# Supporting Information

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### SI Text

**Method Used for Estimating Developmental Trajectories.** Maternal depression symptomatology (MDS) was assessed at 5, 17, 30, 42, 60, and 84 mo using the National Institute of Mental Health's Center for Epidemiological Studies-Depression (CES-D) scale (1), a well-validated self-reported tool for screening depression in the general population. Items in this version included depressed mood (equivalent to items 3, 6, and 14 in the 20-items version), positive affect (equivalent to items 12 and 16, reverse scored), and psychomotor retardation (equivalent to item 7). Each item could be scored from between 0 and 3 (from "rarely or none of the time" to "often and most of the time"). Scale scores could therefore range from 0 to 18 for this version. Family income was measured on a scale from 1 to 8 representing, respectively, an income from less then $10,000 Canadian dollars (CAN) to greater than $80,000 CAN.

In all children, we estimated joint developmental trajectories from ages 5 to 84 mo using a censored normal density for MDS and income (2). The group-based trajectory methodology allows to simultaneously take into account variations in both variables over time and classify individuals as a function of these patterns (3). A key output of model estimation is the posterior probability of trajectory membership. For each trajectory group, this probability measures the likelihood for an individual of belonging to that trajectory based on observations across assessments. For example, in the case of an individual who scores high on depression at all assessment periods, the posterior probability of membership to a chronically high trajectory group would be high, whereas the probability of membership to a low trajectory group would be near 0. Because we are interested in children's exposure to chronic depression while controlling for income, using several time points is more reliable for identifying stability in patterns than any single time measurement, as it assigns individuals to trajectories and takes into account not only variations over time but also the degree of uncertainty in classification. The average posterior probability for being classified in low- and high-income trajectories were 0.93 and 0.97, respectively, and 0.93 and 0.86 for exposed and nonexposed to MDS, respectively, which indicates good fit.

MDS was best-fitted (based on the Bayesian information criterion, BIC) by a two-groups model (exposed and nonexposed, respectively 21% and 79% of the sample). Both trajectories showed trends for slight linear decreases over time. The exposed MDS trajectory group that was selected on the basis of the developmental trajectories analysis represents mothers whose depression score averaged around 6 over time, and the low trajectory represents mothers whose depression score averaged around 1.5 over time. A mean score of 6 over time on this subscale of the CES-D represents chronic mild depression (4). However, given that lifetime rates of major depressive disorder between the ages of 18 and 45 y is about 18% and that the rate is ∼1.5-times greater in women than in men in general population studies (5), the high trajectory identified here in our population study is likely to have identified women who will show clinical signs of depression in their lifetime. In a sister cohort of families (1-y younger) coming from a similar epidemiological catchment area, 27% of mothers reported a lifetime history of major depressive episode when assessed when the child was 29 mo of age (4). We found that 23% of mothers in our sample met the same criterion for major depression when the child was 30 mo of age. The relation between this categorisation at 30 mo and MDS trajectories from 5 to 84 mo was significant (Spearman $\rho = 0.27$, $P < 0.001$; $\chi^2 = 40.97$, $P < 0.001$), with 72% of cases well-classified.

Family income (in CAN) was best-fitted (based on the BIC) by a five-group model. All trajectories showed trends for slight linear increases over time, which is typical for this variable. The first two groups (low and moderately low) represent families with incomes around $13,500 and $25,000, respectively. The third group (moderate) represents families with incomes around $42,500. Finally, the last two groups (moderately high and high) earned, respectively, around $70,000 and $80,000. To simplify sampling, the five trajectories of family income were recoded into two trajectories. The first two groups were recoded into a low- to moderately low income trajectories (23% of sample with an income below $25,000 CAN) and the last three groups were recoded into the middle-to-high income group (77% of the sample with an income equal or greater than $25,000 CAN). This cut-off is slightly above the low income cut-off threshold after taxes set by Statistics Canada (2009) (6) for a four-person family during the income sampling period (1998–2003) in constant dollars (2005 basis), which means that these families spend about 60% or more of their income on food, shelter, and clothing. As expected, the correlation between trajectories of MDS and income across the entire sample was negative (Spearman $\rho = -0.29$, $P < 0.001$). To control for income in the study sample, children across MDS groups were then matched on income level.

**Manual Segmentation Procedure for Analysis of Hippocampus and Amygdala Volumes.** The posterior end of the hippocampus was defined inferomedial to the inferior horn of the lateral ventricle, when the tail of the hippocampus first appears as an oval mass of gray matter between lateral ventricle and ambient cistern. The superior and medial borders of the hippocampus at this point are the fasciolar gyrus and the Andreas Retzius gyrus; the inferior and medial border of the hippocampus at this point is the white matter demarcating the hippocampus from the parahippocampal gyrus. Moving further anterior, the hippocampus fuses with the parahippocampal gyrus medially, and the subiculum replaces the white matter as the medial border of the hippocampus. Laterally, fimbria and alveus mark the border of the hippocampus in the body and head. Finally, in the most anterior portion of the hippocampus, the superior border of the hippocampus is defined by the appearance of either the alveus or the uncal recess of the inferior horn of the lateral ventricle. Anteriorly, the gray matter of the hippocampus fuses with the gray matter of the amygdala.

The transition from hippocampus to amygdala is best defined in the horizontal plane, at the point where gray matter first starts to appear superior to the alveus, or inferior horn of the lateral ventricle, and anterior to the hippocampus. The superior border of the amygdala was defined by drawing a horizontal line between the superolateral part of the optical tract and the fundus of the inferior portion of the circular sulcus of the insula. For identification of the medial and lateral border, the horizontal view was used. The ambient cistern was used as reference for the medial border. Further anterior, a semicircle drawn from the lateral end of the lateral ventricle to the alveus was used as landmark for the medial border. The lateral border of the amygdala was defined by the transition from gray to white matter, and by reference to the lateral border of the inferior horn of the lateral ventricle located posterior to the amygdala. For the inferior border of the amygdala, the coronal images were used for best separation. The tentorial indentation served as demarcation

line between amygdala and entorhinal cortex, by excluding the gray matter inferolateral to the indentation. The anterior border of the amygdala was defined at the level of the closure of the lateral sulcus, which was identified in the horizontal plane.


1. Radloff LS (1977) The CES-D scale: A self-report depression scale for research in the general population. *Applied Psychometric Measure* 1:385–401.
2. McLachlan G, Peel D (2000) *Finite Mixture Models* (Wiley-Interscience, New York), p 342.
3. Jones BL, Nagin DS (2007) Advances in group-based trajectory modeling and a SAS procedure for estimating them. *Sociol Methods Res* 35:542–571.
4. Roy CA, et al. (2005) Construct validity of an instrument to assess major depression in parents in epidemiologic studies. *Can J Psychiatry* 50:784–791.
5. Kessler RC, et al. (2005) Lifetime prevalence and age-of-onset distributions of DSM-IV disorders in the National Comorbidity Survey Replication. *Arch Gen Psychiatry* 62: 593–602.
6. Canada Statistics G (2005) *Income Trends in Canada: 1980–2003* (Government of Canada, Ottawa).