Supplementary Online Content

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eAppendix. Summary of literature on the effect of socioeconomic disadvantage on structural brain development across adolescence
eMethods 1. Measures of socioeconomic disadvantage
eMethods 2. Family interaction assessment and measures
eMethods 3. MRI acquisition and analysis and interscanner reliability
eMethods 4. Children's Global Assessment Scale
eMethods 5. Statistical analysis
eTable 1. Index of Relative Socioeconomic Disadvantage (IRSD) variable loadings, weights, and descriptions (SEIFA 2006)
eTable 2. Pearson bivariate correlations between variables
eTable 3. Clusters where cortical thickness and its development was significantly associated with neighborhood disadvantage (random field theory cluster corrected, *P* < .013)
eTable 4. Linear mixed effects models where there were significant effects of disadvantage (main or in interaction with age, sex, and/or maternal positive behavior)
eFigure 1. Histogram of Index of Relative Socioeconomic Disadvantage (IRSD) scores in the sample (higher scores indicate greater disadvantage)
eFigure 2. Proportion of participants for whom ROI thickness increased (light gray), decreased (dark gray), or did not change (mid gray), based on interscanner reliability analysis
eFigure 3. Neighborhood disadvantage associated with increased right middle temporal lobe thickness across age
eFigure 4. Individual developmental trajectories of the right amygdala, parahippocampal, and inferior temporal in adolescents with relatively high and low neighborhood disadvantage
eFigure 5. Individual development trajectories of regions associated with an interaction between positive maternal behavior and different measures of socioeconomic disadvantage
eFigure 6. Sex differences in the moderating effect of positive maternal behavior (during the event-planning interaction) on the association between neighborhood disadvantage and development of cortical thickness
eReferences

eAppendix. Summary of literature on the effect of socioeconomic disadvantage on structural brain development across adolescence

Few studies to date have investigated the associations between indicators of socioeconomic disadvantage and brain structural *development*. Regarding volume development, Hanson et al.[1] found that low parental income predicted reduced growth trajectories for total, frontal and parietal gray matter volumes from infancy to mid-childhood. Hair et al.[2], in children and adolescents aged 4 to 22, found that low parental income was associated with a maturational lag in the volumetric development of the frontal and temporal lobes and hippocampus. Although not using longitudinal methodology, Noble et al.[3], in a cross-sectional sample of children and adolescents aged 5 to 17, found increasing parental education-related differences with age in superior temporal and inferior frontal gyri volume. In the only study to investigate associations between SES and cortical thickness development, Piccolo et al.[4] found that higher SES (parental income and education) was linked with steeper age-related decreases in temporal cortical thickness in adolescence.[4]

eMethods 1. Measures of socioeconomic disadvantage

Australian National University Four (ANU$_4$) Scale of Occupations

Of note, the measure of occupation status used in the current study was based on optimal scaling procedures, whereby scores were assigned to occupations in such a way as to maximize the role of occupation as an intervening variable between education and income (rather than using prestige as the criterion for weighting education and income). This approach remains the state-of-the art approach for the continuous scaling of occupations and has also been used to generate national socioeconomic indices in countries such as New Zealand[5].

Income-to-needs

Income-to-needs ratio was measured based on reported family income relative to the relevant Australian poverty line for household size. Income was assessed for parents individually via interview. Income brackets (per annum, AUD: nil, $1-7,799, $7,800-12,999, $13,000-20,799, $20,800-31,199, $31,200-41,599, $41,600-51,999, $52,000-67,599, $67,600-83,199, $83,200-103,999, $104,000+), rather than exact amounts, were assessed due to sensitivities around inquiring about exact figures. The mid-point of income brackets < $104,000, and a Pareto estimate[6] for the "$104,000+" bracket, was used to calculate family income. For 38 families, where two parents were living in the home, income was only obtained from one parent. For these families, income of the missing parent was deduced from occupation based on national median salary scales. The income-to-needs ratio was not calculated for single parent families where parent income was not reported, and for two parent families where income was not reported by at least one parent and/or occupation for the other parent was not reported. Poverty lines were based upon the Melbourne Institute Labour Economics and Social Policy quarterly publication, "Poverty Lines: Australia" (https://melbourneinstitute.com/miaesr/publications/indicators/poverty-lines-australia.html), for the December 2011 quarter. This is a standard reference material for social welfare policy in Australia. Minimum income levels required to avoid a situation of poverty are presented for a range of family sizes and circumstances. The income-to-needs ratio was calculated as *parental income/poverty line (derived for single or couple, + number of children).*

Socio-Economic Indexes For Areas (SEIFA) Index of Relative Socio-economic Disadvantage (IRSD)

The SEIFA-IRSD[7] is a summary measure of a group of characteristics related to relative socioeconomic disadvantage in a given geographical area based upon household's responses to a compulsory national population and household census conducted every five years by the Australian Bureau of Statistics (ABS). In SEIFA, principal components analysis is used to create a summary measure of a group of characteristics for each index. The IRSD item descriptions, variable loadings and weights are provided in eTable 1. The IRSD scores used here were based on the 2006 census, as is the most proximal to the maternal parenting assessment. The smallest area for which SEIFA data is available from the 2006 census is the Census Collection District (CD), which is equivalent to a group of suburban blocks, roughly 250 households in an urban area. Participant's residential addresses at the Time 1 assessment were geocoded (i.e., longitude and latitude) and matched to the 2006 CD areas using a cloud-deployed commercial geomapping service (Callpoint Spatial Pty Ltd).

The IRSD scores for each CD were then extracted from ABS data, which are publically available online. Four participant addresses were unable to be geocoded to the specific address provided, as no corresponding physical address was on record: two addresses were unable to be matched at the street level, and post code level average IRSD was used in these cases; and, two addresses could not be matched at the street number level, and street level IRSD was used in these cases.

Note that area based measures are useful for the investigation of contextual effects of the socioeconomic environment. There is a wealth of empirical evidence that the social environment, including neighborhood characteristics, has a strong influence on child development, independent of the individual family situation (for a review see Sellström and Bremberg[8]). Further, while research has shown that family measures such as income-to-needs may be more predictive than neighborhood disadvantage for some child outcomes, for others, these measures may have equal (but unique) effects. It has been shown that there are contextual effects of area of residence on achievement for example, that are not captured by family-level measures.[9]

eMethods 2. Family interaction assessment and measures

Family interaction assessment and measures

Adolescents and mothers completed the lab-based interaction assessment at T1. Mother-adolescent dyads completed two 20-min interaction tasks that were video recorded for subsequent coding. An event-planning interaction (EPI) was completed first, followed by a problem-solving interaction (PSI). The EPI and PSI tasks were intended to differentially elicit positive and negative behavior, respectively. For the EPI, mothers and adolescents were instructed to plan one or more pleasant activities to do together, with up to five activities chosen on the basis of items that both the mother and adolescent rated as being “very pleasant” on the Pleasant Events Schedule.[11] For the PSI, mother-adolescent dyads were instructed to try to resolve one or more issues of disagreement, with up to five issues selected that the mother and adolescent endorsed as occurring the most frequently and generating the highest intensity of anger on the Issues Checklist.[12]

Living in Family Environments (LIFE) coding system

The LIFE[13] is an observational, microsocial coding system that allows for a detailed analysis of individual family members’ behaviors. The LIFE system consists of 10 nonverbal affect codes (e.g., anger, dysphoria, happy) and 27 verbal content codes (e.g., validation, complaint, provoke). To code the video-recorded interactions, we used an event-based protocol in which new codes were entered each time the affect or content of one of the interactants changed. The affect and content codes were used to develop a composite positive interpersonal behavior construct (for the EPI and PSI separately). The positive construct included all behaviors with happy or caring affect as well as approving, validating, affectionate, or humorous comments made with neutral affect. We used the LIFE data to construct a frequency variable to measure maternal expression of positive emotion. These variables indicate the average number of times a mother expressed positive behavior per minute and were calculated separately for the EPI and PSI. Coders were extensively trained and blind to the clinical and demographic characteristics of the participants. Approximately 20% of the interactions were coded by a second observer to provide an estimate of observer agreement. The Kappa reliability coefficient for the positive construct was 0.86.

Validity of family interaction assessment and measures

Observational research is suggested to be the gold standard by which parents’ responses to their children’s emotions can be measured[14,15], offering several advantages over self-report measures. First, behavioral observations provide a more objective and relatively ‘natural’ assessment of behavior[16]. Second, observational methods may be less influenced by social desirability because participants have less control over the content of behavior that is observed in such paradigms[16]. Third, observational methods enable the recording of behavior of which the participant may not be consciously aware or able to report on, such as non-verbal behavior[16].

The validity of the specific observational setting and coding system used in this study has been demonstrated previously. For example, in other work with this and other samples, we have shown that the frequency of parental negative and positive behaviors are significantly associated with maternal expressed emotion[17], maternal temperament[18], and adolescent emotion regulation[19] and autonomic responses[20] as well as mental health outcomes, including depression and anxiety (e.g.[21,22]).

eMethods 3. MRI acquisition and analysis and interscanner reliability

MRI acquisition and analysis

At T1, MRI scans were performed on a 3 Tesla GE Signa scanner at the Brain Research Institute, Austin and Repatriation Medical Centre, Melbourne, Australia, with the following parameters: repetition time = 36 msec; echo time = 9msec; flip angle = 35°, field of view = 20cm, 124 T1-weighted contiguous slices (voxel dimensions = 0.4883 x 0.4883 x 1.5mm). MRI scans at T2 and T3 were performed on a 3 Tesla Siemens MAGNETOM Trio scanner at the Royal Children's Hospital, Melbourne, Australia, with the following parameters: repetition time = 1900 msec; echo time = 2.24 msec; flip angle = 9°, field of view = 23cm; 176 T1-weighted contiguous slices (voxel dimensions = $0.9mm^3$).

Images were transferred to an SGI/Linux workstation for morphometric analysis. Cortical reconstruction was performed using the FreeSurfer image analysis suite (http://surfer.nmr.mgh.harvard.edu/). Cortical thickness values were automatically quantified within FreeSurfer on a vertex-by-vertex basis by computing the average shortest distance between the white matter boundary and the pial surface.[23] Surface boundaries were visually inspected by a trained rater and, if necessary, errors due to segmentation miss-classification were manually corrected and re-processed. Subcortical volumes were estimated using an automated subcortical segmentation procedure that involves the assignment of a neuroanatomical label to each voxel in a MRI volume using a probabilistic atlas and Bayesian classification rule for label assignment. Subcortical segmentation output was visually inspected for accuracy by an individual trained in neuroanatomy. In order to address issues arising from longitudinal and/or multisite studies (such as geometric distortion and voxel dimension drift), images were processed through the longitudinal stream of FreeSurfer version 5.3,[24] which creates a within-unbiased subject template space and average image from both time points using robust, inverse consistent registration.[25] The template is used as an estimate to initialize subsequent segmentation processes in the longitudinal stream for each time point, providing common information regarding anatomical structures. This process significantly improves the repeatability and power of cortical measurements, having superior robustness with respect to noise, intensity scaling and outliers when compared to alternate registration tools.[26] All FreeSurfer image processing was conducted on a high performance computing facility at the Melbourne Neuropsychiatry Centre, Melbourne, Australia.

Interscanner reliability

Given that different scanners were used at the first vs the second and third MRI assessment, a reliability analysis was undertaken to address concerns that changes in cortical thickness over time may be due to measurement bias from the different scanner platforms and acquisition parameters. Four individuals (not part of the ADS sample), aged 23, 28, 35 and 36 were each scanned at BRI (locale of first MRI) and RCH (locale of second and third MRI) within a two-week period. The same acquisition parameters were used at each location to those described above, as well as the same semi-automated methods of data processing. Data from the inter-scanner reliability analysis was applied to the ADS sample using the descriptive procedure proposed by Lebel and Beaulieu[27], in order to determine if the mean amount of change experienced by the study sample was likely to have occurred over and above that expected from scanner effects. We calculated standard deviations for four ROIs (Desikan atlas labels based on regions plotted in Figures 1 and 4: right parahippocampal gyrus, right inferior temporal gyrus, right caudal middle frontal gyrus, right lateral orbitofrontal cortex) within each reliability subject based on their scores from the different scanners. A group average standard deviation was then calculated for each ROI (mean SD across all subjects). These values provide estimates of the measurement variability in each ROI that can be expected from scanner differences alone. The average SD data was applied to the ADS sample in order to determine the proportion (i.e., percentage) of subjects that experienced greater change (either increases or decreases) than the average SD. For each subject, change for each ROI was calculated using a difference score (i.e., cortical thickness for time 2 – time 1). Those with difference scores within 1 SD (determined from the reliability study) were considered to not change, while those with difference scores greater than 1 SD were considered to experience true change (over and above scanner effects). When the majority of subjects (i.e., >50%) experienced longitudinal change over and above that expected from scanner effects, this is taken as evidence that changes in cortical metrics identified by the mixed models in our previously reported results (Nandi ref) was reliable. The results from the ADS sample are presented in eFigure 2, indicating that for each ROI the majority of individuals (>50%) experienced greater cortical change over time than could be attributed to inter-scanner variance alone based on the reliability estimates. Similar results for other cortical ROIs have been previously reported by Vijayakumar et al.[28,29], and for subcortical volumes have been previously reported by Dennison et al.[30]

eMethods 4. Children's Global Assessment Scale

The Children's Global Assessment Scale (CGAS[31]) was administered via interview during late adolescence to assess current global functioning (see Supplementary Material for more detail). The CGAS results in a total score from one to 100, with higher scores indicating superior functioning across a range of domains (i.e., functioning at school, home and with peers, involvement in activities and hobbies, absence of behavioral disturbance and psychiatric symptoms).

eMethods 5. Statistical analysis

Cortical thickness was modeled within each i^{th} subject at each j^{th} vertex using the following equations:

1. Effects of socioeconomic disadvantage on brain development (where SD = occupation or education or neighborhood disadvantage): Y = Intercept + d_{ij} + β_1 (age) + β_2 (SD) + β_4 (age*SD) + $e_{ijk.}$
2. Sex effects in model 1: Y = Intercept + d_{ij} + β_1 (sex) + β_2 (age) + β_3 (SD) + β_4 (age*SD) + β_5 (age*sex) + β_6 (sex*SD) + β_7 (age*sex*SD) + $e_{ijk.}$
3. Moderating effect of maternal behavior (MPI = EPI or PSI) in model 1: Y = Intercept + d_{ij} + β_1 (age) + β_2 (SD) + β_3 (MPI) + β_4 (age*SD) + β_5 (age*MPI) + β_6 (MPI*SD) + β_7 (age*SD*MPI) + $e_{ijk.}$
4. Moderating effect of sex in model 3: Y = Intercept + d_{ij} + β_1 (age) + β_2 (SD) + β_3 (MPI) + β_4 (sex) + β_5 (age*SD) + β_6 (age*MPI) + β_7 (MPI*SD) + β_8 (age*sex) + β_9 (SD*sex) + β_{10} (MPI*sex) + β_{11} (age*SD*MPI) + β_{12} (age*SD*sex) + β_{13} (age*sex*MPI) + β_{14} (sex*SD*MPI) + β_{15} (age*SD*MPI*sex) + $e_{ijk.}$

The d_{ij} term represents the random effect of the intercept within each vertex in each subject. The e_{ijk} represents the normally distributed residual error term. Age, sex, SD and MPI were fixed effects, with β representing the parameter estimates for each of the main effects and interactions. All models were run with mean-centered continuous variables. Similar models were run for individual subcortical volumes. We did not control for whole brain volume or thickness. There is no consensus regarding controlling for such measures in longitudinal studies due to multiple issues with this process. First, whole brain volume is driven by both thickness and surface area, with some research suggesting that it is largely driven by surface area[32,33]. Only minor change has been identified in cortical thickness with enlargements of brain size, consistent with theoretical models by Van Essen[34] and Rakic[35]. These findings and theories question the influence of increasing whole brain volume on cortical thickness. Another important issue for developmental neuroimaging is that global brain size continues to change during adolescence[36], and differences in development rates across the brain could bias results when controlling for global size.

eTable 1. Index of Relative Socioeconomic Disadvantage (IRSD) variable loadings, weights, and descriptions (SEIFA 2006)

Variable mnemonic	Variable loading	Variable weight	
			Variable description
NONET	–0.85	–0.33	% Occupied private dwellings with no Internet connection
OCC_LABOUR	–0.76	–0.30	% Employed people classified as Labourers
NOQUAL	–0.76	–0.30	% People aged 15 years and over with no post-school qualifications
INC_LOW	–0.76	–0.30	% People with stated annual household equivalised income between $13,000 and $20,799 (approx. 2nd and 3rd deciles)
RENT_SOCIAL	–0.70	–0.27	% Households renting from a Government or Community organisation
UNEMPLOYED	–0.70	–0.27	% People (in the labour force) unemployed
ONEPARENT	–0.67	–0.26	% Families that are one parent families with dependent offspring only
LOWRENT	–0.67	–0.26	% Households paying rent who pay less than $120 per week (excluding $0 per week)
DISABILITYU70	–0.61	–0.24	% People aged under 70 who have a long-term health condition or disability and need assistance with core activities
NOCAR	–0.57	–0.22	% Occupied private dwellings with no car
INDIGENOUS	–0.52	–0.20	% People who identified themselves as being of Aboriginal and/or Torres Strait Islander origin
OVERCROWD	–0.52	–0.20	% Occupied private dwellings requiring one or more extra bedrooms (based on Canadian National Occupancy Standard)
DIVORCED	–0.51	–0.20	% People aged 15 years and

			over who are separated or divorced
OCC_DRIVERS	–0.51	–0.20	% Employed people classified as Machinery Operators and Drivers
NOSCHOOL	–0.44	–0.17	% People aged 15 years and over who did not go to school
OCC_SERVICE_L	–0.44	–0.17	% Employed people classified as Low Skill Community and Personal Service Workers
ENGLISHPOOR	–0.33	–0.13	% People who do not speak English well

eTable 2. Pearson bivariate correlations between variables

	IRSD	Parental Occupation	Parental Education	MPI PSI	MPI EPI	FSIQ	CGAS	ATAR	DNCYr12
INR	**-0.293**	**0.325**	**0.315**	0.068	0.146	.186	0.185	**0.352**	-0.157
IRSD		**-0·281**	**-0·227**	-0·035	0·054	**-0·172**	**-0·277**	-0·172	**0·233**
Parental Occupation			**0·623**	0·098	-0·104	0·068	**0·207**	**0·365**	**-0·249**
Parental Education				0·094	-0·017	**0·356**	0·175	**0·469**	-0·158
MPI PSI					**0·457**	**0·178**	**0·269**	0·151	**-0·200**
MPI EPI						0·036	**0·209**	-0·032	**-0·183**
FSIQ							0·095	**0·363**	**-0·185**
CGAS								**0·230**	**-0·493**
ATAR									-0·201

Bold indicates significant at p < 0·05

FSIQ = estimated full-scale intelligence quotient, INR = income-to-needs ratio, IRSD = Index of Relative Socioeconomic Disadvantage (i.e., neighborhood disadvantage; higher score represents greater disadvantage), CGAS = child global assessment scale, DNCYr12 = did not complete year 12. Maternal positive interpersonal (MPI) behaviors were measures from both a problem solving interaction (PSI) and an event planning interaction (EPI).

eTable 3. Clusters where cortical thickness and its development was significantly associated with neighborhood disadvantage (random field theory cluster corrected, *P* < .013)

	Region	Hemisphere	t	Cluster size	x	y	z
IRSD	Middle temporal cortex	R	4.669	160	65.2	-22.3	-9.8
-IRSD x age	Fusiform/Inferior/middle temporal cortex, parahippocamal cortex	R	5.879	3150	39.2	-12.5	-29.9
	Inferior temporal cortex	L	4.239	618	-56.7	-58.4	-19.4
	Middle temporal cortex	R	4.283	272	51.8	3.2	-25.1
	Lateral occipital cortex	L	3.896	169	-41.8	-62.7	19.8
	Temporal pole	L	4.604	207	-36.4	20.3	-38.9
IRSD x age x MPI (PSI) x sex	Superior frontal cortex	R	4.601	340	9.5	22.8	62.8
	Middle frontal cortex	R	5.102	318	43.1	16.2	41.4
	Lateral orbitofrontal cortex	R	4.370	271	32.1	32.7	-14.4
	Middle frontal cortex	L	4.917	196	-29.3	9.6	57.7
	Precentral cortex	L	5.225	199	-7.0	-23.4	60.7
	Supramarginal cortex	L	4.559	143	-44.3	-40.8	41.7
	Superior frontal cortex	R	4.488	113	23.7	6.1	51.1
IRSD x age x MPI (EPI) x sex	Superior frontal cortex	R	5.300	213	23.2	26.6	54.7
	Superior frontal cortex	L	4.076	180	-18.3	33.8	52.8
	Posterior insula cortex	R	4.833	192	41.3	-13.2	11.0
	Middle frontal cortex	L	4.319	135	-39.9	23.5	44.6

IRSD = Index of Relative Socio-economic Disadvantage, L = left, R = right, MPI = frequency of maternal positive interpersonal behaviour, EPI = event planning interaction, PSI = problem solving interaction.

eTable 4. Linear mixed effects models where there were significant effects of disadvantage (main or in interaction with age, sex, and/or maternal positive behavior)

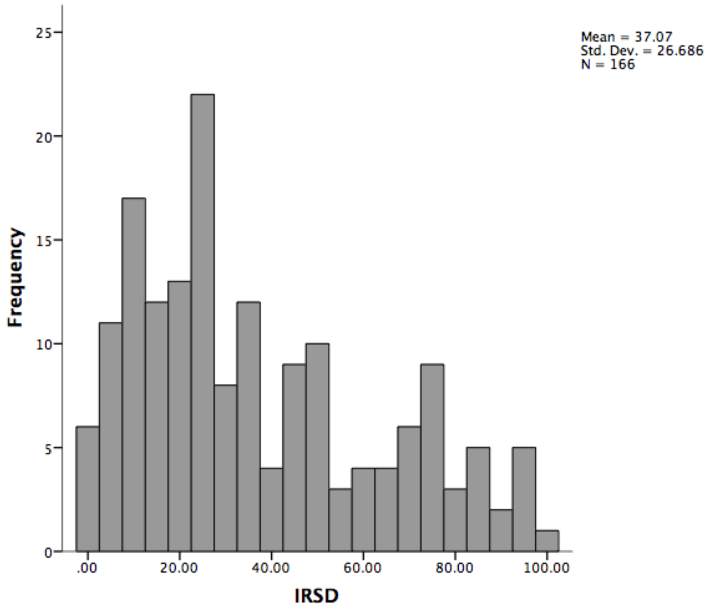
Neighborhood Disadvanatge																				
	Intercept					**Age**					**IRSD**					**Age*IRSD**				
	B	SE	DF	T	p	B	SE	DF	T	p	B	SE	DF	T	p	B	SE	DF	T	p
Left Amygdala	1427.85491	29.8359839	198	47.8568064	0.00000	13.3139295	1.59891459	198	8.32685472	0.0000	4.34622442	1.12583125	164	3.86045814	0.00016252	-0.2331414	0.06158061	198	-3.7859541	0.00020294
Right Amygdala	1514.3507	35.9296852	198	42.1476194	0.00000	12.2487308	2.03107225	198	6.03067212	0.0000	3.72559905	1.3568116	164	2.74584847	0.00670945	-0.2085177	0.07823552	198	-2.6652563	0.00832784
Right Inferior Temporal Gyrus	2.13810652	0.07686934	198	27.8148168	0.00000	0.05438741	0.0045824	198	11.8687631	0.0000	0.01968652	0.00290748	164	6.77098298	0.00000000	-0.0011031	0.00017661	198	-6.246257	0.00000000
Right Parahippocampal Gyrus	3.01560623	0.05887111	198	51.2238697	0.00000	0.00726001	0.00349133	198	2.07943763	0.0389	0.01120085	0.00222614	164	5.03151867	0.00000127	-0.0006585	0.00013454	198	-4.8941225	0.00000204
	Intercept					**Age**					**IRSD**					**Sex**				
	B	SE	DF	T	p	B	SE	DF	T	p	B	SE	DF	T	p	B	SE	DF	T	p
Right Amygdala	1537.3751	49.4611321	196	31.0824891	0.00000	15.7233963	2.84963178	196	5.51769403	0.0000	8.18190903	1.91694634	162	4.2681993	0.00003340	-52.670939	69.8566406	162	-0.7539861	0.45195207
	Intercept					**Age**					**IRSD**					**MPI_PSI**				
	B	SE	DF	T	p	B	SE	DF	T	p	B	SE	DF	T	p	B	SE	DF	T	p
Right Dorsal Frontal Cortex	3.61126833	0.08443896	192	42.7677974	0.00000	-0.012567	0.0050143	192	-2.5062282	0.0130	0.00689485	0.00332633	158	2.07280591	0.03981431	-0.0731975	0.15701456	158	-0.4661829	0.64172664
Right Lateral Orbitofrontal Cortex	3.2758925	0.08111214	192	40.3872051	0.00000	-0.0051089	0.00484117	192	-1.055305	0.2926	0.00865376	0.00319527	158	2.70830275	0.00750822	0.25037335	0.15084387	158	1.65981783	0.09893458
Occupation																				
	Intercept					**Age**					**Occupation**					**MPI_PSI**				
	B	SE	DF	T	p	B	SE	DF	T	p	B	SE	DF	T	p	B	SE	DF	T	p
Left Amygdala	1419.77245	30.1589413	196	47.0763358	0.00000	13.589621	1.62851186	196	8.34480935	0.0000	0.37249475	1.52513697	162	0.24423691	0.80735639	57.1483222	50.1243922	162	1.14012998	0.25591499
Income-to-needs																				
	Intercept					**Age**					**INR**					**MPI_PSI**				
	B	SE	DF	T	p	B	SE	DF	T	p	B	SE	DF	T	p	B	SE	DF	T	p
Right Amygdala	1781.0879	20.96003	188	84.97545	0.00000	13.2384	2.87744	188	4.60075	0.0000	23.484	13.00554	188	1.80569	0.0726	102.7108	35.65656	162	2.88056	0.0045

Neighborhood Disadvanatge																				
Left Amygdala																				
Right Amygdala																				
Right Inferior Temporal Gyrus																				
Right Parahippocampal Gyrus																				
	Age*IRSD					**Age*Sex**					**IRSD*sex**					**AGE*IRSD*sex**				
	B	SE	DF	T	p	B	SE	DF	T	p	B	SE	DF	T	p	B	SE	DF	T	p
Right Amygdala	-0.456335	0.11444446	196	-3.9873927	0.000094	-6.4630229	3.9899192	196	-1.619838	0.1068749	-8.0698702	2.64539684	162	-3.0505329	0.00266963	0.45037269	0.15450705	196	2.91490053	0.00397212
	Sex					**Age*IRSD**					**Age*MPI_PSI**					**IRSD*MPI_PSI**				
	B	SE	DF	T	p	B	SE	DF	T	p	B	SE	DF	T	p	B	SE	DF	T	p
Right Dorsal Frontal Cortex	0.08329453	0.11978406	158	0.69537241	0.48784341	-0.0003634	0.00020688	192	-1.7563957	0.08061515	-0.0032138	0.00930313	192	-0.3454519	0.73013286	-0.0201454	0.0065251	158	-3.0873749	0.0023856
Right Lateral Orbitofrontal Cortex	0.15766786	0.11510816	158	1.36973659	0.17271263	-0.0006484	0.00019957	192	-3.2487309	0.00136849	-0.0146402	0.00897621	192	-1.6309951	0.1045306	-0.0239354	0.00626534	158	-3.820284	0.00019121
Occupation																				
	Age*Occupation					**Age*MPI_PSI**					**Occupation*MPI_PSI**					**AGE*Occupation*MPI_PSI**				
	B	SE	DF	T	p	B	SE	DF	T	p	B	SE	DF	T	p	B	SE	DF	T	p
Left Amygdala	-0.0913941	0.08154607	196	-1.1207669	0.26375844	0.35875073	2.73146204	196	0.13134019	0.89564092	-5.9784911	2.50474561	162	-2.3868656	0.01814564	0.38201269	0.13185445	196	2.8972302	0.00419295
Income-to-needs																				
	Sex					**Age*INR**					**Age*MPI_PSI**					**INR*MPI_PSI**				
	B	SE	DF	T	p	B	SE	DF	T	p	B	SE	DF	T	p	B	SE	DF	T	p
Right Amygdala	-146.695	29.77041	162	-4.92754	0.0000	-10.0582	3.95177	188	-2.54524	0.0117	8.6202	5.42207	188	1.58983	0.1136	-37.6313	24.00658	188	-1.56764	0.1187

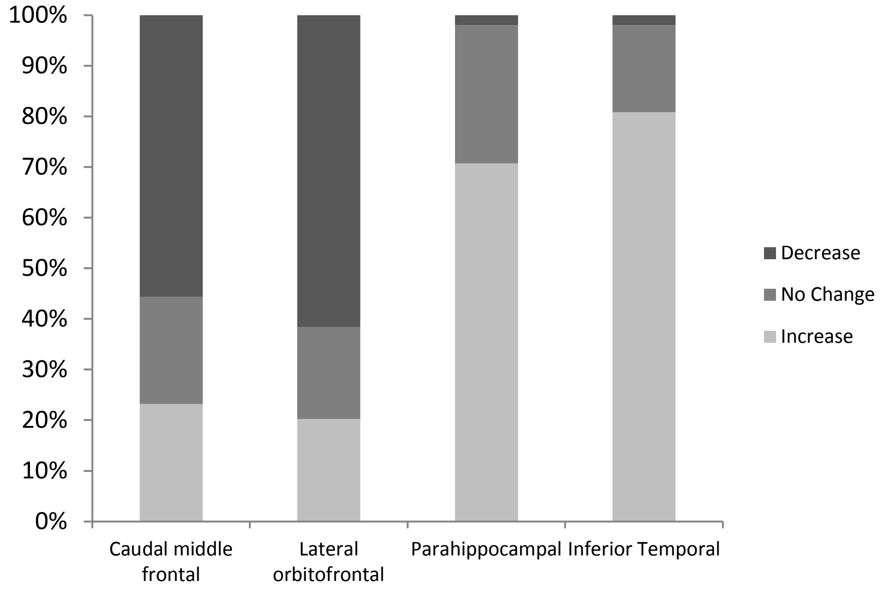
Neighborhood Disadvanatge																				
Left Amygdala																				
Right Amygdala																				
Right Inferior Temporal Gyrus																				
Right Parahippocampal Gyrus																				
Right Amygdala																				
	Age*Sex					**IRSD*Sex**					**MPI_PSI*sex**					**Age*IRSD*MPI_PSI**				
	B	SE	DF	T	p	B	SE	DF	T	p	B	SE	DF	T	p	B	SE	DF	T	p
Right Dorsal Frontal Cortex	-0.0025252	0.00703703	192	-0.3588415	0.72010798	0.00123739	0.0045583	158	0.27145924	0.7863922	0.06961706	0.20533288	158	0.33904489	0.73502611	0.00119467	0.00041549	192	2.87534982	0.00449147
Right Lateral Orbitofrontal Corte	-0.0136415	0.00679799	192	-2.0066942	0.04618515	-0.007309	0.00438133	158	-1.6682241	0.09725182	0.03619767	0.1972717	158	0.18349143	0.85464771	0.00168945	0.00040019	192	4.22163544	0.0000374
Occupation																				
Left Amygdala																				
Income-to-needs																				
	Sex*Age					**Sex*INR**					**Sex*MPI_PSI**					**INR*Age*MPI_PSI**				
	B	SE	DF	T	p	B	SE	DF	T	p						B	SE	DF	T	p
Right Amygdala	-4.4462	3.99823	188	-1.11205	0.2675	-29.604	16.91385	188	-1.75028	0.0817	-104.6021	49.73246	162	-2.10333	0.037	-21.5539	7.94071	188	-2.71435	0.0073

Neighborhood Disadvanatge																				
Left Amygdala																				
Right Amygdala																				
Right Inferior Temporal Gyrus																				
Right Parahippocampal Gyrus																				
Right Amygdala																				
	Age*IRSD*Sex					**Age*MPI_PSI*Sex**					**IRSD*MPI_PSI*Sex**					**Age*IRSD*MPI_PSI*Sex**				
	B	SE	DF	T	p	B	SE	DF	T	p	B	SE	DF	T	p	B	SE	DF	T	p
Right Dorsal Frontal Cortex	-0.0001601	0.0002763	192	-0.579261	0.56309211	0.00328724	0.01211812	192	0.27126649	0.7864775	0.04144263	0.00852161	158	4.86323835	0.000003	-0.0024347	0.00052495	192	-4.6380269	0.000006
Right Lateral Orbitofrontal Cor	0.00060853	0.00026687	192	2.28022139	0.02369334	0.00135134	0.0117014	192	0.11548549	0.90818101	0.03524897	0.00818515	158	4.30645528	0.000029	-0.0021207	0.00050637	192	-4.1879719	0.000043
Occupation																				
Left Amygdala																				
Income-to-needs																				
	Age*INR*Sex					**Age*MPI_PSI*Sex**					**INR*MPI_PSI*Sex**					**Age*INR*MPI_PSI*Sex**				
	B	SE	DF	T	p	B	SE	DF	T	p	B	SE	DF	T	p	B	SE	DF	T	p
Right Amygdala	12.5916	4.93621	188	2.55087	0.0115	-15.8054	6.98033	188	-2.26427	0.0247	16.4654	31.37602	188	0.52478	0.600400	27.7406	9.54366	188	2.9067	0.004100

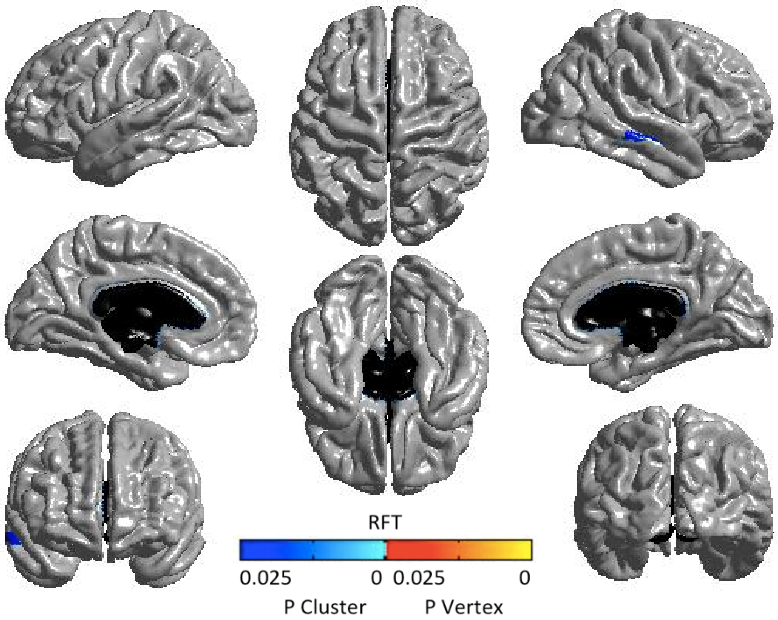
eFigure 1. Histogram of Index of Relative Socioeconomic Disadvantage (IRSD) scores in the sample (higher scores indicate greater disadvantage)



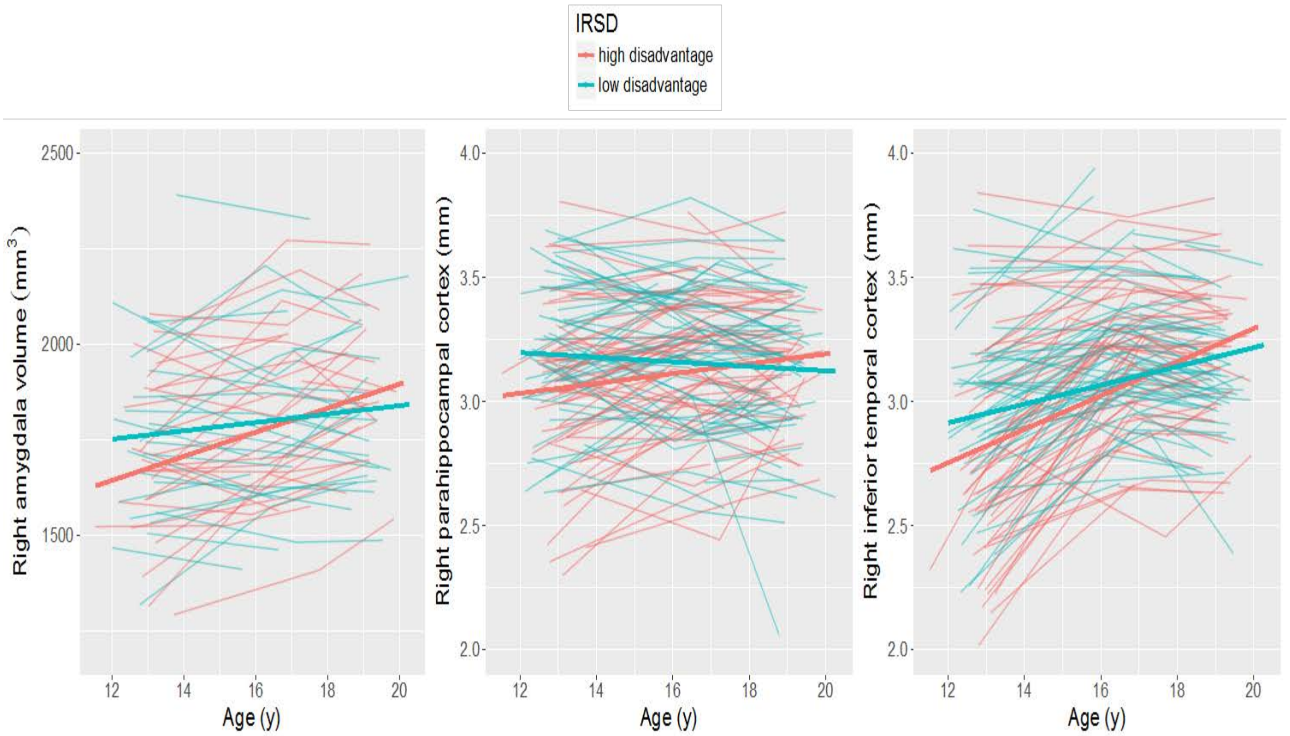
eFigure 2. Proportion of participants for whom ROI thickness increased (light gray), decreased (dark gray), or did not change (mid gray), based on interscanner reliability analysis[28]



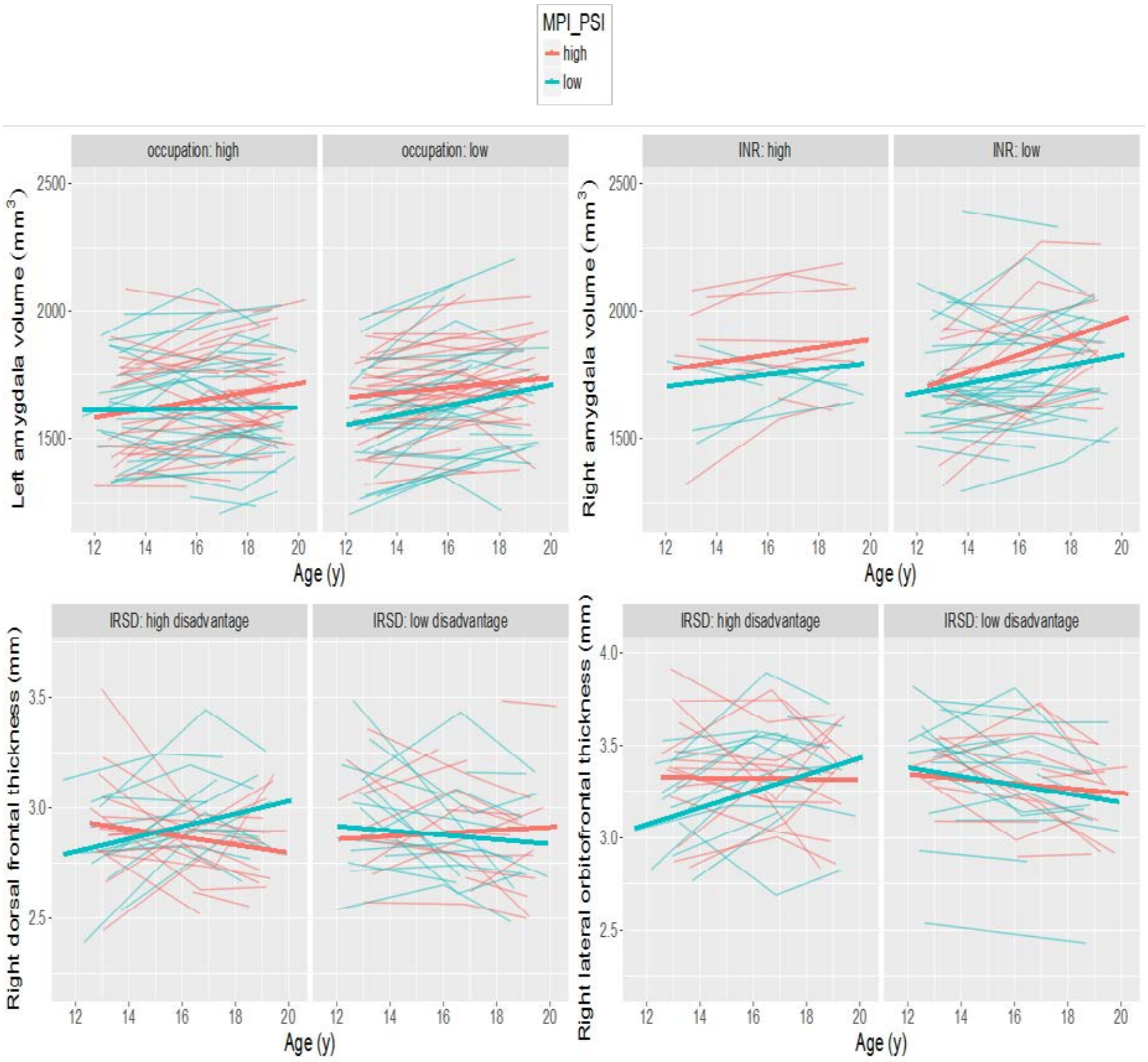
eFigure 3. Neighborhood disadvantage associated with increased right middle temporal lobe thickness across age



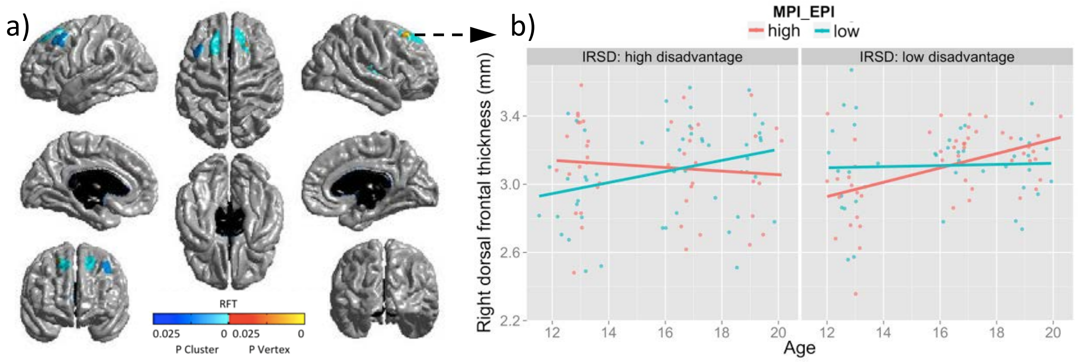
eFigure 4. Individual developmental trajectories of the right amygdala, parahippocampal, and inferior temporal in adolescents with relatively high and low neighborhood disadvantage



eFigure 5. Individual development trajectories of regions associated with an interaction between positive maternal behavior and different measures of socioeconomic disadvantage



eFigure 6. Sex differences in the moderating effect of positive maternal behavior (during the event-planning interaction) on the association between neighborhood disadvantage and development of cortical thickness



Note that slopes represent average brain development for low and high MPI groups based on a median split of the data. IRSD = Index of Relative Socio-economic Disadvantage, MPI_EPI = maternal positive interpersonal behaviour during the event planning interaction.

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