal axis indicates the year of measurement for parks (Section 2.3) and the caregiving measure Section 2.5. Vertical lines are 95% confidence intervals constructed from geographically clustered standard errors. Common axis scales.



Figure D5 Schoolwork modifier: Mother/father helps with schoolwork, art projects, etc. (m = 1 if indicated, 0 if not). First row shows the additive difference (γ^y in Equation (3)). Second row shows the underlying associations by strata (source of difference for the first row). The horizontal axis indicates the year of measurement for parks (Section 2.3) and the caregiving measure Section 2.5. Vertical lines are 95% confidence intervals constructed from geographically clustered standard errors. Common axis scales.





Figure D6 Lower income modifier: Mother/father is from lower income group (m = 1 if indicated, 0 if not). First row shows the additive difference (γ^y in Equation (3)). Second row shows the underlying associations by strata (source of difference for the first row). The horizontal axis indicates the year of measurement for parks (Section 2.3) and the caregiving measure Section 2.5. Vertical lines are 95% confidence intervals constructed from geographically clustered standard errors. Common axis scales.



Figure D7 [Higher income modifier: Mother/father is from higher income group (m = 1 if indicated, 0 if not). First row shows the additive difference (γ^y in Equation (3)). Second row shows the underlying associations by strata (source of difference for the first row). The horizontal axis indicates the year of measurement for parks (Section 2.3) and the caregiving measure Section 2.5. Vertical lines are 95% confidence intervals constructed from geographically clustered standard errors. Common axis scales.



Figure D8 [College modifier: Mother/father has college degree (m = 1 if indicated, 0 if not). First row shows the additive difference (γ^y in Equation (3)). Second row shows the underlying associations by strata (source of difference for the first row). The horizontal axis indicates the year of measurement for parks (Section 2.3) and the caregiving measure Section 2.5. Vertical lines are 95% confidence intervals constructed from geographically clustered standard errors. Common axis scales.



Figure D9 [PMET modifier: Mother/father is in the PMET (Professionals, Managers, Executives, and Technicians) occupation classification (m = 1 if indicated, 0 if not). First row shows the additive difference (γ^y in Equation (3)). Second row shows the underlying associations by strata (source of difference for the first row). The horizontal axis indicates the year of measurement for parks (Section 2.3) and the caregiving measure Section 2.5. Vertical lines are 95% confidence intervals constructed from geographically clustered standard errors. Common axis scales.

E. Additional Sensitivity Analyses

No parental baselines

Figures E1 to E5 replicate the main results reported in Figures 5 to 9, but only with the 644 child baselines and the neighborhood fixed effects. 645



Figure E1 Primary caregiver modifier: Mother/father is the primary caregiver (m = 1 if indicated, 0 if not). Only child baselines included. No parental baselines. First row shows the additive difference (γ^y in Equation (3)). Second row shows the underlying associations by strata (source of difference for first row). Vertical lines are 95% confidence intervals constructed from geographically clustered standard errors.

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Figure E2 Bathe/shower modifier: Mother/father bathe/shower child or keep child company during bath/shower most often (m = 1 if indicated, 0 if not). Only child baselines included. No parental baselines. First row shows the additive difference (γ^y in Equation (3)). Second row shows the underlying associations by strata (source of difference for first row). Vertical lines are 95% confidence intervals constructed from geographically clustered standard errors.



Figure E3 Play modifier: Mother/father play with child most of the time (m = 1 if indicated, 0 if not). Only child baselines included. No parental baselines. First row shows the additive difference (γ^y in Equation (3)). Second row shows the underlying associations by strata (source of difference for first row). Vertical lines are 95% confidence intervals constructed from geographically clustered standard errors.



Figure E4 [Unstructured outings modifier: Mother/father take child on unstructured outings most of the time (m = 1 if indicated, 0 if not). Only child baselines included. No parental baselines. First row shows the additive difference (γ^y in Equation (3)). Second row shows the underlying associations by strata (source of difference for first row). Vertical lines are 95% confidence intervals constructed from geographically clustered standard errors.



Figure E5 Schoolwork modifier: Mother/father helps with schoolwork, art projects, etc. (m = 1 if indicated, 0 if not). Only child baselines included. No parental baselines. First row shows the additive difference (γ^y in Equation (3)). Second row shows the underlying associations by strata (source of difference for the first row). The horizontal axis indicates the year of measurement for parks (Section 2.3) and the caregiving measure Section 2.5. Vertical lines are 95% confidence intervals constructed from geographically clustered standard errors. Common axis scales.

Excluding father PCQ respondents

Tables E1 to E10 report replications of the main results in Tables B2 to B11. Tables E1 647 to E10 exclude observations where, in the closest matched PCQ (Primary Caregiver Ques-648 tionnaire) survey, the father is the person present as the survey respondent. See Sec-649 tion 2.5 for details of matching across years based on the child's age and survey ad-650 ministrative dates. While they are a minority in the sample, fathers may overstate their 651 involvement with the child's day-to-day activities when they are the ones answering ques-652 tions. Tables E1 to E10 report the number of observations dropped when the father is 653 the survey respondent. 654

Table E1 | Differences in association between CD-RISC and Parks within 15-minute of residence, by Father as the Primary Caregiver.

	-	-									
	(1)	(2)	(3)	(4)	(5)	(6)	(7)	(8)	(9)	(10)	(11)
				Ou	tcome variable	e: Resilience (CD-RISC) at Ye	ar 10			
				Parks within	15-minute of r	esidence base	d on residentia	al record at ye	ar:		
	YO	Y1	Y2	¥3	Y4	Y5	Y6	¥7	¥8	Y9	Y10
Parks within 15-min	0.20 ^c	0.16	0.06	0.08	0.06	0.06	0.07	0.06	0.04	0.05	0.05
	(0.10)	(0.11)	(0.11)	(0.11)	(0.12)	(0.11)	(0.12)	(0.13)	(0.11)	(0.11)	(0.10)
	[-0.01-0.42]	[-0.06-0.37]	[-0.16-0.28]	[-0.15-0.32]	[-0.17-0.30]	[-0.16-0.28]	[-0.18 - 0.33]	[-0.19-0.32]	[-0.20-0.27]	[-0.17-0.28]	[-0.16-0.26]
Caregiver modifier	-13.03^{c}	-12.72°	-4.91	-2.09	-1.64	-10.56	-5.05	5.48	-34.45^{c}	-2.53	0.44
	(6.60)	(6.69)	(7.00)	(4.80)	(7.25)	(8.73)	(8.93)	(13.85)	(19.18)	(21.69)	(8.05)
	[-26.56-0.49]	[-26.42 - 0.98]	[-19.27 - 9.45]	[-11.94 - 7.76]	[-16.52 - 13.25]	[-28.46 - 7.35]	[-23.38 - 13.28]	[-22.89 - 33.84]	[-73.69 - 4.78]	[-46.90 - 41.84]	[-16.03 - 16.91]
(Parks within 15-min) × (Caregiver modifier)	1.24^{b}	1.22^{b}	0.30	-0.02	0.32	0.28	0.77	0.34	1.96 ^b	-0.03	-0.34
	(0.54)	(0.55)	(0.70)	(0.59)	(0.46)	(0.45)	(0.54)	(0.65)	(0.76)	(0.88)	(0.32)
	[0.13 - 2.35]	[0.10 - 2.35]	[-1.14-1.73]	[-1.23-1.20]	[-0.63-1.27]	[-0.65 - 1.20]	[-0.35 - 1.89]	[-0.99-1.66]	[0.40 - 3.52]	[-1.83 - 1.78]	[-1.01-0.32]
R ²	0.446	0.438	0.441	0.434	0.488	0.444	0.424	0.453	0.484	0.478	0.501
Baseline (mother)	х	х	х	х	х	х	х	х	х	х	х
Baseline (child)	х	х	х	Х	х	х	х	х	х	х	х
Areal effects: Neighborhood	х	х	х	Х	х	х	х	х	х	х	х
Mean of outcome	59.9	59.9	59.9	59.9	59.8	60.0	59.9	59.9	59.9	59.9	59.9
Std. dev. X	11.6	11.7	11.9	12.0	11.3	11.3	11.2	10.5	10.5	10.4	10.3
$N(Modifier^* = 1)$	17	17	17	17	17	12	9	9	9	13	19
N(father responded = 1)	18	18	18	18	18	24	36	36	36	36	36
Clusters	29	29	28	28	28	28	28	29	30	30	30
N	397	396	397	399	399	396	387	388	387	385	384

Note: Caregiver modifier is: Father as the Primary Caregiver. Baseline associations are between CD-RISC (always at Year 10) and Parks within 15-minute of residence based on residence at different age of the child. See Figure 5 for an alternate visualization of the estimated coefficients across years. Other variables are not reported for brevity. Maternal baselines include (i) mother age at delivery (quadratic), (ii) ethnicity, (iii) mother university degree, (iv) occupation, and (v) public housing. Child baselines include child's sex, age at time of CD-RISC collection (in years), birth order, and employment of domestic helper. Standard errors are clustered at planning areas. Parentheses: standard errors. Square brackets: 95% confidence intervals. Angle brackets: p-values. Significance levels: ^c 0.1 ^b 0.05 ^a 0.01.

Table E2 | Differences in association between CD-RISC and Parks within 15-minute of residence, by Mother as the Primary Caregiver.

	(1)	(2)	(3)	(4)	(5)	(6)	(7)	(8)	(9)	(10)	(11)
				Outo	ome variable:	Resilience (CD-RISC) at Y	ear 10			
			Pa	arks within 15	-minute of re	sidence base	1 on residenti	al record at yea	r:		
	YO	Y1	Y2	Y3	Y4	Y5	Y6	Y7	Y8	Y9	Y10
Parks within 15-min	0.19	0.10	-0.13	-0.12	0.02	-0.01	-0.06	-0.33^{b}	-0.26	-0.12	0.03
	(0.24)	(0.24)	(0.18)	(0.19)	(0.20)	(0.20)	(0.14)	(0.15)	(0.20)	(0.15)	(0.31)
	[-0.30-0.68]	[-0.40-0.60]	[-0.51-0.24]	[-0.51-0.27]	[-0.39-0.43]	[-0.42 - 0.39]	[-0.35-0.23]	[-0.63 - 0.02]	[-0.66-0.15]	[-0.43-0.18]	[-0.61-0.67]
					< p=0.93>					< p=0.41>	
Caregiver modifier	-1.77	-2.54	-4.90	-5.61	-1.49	0.83	-0.93	-8.57^{b}	-3.78	1.24	-0.31
	(4.83)	(4.93)	(4.90)	(4.49)	(4.84)	(4.67)	(3.64)	(3.22)	(5.08)	(4.39)	(4.29)
	[-11.67 - 8.12]	[-12.65 - 7.56]	[-14.95 - 5.15]	[-14.83 - 3.61]	[-11.41 - 8.43]	[-8.76-10.42]	[-8.40-6.54]	[-15.16 - 1.98]	[-14.17-6.60]	[-7.75 - 10.22]	[-9.08 - 8.47]
		< p=0.61>			< p=0.76>						< p=0.94>
(Parks within 15-min) \times (Caregiver modifier)	0.05	0.11	0.32	0.28	0.09	0.11	0.21	0.54^{a}	0.43^{c}	0.24	-0.01
	(0.26)	(0.26)	(0.23)	(0.22)	(0.25)	(0.21)	(0.14)	(0.15)	(0.22)	(0.18)	(0.26)
	[-0.48 - 0.57]	[-0.43 - 0.66]	[-0.15-0.79]	[-0.16-0.73]	[-0.42 - 0.60]	[-0.33-0.55]	[-0.08-0.50]	[0.24 - 0.85]	[-0.02-0.88]	[-0.13-0.61]	[-0.55-0.53]
	< p=0.86>	< p=0.67>	< p=0.17>		< p=0.72>	< p=0.62>	< p=0.15>		< p=0.06>	< p=0.19>	
R ²	0.439	0.432	0.446	0.441	0.487	0.443	0.422	0.461	0.482	0.486	0.497
Baseline (mother)	х	х	х	х	х	х	х	х	х	х	х
Baseline (child)	Х	х	х	Х	х	Х	х	х	х	х	Х
Areal effects: Neighborhood	х	х	х	х	х	х	Х	Х	х	х	х
Mean of outcome	59.9	59.9	59.9	59.9	59.8	60.0	59.9	59.9	59.9	59.9	59.9
Std. dev. X	11.6	11.7	11.9	12.0	11.3	11.3	11.2	10.5	10.5	10.4	10.3
$N(Modifier^* = 1)$	268	267	267	269	269	287	285	314	317	316	307
N(father responded = 1)	18	18	18	18	18	24	36	36	36	36	36
Clusters	29	29	28	28	28	28	28	29	30	30	30
N	397	396	397	399	399	396	387	388	387	385	384

Note: Caregiver modifier is: Mother is the Primary Caregiver. Baseline associations are between CD-RISC (always at Year 10) and Parks within 15-minute of residence based on residence at different age of the child. See Figure 5 for an alternate visualization of the estimated coefficients across years. Other variables are not reported for brevity. Maternal baselines include (i) mother age at delivery (quadratic), (ii) ethnicity, (iii) mother university degree, (iv) occupation, and (v) public housing. Child baselines include child's sex, age at time of CD-RISC collection (in years), birth order, and employment of domestic helper. Standard errors are clustered at planning areas. Parentheses: standard errors. Square brackets: 95% confidence intervals. Angle brackets: p-values. Significance levels: ^c 0.1 ^b 0.05 ^a 0.01.

Table E3 | Differences in association between CD-RISC and Parks within 15-minute of residence, by Father bathes/shower child most often.

	(1)	(2)	(3)	(4)	(5)	(6)	(7)	(8)	(9)	(10)	(11)
	-			Outco	me variable: R	esilience (CD	-RISC) at Year	10			
			Parl	s within 15-	minute of resid	lence based o	n residential r	ecord at year:			-
	YO	Y1	Y2	Y3	Y4	Y5	Y6	Y7	Y8	Y9	Y10
Parks within 15-min	0.11	0.06	0.01	0.01	0.09	0.07	0.09	0.11	0.10	0.09	0.10
	(0.12)	(0.13)	(0.10)	(0.12)	(0.11)	(0.12)	(0.14)	(0.14)	(0.16)	(0.16)	(0.15)
	[-0.14 - 0.36]	[-0.20-0.33]	[-0.20-0.21]	[-0.23-0.26]	[-0.13 - 0.32]	[-0.17-0.31]	[-0.20-0.39]	[-0.19-0.41]	[-0.22-0.42]	[-0.24-0.42]	[-0.20-0.41]
Caregiver modifier	-9.81^{b}	-9.99^{b}	-7.64^{c}	-6.46	-0.58	2.52	2.74	3.89	7.44	5.42	5.55
	(4.13)	(4.25)	(4.25)	(4.50)	(5.84)	(4.05)	(6.71)	(6.82)	(5.92)	(6.07)	(5.92)
	[-18.26 1.36]	[-18.70 - 1.29]	[-16.37 - 1.08]	[-15.70 - 2.78]	[-12.55 - 11.39]	[-5.78 - 10.83]	[-11.03 - 16.52]	[-10.07 - 17.85]	[-4.66 - 19.55]	[-6.99 - 17.83]	[-6.57 - 17.66]
(Parks within 15-min) \times (Caregiver modifier)	0.49^{b}	0.52^{b}	0.39^{b}	0.29	-0.21	-0.13	-0.02	-0.14	-0.30	-0.23	-0.23
	(0.19)	(0.19)	(0.17)	(0.18)	(0.26)	(0.25)	(0.26)	(0.26)	(0.26)	(0.27)	(0.27)
	[0.11-0.88]	[0.13-0.91]	[0.04 - 0.73]	[-0.08-0.67]	[-0.73 - 0.32]	[-0.64-0.37]	[-0.55-0.52]	[-0.68-0.39]	[-0.83-0.22]	[-0.78-0.32]	[-0.79-0.33]
R ²	0.461	0.454	0.456	0.448	0.498	0.448	0.431	0.460	0.489	0.492	0.516
Baseline (mother)	Х	Х	х	х	х	Х	х	х	х	х	х
Baseline (child)	Х	Х	х	х	х	Х	х	х	х	х	х
Areal effects: Neighborhood	Х	Х	х	х	х	Х	х	х	х	х	х
Mean of outcome	60.1	60.1	60.0	60.0	60.0	60.1	60.0	60.0	60.1	60.0	60.0
Std. dev. X	11.6	11.8	12.0	12.1	11.4	11.4	11.3	10.6	10.6	10.4	10.4
$N(Modifier^* = 1)$	43	43	44	45	45	48	45	45	45	45	45
N(father responded = 1)	18	18	18	18	18	24	36	36	36	36	36
Clusters	29	29	28	28	28	28	28	29	30	30	30
N	384	384	384	386	386	383	374	375	374	372	371

Note: Caregiver modifier is: Father bathes/showers child or keeps child company during bath/shower most often. Baseline associations are between CD-RISC (always at Year 10) and Parks within 15-minute of residence based on residence at different age of the child. See Figure 6 for an alternate visualization of the estimated coefficients across years. Other variables are not reported for brevity. Maternal baselines include (i) mother age at delivery (quadratic), (ii) ethnicity, (iii) mother university degree, (iv) occupation, and (v) public housing. Child baselines include child's sex, age at time of CD-RISC collection (in years), birth order, and employment of domestic helper. Standard errors are clustered at planning areas. Parentheses: standard errors. Square brackets: 95% confidence intervals. Angle brackets: p-values. Significance levels: c 0.1 b 0.05 a 0.01.

Table E4 | Differences in association between CD-RISC and Parks within 15-minute of residence, by Mother bathes/shower child most often.

	(1)	(2)	(3)	(4)	(5)	(6)	(7)	(8)	(9)	(10)	(11)
				Outco	ome variable:	Resilience (CD-RISC) at Y	ear 10			
			I	Parks within 15	-minute of re	sidence base	d on residenti	al record at y	ear:	-	-
	YO	Y1	Y2	Y3	Y4	Y5	Y6	Y7	Y8	Y9	Y10
Parks within 15-min	0.14	0.07	0.02	-0.04	0.04	0.16	0.00	-0.06	-0.16	-0.12	-0.13
	(0.09)	(0.10)	(0.13)	(0.16)	(0.14)	(0.19)	(0.20)	(0.18)	(0.19)	(0.20)	(0.17)
	[-0.03-0.32]	[-0.14 - 0.28]	[-0.25 - 0.30]	[-0.36-0.29]	[-0.26-0.33]	[-0.24 - 0.55]	[-0.40-0.41]	[-0.43 - 0.32]	[-0.55-0.23]	[-0.52 - 0.28]	[-0.48 - 0.23]
	< p=0.11>					< p=0.43>					
Caregiver modifier	-2.05	-2.97	-3.66	-5.70^{b}	-2.89	1.27	-4.47	-6.09^{c}	-6.97^{b}	-5.30	-6.23^{c}
	(2.88)	(2.89)	(2.74)	(2.67)	(3.11)	(3.38)	(3.37)	(3.41)	(3.11)	(3.35)	(3.62)
	[-7.95 - 3.85]	[-8.88 - 2.95]	[-9.28 - 1.95]	[-11.17 - 0.22]	[-9.27 - 3.49]	[-5.66-8.19]	[-11.38 - 2.44]	[-13.07 - 0.89]	[-13.35 - 0.60]	[-12.15 - 1.56]	[-13.64 - 1.19]
						< p=0.71>					
(Parks within 15-min) × (Caregiver modifier)	0.05	0.10	0.04	0.14	-0.00	-0.27	0.16	0.23	0.35	0.30	0.32
	(0.17)	(0.17)	(0.16)	(0.14)	(0.18)	(0.27)	(0.27)	(0.21)	(0.21)	(0.22)	(0.20)
	[-0.30-0.40]	[-0.25-0.45]	[-0.28 - 0.37]	[-0.16-0.44]	[-0.36-0.36]	[-0.83 - 0.28]	[-0.41 - 0.72]	[-0.21-0.66]	[-0.08-0.79]	[-0.15 - 0.76]	[-0.08-0.73]
	< p=0.77>	< p=0.57>	< p=0.79>		< p=1.00>	< p=0.32>		< p=0.29>			
R ²	0.451	0.444	0.453	0.451	0.499	0.453	0.434	0.467	0.493	0.496	0.521
Baseline (mother)	Х	х	х	х	Х	Х	Х	х	х	х	х
Baseline (child)	х	х	х	х	Х	Х	х	х	х	х	х
Areal effects: Neighborhood	х	х	х	х	Х	х	Х	х	х	х	х
Mean of outcome	60.1	60.1	60.0	60.0	60.0	60.1	60.0	60.0	60.1	60.0	60.0
Std. dev. X	11.6	11.8	12.0	12.1	11.4	11.4	11.3	10.6	10.6	10.4	10.4
$N(Modifier^* = 1)$	245	245	244	245	244	230	224	225	224	222	221
N(father responded = 1)	18	18	18	18	18	24	36	36	36	36	36
Clusters	29	29	28	28	28	28	28	29	30	30	30
N	384	384	384	386	386	383	374	375	374	372	371

Note: Caregiver modifier is: Mother bathes/showers child or keeps child company during bath/shower most often. Baseline associations are between CD-RISC (always at Year 10) and Parks within 15-minute of residence based on residence at different age of the child. See Figure 6 for an alternate visualization of the estimated coefficients across years. Other variables are not reported for brevity. Maternal baselines include (i) mother age at delivery (quadratic), (ii) ethnicity, (iii) mother university degree, (iv) occupation, and (v) public housing. Child baselines include child's sex, age at time of CD-RISC collection (in years), birth order, and employment of domestic helper. Standard errors are clustered at planning areas. Parentheses: standard errors. Square brackets: 95% confidence intervals. Angle brackets: p-values. Significance levels: c 0.1 b 0.05 a 0.01.

Table E5 | Differences in association between CD-RISC and Parks within 15-minute of residence, by Father plays with child most often.

	(1)	(2)	(3)	(4)	(5)	(6)	(7)	(8)	(9)	(10)	(11)
				Outco	me variable:	Resilience (C	D-RISC) at Y	ear 10			
			Par	ks within 15-	minute of re	sidence based	l on residenti	al record at y	ear:		
	YO	Y1	Y2	Y3	Y4	Y5	Y6	Y7	Y8	Y9	Y10
Parks within 15-min	0.12	0.09	-0.00	0.01	0.05	0.14	0.13	0.11	0.11	0.10	0.08
	(0.11)	(0.12)	(0.11)	(0.12)	(0.11)	(0.14)	(0.14)	(0.15)	(0.18)	(0.17)	(0.16)
	[-0.12-0.35]	[-0.15-0.34]	[-0.23-0.23]	[-0.25-0.26]	[-0.18-0.28]	[-0.14-0.43]	[-0.16-0.42]	[-0.20-0.42]	[-0.25-0.47]	[-0.25-0.45]	[-0.25-0.41]
Caregiver modifier	-5.07	-3.39	-3.60	-3.31	-1.62	4.25^{c}	4.53	2.91	6.35	4.93	2.94
	(3.32)	(3.33)	(3.40)	(3.49)	(3.47)	(2.48)	(4.69)	(4.35)	(4.25)	(4.46)	(4.83)
	[-11.88 - 1.74]	[-10.21 - 3.44]	[-10.58 - 3.38]	[-10.47 - 3.84]	[-8.74 - 5.50]	[-0.85 - 9.34]	[-5.10-14.15]	[-5.99 - 11.82]	[-2.34 - 15.04]	[-4.20-14.06]	[-6.94 - 12.81]
(Parks within 15-min) × (Caregiver modifier)	0.25	0.16	0.22	0.17	0.06	-0.26	-0.15	-0.12	-0.33	-0.26	-0.13
	(0.17)	(0.18)	(0.22)	(0.21)	(0.23)	(0.19)	(0.26)	(0.27)	(0.30)	(0.31)	(0.32)
	[-0.09-0.59]	[-0.21-0.52]	[-0.23-0.67]	[-0.25-0.60]	[-0.41-0.53]	[-0.64-0.13]	[-0.68-0.38]	[-0.66-0.43]	[-0.93-0.28]	[-0.89-0.37]	[-0.78-0.52]
					< p=0.80>	< p=0.19>	< p=0.57>			< p=0.41>	< p=0.68>
R ²	0.455	0.444	0.452	0.445	0.496	0.451	0.433	0.460	0.490	0.493	0.514
Baseline (mother)	х	X	X	X	х	X	х	X	х	х	х
Baseline (child)	X	х	X	х	X	х	Х	х	X	х	х
Areal effects: Neighborhood	х	х	х	х	х	х	х	х	Х	х	х
Mean of outcome	60.1	60.1	60.0	60.0	60.0	60.1	60.0	60.0	60.1	60.0	60.0
Std. dev. X	11.6	11.8	12.0	12.1	11.4	11.4	11.3	10.6	10.6	10.4	10.4
$N(Modifier^* = 1)$	97	97	98	99	99	110	95	96	96	95	95
N(father responded = 1)	18	18	18	18	18	24	36	36	36	36	36
Clusters	29	29	28	28	28	28	28	29	30	30	30
N	384	384	384	386	386	383	374	375	374	372	371

Note: Caregiver modifier is: Father plays with child most of the time. Baseline associations are between CD-RISC (always at Year 10) and Parks within 15-minute of residence based on residence at different age of the child. See Figure 7 for an alternate visualization of the estimated coefficients across years. Other variables are not reported for brevity. Maternal baselines include (i) mother age at delivery (quadratic), (ii) ethnicity, (iii) mother university degree, (iv) occupation, and (v) public housing. Child baselines include child's sex, age at time of CD-RISC collection (in years), birth order, and employment of domestic helper. Standard errors are clustered at planning areas. Parentheses: standard errors. Square brackets: 95% confidence intervals. Angle brackets: p-values. Significance levels: c 0.1 b 0.05 a 0.01.

Table E6 | Differences in association between CD-RISC and Parks within 15-minute of residence, by Mother plays with child most often.

	(1)	(2)	(3)	(4)	(5)	(6)	(7)	(8)	(9)	(10)	(11)
				Outco	ome variable:	Resilience (CD-RISC) at Y	ear 10			
			Par	ks within 15	-minute of re	sidence base	d on residenti	al record at y	ear:		
	YO	Y1	Y2	Y3	Y4	Y5	Y6	Y7	¥8	Y9	Y10
Parks within 15-min	0.21	0.15	0.16	0.12	0.11	-0.03	-0.15	-0.15	-0.19	-0.11	-0.15
	(0.13)	(0.15)	(0.16)	(0.17)	(0.16)	(0.16)	(0.19)	(0.19)	(0.19)	(0.21)	(0.18)
	[-0.07-0.49]	[-0.16-0.46]	[-0.17 - 0.50]	[-0.23-0.46]	[-0.21-0.43]	[-0.35 - 0.30]	[-0.54 - 0.25]	[-0.53 - 0.23]	[-0.58-0.19]	[-0.54 - 0.32]	[-0.53-0.23]
Caregiver modifier	3.05	2.93	5.08^{c}	2.59	2.98	0.33	-4.13	-3.54	-2.72	-1.11	-2.20
	(2.72)	(2.78)	(2.87)	(3.03)	(3.04)	(2.78)	(4.23)	(4.23)	(3.74)	(4.06)	(4.12)
	[-2.54-8.63]	[-2.78 - 8.63]	[-0.80 - 10.96]	[-3.63 - 8.80]	[-3.26 - 9.22]	[-5.37 - 6.02]	[-12.82 - 4.55]	[-12.22 - 5.13]	[-10.36 - 4.93]	[-9.42 - 7.19]	[-10.63 - 6.24]
(Parks within 15-min) \times (Caregiver modifier)	-0.06	-0.04	-0.20	-0.11	-0.09	0.10	0.38^{b}	0.37^{b}	0.38^{b}	0.25	0.33^{c}
	(0.17)	(0.18)	(0.20)	(0.17)	(0.18)	(0.18)	(0.17)	(0.16)	(0.15)	(0.19)	(0.16)
	[-0.41 - 0.28]	[-0.41-0.33]	[-0.62-0.21]	[-0.46-0.23]	[-0.45 - 0.28]	[-0.27-0.47]	[0.03 - 0.74]	[0.04 - 0.69]	[0.06-0.69]	[-0.13 - 0.63]	[-0.01-0.66]
	< p=0.71>	< p=0.83>		< p=0.51>	< p=0.63>	< p=0.58>	< p=0.03>	< p=0.03>	< p=0.02>	< p=0.18>	< p=0.06>
R ²	0.452	0.445	0.454	0.444	0.497	0.449	0.437	0.466	0.492	0.495	0.520
Baseline (mother)	X	х	X	X	X	X	х	х	х	х	х
Baseline (child)	X	х	X	X	х	X	х	х	х	х	х
Areal effects: Neighborhood	X	х	X	X	х	X	х	х	х	х	х
Mean of outcome	60.1	60.1	60.0	60.0	60.0	60.1	60.0	60.0	60.1	60.0	60.0
Std. dev. X	11.6	11.8	12.0	12.1	11.4	11.4	11.3	10.6	10.6	10.4	10.4
$N(Modifier^* = 1)$	217	217	218	219	222	236	238	239	239	238	237
N(father responded = 1)	18	18	18	18	18	24	36	36	36	36	36
Clusters	29	29	28	28	28	28	28	29	30	30	30
N	384	384	384	386	386	383	374	375	374	372	371

Note: Caregiver modifier is: Mother plays with child most of the time. Baseline associations are between CD-RISC (always at Year 10) and Parks within 15-minute of residence based on residence at different age of the child. See Figure 7 for an alternate visualization of the estimated coefficients across years. Other variables are not reported for brevity. Maternal baselines include (i) mother age at delivery (quadratic), (ii) ethnicity, (iii) mother university degree, (iv) occupation, and (v) public housing. Child baselines include child's sex, age at time of CD-RISC collection (in years), birth order, and employment of domestic helper. Standard errors are clustered at planning areas. Parentheses: standard errors. Square brackets: 95% confidence intervals. Angle brackets: p-values. Significance levels: c 0.1 b 0.05 a 0.01.

Table E7 | Differences in association between CD-RISC and Parks within 15-minute of residence, by Father takes child on unstructured outings most often.

	(1)	(2)	(3)	(4)	(5)	(6)	(7)	(8)	(9)	(10)	(11)
				Outco	ome variable:	Resilience (O	CD-RISC) at Y	ear 10			
			Par	ks within 15	minute of re	sidence base	1 on residenti	al record at y	ear:		
	YO	Y1	Y2	Y3	Y4	Y5	Y6	¥7	Y8	Y9	Y10
Parks within 15-min	0.00	-0.02	-0.08	-0.07	0.01	0.02	0.15	0.13	0.08	0.09	0.09
	(0.11)	(0.11)	(0.11)	(0.12)	(0.11)	(0.16)	(0.17)	(0.17)	(0.17)	(0.17)	(0.16)
	[-0.23-0.23]	[-0.26-0.21]	[-0.31-0.16]	[-0.32-0.18]	[-0.22-0.25]	[-0.30-0.34]	[-0.20-0.51]	[-0.22-0.48]	[-0.26-0.43]	[-0.25-0.43]	[-0.24-0.42]
					< p=0.91>	< p=0.90>					
Caregiver modifier	-4.54	-3.72	-2.80	-3.27	0.32	1.11	7.08^{c}	6.39 ^c	7.13 ^c	7.05^{c}	5.80
	(2.99)	(3.07)	(2.90)	(3.10)	(3.18)	(2.65)	(3.90)	(3.71)	(3.77)	(3.88)	(4.25)
	[-10.66 - 1.58]	[-10.00-2.57]	[-8.75-3.14]	[-9.62 - 3.08]	[-6.20-6.84]	[-4.33 - 6.55]	[-0.93 - 15.09]	[-1.21 - 14.00]	[-0.58 - 14.83]	[-0.88 - 14.98]	[-2.89-14.49]
						< p=0.68>					
(Parks within 15-min) \times (Caregiver modifier)	0.38^{a}	0.33^{b}	0.32^{b}	0.33^{b}	0.13	0.06	-0.17	-0.17	-0.17	-0.16	-0.13
	(0.12)	(0.14)	(0.15)	(0.14)	(0.19)	(0.18)	(0.27)	(0.26)	(0.24)	(0.24)	(0.25)
	[0.13 - 0.64]	[0.05 - 0.61]	[0.01 - 0.62]	[0.04 - 0.63]	[-0.26-0.53]	[-0.31-0.42]	[-0.72-0.38]	[-0.70-0.35]	[-0.66-0.32]	[-0.65-0.34]	[-0.65-0.39]
			< p=0.04>		< p=0.50>	< p=0.76>	< p=0.53>	< p=0.51>			
R ²	0.460	0.450	0.457	0.451	0.498	0.449	0.441	0.468	0.495	0.502	0.521
Baseline (mother)	Х	Х	х	х	х	х	х	х	Х	Х	х
Baseline (child)	Х	Х	х	х	х	х	х	х	Х	Х	х
Areal effects: Neighborhood	Х	Х	х	X	х	х	х	х	Х	Х	х
Mean of outcome	60.1	60.1	60.0	60.0	60.0	60.1	60.0	60.0	60.1	60.0	60.0
Std. dev. X	11.6	11.8	12.0	12.1	11.4	11.4	11.3	10.6	10.6	10.4	10.4
$N(Modifier^* = 1)$	153	153	151	152	151	159	125	126	126	125	125
N(father responded = 1)	18	18	18	18	18	24	36	36	36	36	36
Clusters	29	29	28	28	28	28	28	29	30	30	30
N	384	384	384	386	386	383	374	375	374	372	371

Note: Caregiver modifier is: Father takes child on unstructured outings most of the time. Baseline associations are between CD-RISC (always at Year 10) and Parks within 15-minute of residence based on residence at different age of the child. See Figure 8 for an alternate visualization of the estimated coefficients across years. Other variables are not reported for brevity. Maternal baselines include (i) mother age at delivery (quadratic), (ii) ethnicity, (iii) mother university degree, (iv) occupation, and (v) public housing. Child baselines include child's sex, age at time of CD-RISC collection (in years), birth order, and employment of domestic helper. Standard errors are clustered at planning areas. Parentheses: standard errors. Square brackets: 95% confidence intervals. Angle brackets: p-values. Significance levels: $^{c} 0.1^{b} 0.05^{a} 0.01$.

Table E8 | Differences in association between CD-RISC and Parks within 15-minute of residence, by Mother takes child on unstructured outings most often.

	(1)	(2)	(3)	(4)	(5)	(6)	(7)	(8)	(9)	(10)	(11)
				Outcome	variable: Resi	ilience (CD-RI	SC) at Year 1	0			
			Park	s within 15-min	nute of resider	ice based on i	esidential re	cord at year:			
	YO	Y1	Y2	¥3	Y4	Y5	Y6	Y7	Y8	Y9	Y10
Parks within 15-min	0.45^{a}	0.43^{a}	0.36^{b}	0.30	0.45^{b}	0.33	-0.10	-0.10	-0.15	-0.11	-0.12
	(0.12)	(0.13)	(0.17)	(0.19)	(0.17)	(0.20)	(0.17)	(0.22)	(0.23)	(0.28)	(0.28)
	[0.19 - 0.70]	[0.16 - 0.69]	[0.01 - 0.71]	[-0.09-0.70]	[0.10-0.80]	[-0.08-0.74]	[-0.45 - 0.25]	[-0.55-0.35]	[-0.62 - 0.32]	[-0.68 - 0.46]	[-0.68 - 0.45]
								< p=0.65>	< p=0.51>		< p=0.68>
Caregiver modifier	7.94^{b}	8.85^{a}	7.12^{b}	6.38^{b}	6.97 ^c	3.78	-2.94	-2.70	-2.63	-2.26	-3.07
	(3.13)	(2.99)	(2.73)	(2.88)	(3.68)	(3.53)	(2.88)	(3.20)	(2.96)	(3.71)	(3.86)
	[1.54 - 14.35]	[2.73 - 14.97]	[1.53 - 12.72]	[0.48 - 12.29]	[-0.57-14.52]	[-3.45 - 11.01]	[-8.84 - 2.96]	[-9.26 - 3.86]	[-8.68 - 3.42]	[-9.84 - 5.32]	[-10.96 - 4.82]
(Parks within 15-min) \times (Caregiver modifier)	-0.41^{b}	-0.46^{a}	-0.42^{b}	-0.35^{b}	-0.46^{a}	-0.34	0.27^{c}	0.24	0.26	0.20	0.23
	(0.16)	(0.15)	(0.15)	(0.16)	(0.16)	(0.22)	(0.15)	(0.20)	(0.19)	(0.26)	(0.26)
	[-0.73 - 0.09]	[-0.76 - 0.15]	[-0.73 - 0.10]	[-0.68 - 0.01]	[-0.78 - 0.14]	[-0.79-0.11]	[-0.03-0.57]	[-0.18 - 0.66]	[-0.13 - 0.65]	[-0.32 - 0.73]	[-0.31 - 0.76]
								< p=0.25>	< p=0.19>	< p=0.43>	< p=0.40>
R ²	0.463	0.458	0.460	0.451	0.505	0.451	0.432	0.461	0.486	0.491	0.515
Baseline (mother)	Х	Х	х	х	х	х	х	х	х	х	х
Baseline (child)	Х	х	х	х	х	х	х	х	х	х	х
Areal effects: Neighborhood	Х	х	х	х	х	х	х	х	х	х	х
Mean of outcome	60.1	60.1	60.0	60.0	60.0	60.1	60.0	60.0	60.1	60.0	60.0
Std. dev. X	11.6	11.8	12.0	12.1	11.4	11.4	11.3	10.6	10.6	10.4	10.4
$N(Modifier^* = 1)$	277	277	278	280	279	283	278	279	278	276	276
N(father responded = 1)	18	18	18	18	18	24	36	36	36	36	36
Clusters	29	29	28	28	28	28	28	29	30	30	30
N	384	384	384	386	386	383	374	375	374	372	371

Note: Caregiver modifier is: Mother takes child on unstructured outings most of the time. Baseline associations are between CD-RISC (always at Year 10) and Parks within 15-minute of residence based on residence at different age of the child. See Figure 8 for an alternate visualization of the estimated coefficients across years. Other variables are not reported for brevity. Maternal baselines include (i) mother age at delivery (quadratic), (ii) ethnicity, (iii) mother university degree, (iv) occupation, and (v) public housing. Child baselines include child's sex, age at time of CD-RISC collection (in years), birth order, and employment of domestic helper. Standard errors are clustered at planning areas. Parentheses: standard errors. Square brackets: 95% confidence intervals. Angle brackets: p-values. Significance levels: $^{\circ}$ 0.1 b 0.05 a 0.01.

Table E9 | Differences in association between CD-RISC and Parks within 15-minute of residence, by Father helps with schoolwork, art projects, etc.

	(1)	(2)	(3)	(4)	(5)	(6)	(7)	(8)	(9)	(10)	(11)
				Outco	me variable:	Resilience (C	D-RISC) at Ye	ar 10			
			Par	ks within 15-	minute of res	idence based	on residentia	al record at y	ear:		
	YO	Y1	Y2	Y3	Y4	Y5	Y6	Y7	Y8	Y9	Y10
Parks within 15-min	0.10	0.07	-0.03	-0.03	0.04	0.04	0.09	0.03	0.04	0.04	0.05
	(0.12)	(0.12)	(0.10)	(0.12)	(0.12)	(0.12)	(0.13)	(0.12)	(0.12)	(0.13)	(0.13)
	[-0.15 - 0.36]	[-0.18 - 0.32]	[-0.24 - 0.18]	[-0.28-0.22]	[-0.20-0.28]	[-0.21 - 0.29]	[-0.17 - 0.36]	[-0.22-0.29]	[-0.21 - 0.29]	[-0.23 - 0.31]	[-0.20-0.31]
Caregiver modifier	-5.29	-2.82	-5.68	-5.29	-1.98	-1.88	4.41	1.15	3.55	2.89	2.98
	(4.87)	(4.94)	(4.46)	(4.43)	(5.26)	(3.13)	(3.87)	(4.15)	(4.03)	(4.34)	(4.56)
	[-15.26 - 4.69]	[-12.94 - 7.31]	[-14.84 - 3.48]	[-14.38 - 3.80]	[-12.78 - 8.81]	[-8.30-4.55]	[-3.54 - 12.35]	[-7.36 - 9.66]	[-4.69 - 11.80]	[-6.00-11.77]	[-6.36 - 12.31]
(Parks within 15-min) × (Caregiver modifier)	0.60^{b}	0.39	0.56^{c}	0.51^{c}	0.19	0.10	0.04	0.24	0.05	0.07	0.10
	(0.27)	(0.30)	(0.28)	(0.27)	(0.34)	(0.22)	(0.19)	(0.20)	(0.24)	(0.25)	(0.28)
	[0.03 - 1.16]	[-0.23 - 1.01]	[-0.01-1.13]	[-0.05 - 1.07]	[-0.51-0.89]	[-0.35-0.54]	[-0.35-0.43]	[-0.17-0.66]	[-0.44 - 0.54]	[-0.44 - 0.57]	[-0.47 - 0.67]
		< p=0.20>	< p=0.05>			< p=0.65>	< p=0.83>	< p=0.24>		< p=0.78>	< p=0.72>
R ²	0.466	0.451	0.464	0.455	0.497	0.447	0.438	0.467	0.489	0.494	0.519
Baseline (mother)	X	х	Х	х	х	х	х	х	х	Х	х
Baseline (child)	X	х	Х	х	х	х	х	х	х	Х	х
Areal effects: Neighborhood	х	х	х	х	х	х	х	х	х	х	х
Mean of outcome	60.1	60.1	60.0	60.0	60.0	60.1	60.0	60.0	60.1	60.0	60.0
Std. dev. X	11.6	11.8	12.0	12.1	11.4	11.4	11.3	10.6	10.6	10.4	10.4
$N(Modifier^* = 1)$	54	54	53	53	53	63	77	77	77	77	77
N(father responded = 1)	18	18	18	18	18	24	36	36	36	36	36
Clusters	29	29	28	28	28	28	28	29	30	30	30
N	384	384	384	386	386	383	374	375	374	372	371

Note: Caregiver modifier is: Father helps with schoolwork, art projects, etc. Baseline associations are between CD-RISC (always at Year 10) and Parks within 15-minute of residence based on residence at different age of the child. See Figure 9 for an alternate visualization of the estimated coefficients across years. Other variables are not reported for brevity. Maternal baselines include (i) mother age at delivery (quadratic), (ii) ethnicity, (iii) mother university degree, (iv) occupation, and (v) public housing. Child baselines include child's sex, age at time of CD-RISC collection (in years), birth order, and employment of domestic helper. Standard errors are clustered at planning areas. Parentheses: standard errors. Square brackets: 95% confidence intervals. Angle brackets: p-values. Significance levels: c 0.1 b 0.05 a 0.01.

Table E10 Differences in association bet	ween CD-RISC and Parks within 15-minute of residence,
by Mother helps with schoolwork, art pro	pjects, etc.

	(1)	(2)	(3)	(4)	(5)	(6)	(7)	(8)	(9)	(10)	(11)
				Outed	ome variable:	Resilience (O	D-RISC) at Ye	ear 10			-
			Par	ks within 15	minute of re	sidence based	l on residenti	al record at y	ear:		
	YO	Y1	Y2	Y3	Y4	Y5	Y6	Y7	Y8	Y9	Y10
Parks within 15-min	0.29^{b}	0.25	0.07	0.02	-0.09	-0.20	0.09	0.07	0.04	0.05	0.11
	(0.14)	(0.15)	(0.19)	(0.18)	(0.12)	(0.15)	(0.19)	(0.19)	(0.21)	(0.24)	(0.23)
	[0.00-0.58]	[-0.05-0.55]	[-0.32 - 0.45]	[-0.35 - 0.39]	[-0.33 - 0.15]	[-0.50-0.11]	[-0.29-0.47]	[-0.31-0.45]	[-0.39-0.47]	[-0.44 - 0.53]	[-0.37 - 0.59]
Caregiver modifier	4.85	4.63	3.49	0.60	-0.06	0.25	4.09	3.86	3.29	4.54	5.32^{c}
	(3.34)	(3.52)	(2.75)	(2.22)	(3.37)	(2.38)	(3.10)	(3.10)	(2.67)	(2.86)	(2.86)
	[-1.99 - 11.68]	[-2.58-11.84]	[-2.15 - 9.12]	[-3.96-5.16]	[-6.98 - 6.86]	[-4.65 - 5.14]	[-2.28-10.45]	[-2.50-10.21]	[-2.18-8.75]	[-1.30-10.38]	[-0.52 - 11.16]
			< p=0.22>								
(Parks within 15-min) \times (Caregiver modifier)	-0.20	-0.21	-0.03	0.05	0.23	0.28^{c}	0.02	0.02	-0.00	-0.02	-0.11
	(0.18)	(0.18)	(0.18)	(0.16)	(0.18)	(0.15)	(0.22)	(0.23)	(0.22)	(0.25)	(0.26)
	[-0.57-0.18]	[-0.58-0.16]	[-0.40-0.34]	[-0.28 - 0.39]	[-0.15 - 0.61]	[-0.01-0.58]	[-0.43 - 0.47]	[-0.45 - 0.49]	[-0.46-0.46]	[-0.53-0.49]	[-0.64-0.43]
	< p=0.29>		< p=0.87>	< p=0.74>	< p=0.23>	< p=0.06>	< p=0.93>	< p=0.93>	< p=1.00>	< p=0.94>	< p=0.69>
R ²	0.455	0.447	0.453	0.444	0.501	0.458	0.437	0.466	0.488	0.497	0.521
Baseline (mother)	х	Х	х	х	х	х	х	х	х	х	х
Baseline (child)	х	Х	х	X	х	х	х	х	х	х	х
Areal effects: Neighborhood	х	х	х	X	х	х	х	х	х	х	х
Mean of outcome	60.1	60.1	60.0	60.0	60.0	60.1	60.0	60.0	60.1	60.0	60.0
Std. dev. X	11.6	11.8	12.0	12.1	11.4	11.4	11.3	10.6	10.6	10.4	10.4
$N(Modifier^* = 1)$	220	220	222	222	222	250	260	261	260	259	258
N(father responded = 1)	18	18	18	18	18	24	36	36	36	36	36
Clusters	29	29	28	28	28	28	28	29	30	30	30
N	384	384	384	386	386	383	374	375	374	372	371

Note: Caregiver modifier is: Mother helps with schoolwork, art projects, etc. Baseline associations are between CD-RISC (always at Year 10) and Parks within 15-minute of residence based on residence at different age of the child. See Figure 9 for an alternate visualization of the estimated coefficients across years. Other variables are not reported for brevity. Maternal baselines include (i) mother age at delivery (quadratic), (ii) ethnicity, (iii) mother university degree, (iv) occupation, and (v) public housing. Child baselines include child's sex, age at time of CD-RISC collection (in years), birth order, and employment of domestic helper. Standard errors are clustered at planning areas. Parentheses: standard errors. Square brackets: 95% confidence intervals. Angle brackets: p-values. Significance levels: c 0.1 b 0.05 a 0.01.

Randomization inference: Permuting parks within 15-minute of residence

To assess the extent to which the temporal patterns for the paternal vs. maternal in-656 teractions of caregiving qualities with parks within 15 minutes of residence—earlier for 657 paternal interaction and later for maternal interaction—occurred by chance, we permute 658 the parks measure. In each iteration of permutation, we randomly shuffle the parks 659 measure across families each year for a pseudo-random seed value while retaining the 660 caregiving modifier. We repeat this $n_p = 1,999$ times to generate the null reference dis-661 tribution of estimated interaction terms. The permutation-based p-value is derived as 662 $1 + \sum_{i=1}^{n_p} 1\left(\left|\gamma_i^{(y)}\right| \ge \left|\gamma_{\text{sample}}^{(y)}\right|\right)$ so that the p-value reflects how extreme the sample estimates p =663 $\frac{1}{1+n_p}$ (the $\gamma^{(y)}$) are in relation to the null random distribution. Figures E6 to E15 report the re-664 sults as a series of subfigures for each year. The vertical solid lines represent the sample 665 estimates against the permutation-derived distribution. We also implement randomiza-666 tion inference within families across years, restricting the parks to temporal shuffling 667 within the family. The p-values are generally smaller (not reported). 668

655



Figure E6 | Primary caregiver modifier: Father is the primary caregiver (m = 1 if indicated, 0 if not).



Figure E7 Primary caregiver modifier: Mother is the primary caregiver (m = 1 if indicated, 0 if not).



Figure E8 Bathe/shower modifier: Father bathe/shower child or keep child company during bath/shower most often (m = 1 if indicated, 0 if not).



Figure E9 Bathe/shower modifier: Mother bathe/shower child or keep child company during bath/shower most often (m = 1 if indicated, 0 if not).







cated, 0 if not).



Figure E13 Unstructured outings modifier: Mother take child on unstructured outings most of the time (m = 1 if indicated, 0 if not).



