Supplementary Online Content

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This supplementary material has been provided by the authors to give readers additional information about their work.
### eTable 1. Specific Measures Available in Each Data Set

| Sample | Step 1 | Step 2 | Step 3 |
|--------|--------|--------|--------|
| **HBN** | WISC/WASI/WAIS MR or BD < 16th %ile OR WISC 5 VIQ-PIQ OR VIQ-FRI > 15 points OR WAIS/WASI VCI-PRI > 15 | WIAT Word reading ≥16th%ile | NIH Flanker or Card Sort ≤ 16th%ile | Grooved Pegboard ≤ 16th%ile | ASSQ <19 |
|        |        | CBCL Social Problems T > 70 | WIAT Numerical Operations ≤ 16th%ile |        |        |
| **NKI** | WASI MR or BD ≤ 16th %ile OR VIQ-PIQ > 15 points | WIAT Word reading ≥16th%ile | CBCL Social Problems > 95th%ile | DKEFS Trail Making, Card Sort ≤ 16th%ile | WJ-III Calculation ≤16th%ile | Perdue Pegboard ≤16th%ile | ASD is exclusion for the study |
| **SYS** | WISC-III PIQ < 16th%ile OR VIQ-PIQ > 15 points | WJ Spelling ≥16th%ile | Positive Youth Development Scale <16th%ile | Stroop Interference ≤16th%ile | WJ-III Calculation ≤16th%ile | Grooved Pegboard ≤ 16th%ile | ASD is exclusion for the study |

*For HBN and NKI samples 16th%ile is based on standardized national norms. For SYS the 16th%ile is calculated within the sample itself.*
### eTable 2. Population and Sample Characteristics Used for Creating Sampling Weights Across 3 Neuroimaging Samples

|                        | Population characteristics available                                                                 | Sample characteristics available                                                                 |
|------------------------|-------------------------------------------------------------------------------------------------------|--------------------------------------------------------------------------------------------------|
| **HBN (N=1350)**       | *American Community Survey, 2016:*                                                                    | *Age:* Single ages grouped into three age groups (5 to 9, 10 to 14, 15 to 17)                     |
|                        |  *Age:* Age groups (5 to 9, 10 to 14, 15 to 17)                                                     | *Sex:* Male or female                                                                              |
|                        |  *Sex:* Male or female                                                                               | *Race/Ethnicity:* Two variables 1) Yes/No Hispanic, 2) Race: White, Black, Hispanic, Asian, Indian, Native American Indian, Alaskan Native, Native Hawaiian/Other Pacific Islander, Two or More races, Other, Unknown. Race/ethnicity was coded from these as: non-Hispanic white, non-Hispanic black, Hispanic, Asian/Pacific Islander, Other/2+ races |
|                        |  *Race/Ethnicity:* Hispanic, non-Hispanic White, Black, American Indian and Alaska Native, Asian, Native Hawaiian and Other Pacific Islander, Other, two or more races | *Socio Economic Status:* Used number of members in each household and household income to determine poverty status – above/below poverty line, missing |
|                        |  *Socio Economic Status:* Above/below the poverty line, missing                                       |                                                                                                  |
| **NKI-Rockland (N=309)** | *American Community Survey, 2016:*                                                                  | *Age:* Single ages grouped into two age groups (6 to 11, 12 to 17)                                 |
|                        |  *Age:* Age groups (6 to 11, 12 to 17)                                                               | *Sex:* Male or female                                                                              |
|                        |  *Sex:* Male or female                                                                               | *Race/Ethnicity:* Two variables 1) Yes/No Hispanic, 2) Race: White, Black, Hispanic, Asian, Indian, Native American Indian, Alaskan Native, Native Hawaiian/Other Pacific Islander, Other. Race/ethnicity was coded from these as: non-Hispanic white, non-Hispanic black, Hispanic, Asian/Pacific Islander, Other/2+ races |
|                        |  *Race/Ethnicity:* Hispanic, Non-Hispanic White, Black, American Indian/Alaska Native, Asian Native Hawaiian/Other Pacific Islander, Other | *Socio Economic Status:* Used number of members in each household and household income to determine poverty status – above/below poverty line, missing |
|                        |  *Socio Economic Status:* Above/below the poverty line, missing                                       |                                                                                                  |
| **SYS (N=1004)**       | *Canadian 2006 Census of Population, Quebec:*                                                         | *Age:* Age in months, rounded to nearest age                                                      |
|                        |  *Age:* Age groups (10 to 14, 15 to 19)                                                              | *Parental Education:* Mother and father parental education categories (Combined: 1. No certificate, diploma or degree certificate or diploma; 2. High school/trade school certificate or equivalent & university studies not completed; 3. College, CEGEP or other non-university certificate or diploma; 4. Bachelor’s degree & above bachelor level; 5. Missing). Used Father’s education and matched it to adult male education. |
|                        |  *Adult Education:* Highest level of education received by adults aged 35-54 (1. No certificate, diploma or degree; 2. High school certificate or equivalent; 3. College, CEGEP or other non-university certificate or diploma; 4. Bachelor’s degree+) | *Income:* Household income categories (< 15,000, 15,000-24,999, 25,000-34,999, 35,000-44999, ≥45000) |
|                        |  *Income:* Household income categories (< 15,000, 15,000-24,999, 25,000-34,999, 35,000-44999, ≥45000)  |                                                                                                  |

Note: Data for the sample weight for HBN and NKI-Rockland were drawn from the 2016 American Community Survey. Data for the sample weight for SYS were drawn from the 2006 Canadian Census of Population.
### eTable 3. HBN and NYC* Populations and Variables Used to Create a Sample Weight

| Sociodemographic Variables for NYC Children | 2016 NYC Population (N =1,340,375) | HBN ( N=1283) | HBN with weight | HBN sensitivity weight - 1% trim | NVLD ONLY ( N=137) |
|---------------------------------------------|-----------------------------------|---------------|-----------------|-------------------------------|------------------|
|                                             | N       | %    | N       | %    | N       | %    | N       | %    |
| Weighted Variables                           |         |      |         |      |         |      |         |      |
| Race                                        |         |      |         |      |         |      |         |      |
| Non-Hispanic White                          | 335,213 | 25.0 | 607     | 47.3 | 25.0    | 29.7 | 57      | 41.6 |
| Non-Hispanic Black                          | 318,564 | 23.8 | 165     | 12.9 | 23.8    | 22.6 | 30      | 21.9 |
| Hispanic                                    | 479,586 | 35.8 | 315     | 24.6 | 35.8    | 35.6 | 33      | 24.1 |
| Asian/Pacific Islander                      | 170,127 | 12.7 | 36      | 2.8  | 12.7    | 8.0  | 5       | 3.7  |
| Other/ 2+ Races                             | 36,952  | 2.8  | 160     | 12.5 | 2.8     | 4.1  | 12      | 8.8  |
| Sex                                         |         |      |         |      |         |      |         |      |
| Male                                        | 682,251 | 50.9 | 796     | 62.0 | 50.9    | 53.0 | 89      | 65.0 |
| Female                                      | 658,124 | 49.1 | 487     | 38.0 | 49.1    | 47.0 | 48      | 35.0 |
| Income                                      |         |      |         |      |         |      |         |      |
| Below Poverty Line                          | 384,688 | 28.7 | 56      | 4.4  | 28.7    | 21.3 | 11      | 8.0  |
| Above Poverty Line                          | 942,394 | 70.3 | 810     | 63.1 | 70.3    | 74.2 | 95      | 69.3 |
| Missing income                              | 13,060  | 1.0  | 417     | 32.5 | 1.0     | 4.5  | 31      | 22.6 |
| Nested Variable                             |         |      |         |      |         |      |         |      |
| Age                                         |         |      |         |      |         |      |         |      |
| 6 to 9 years                                | 392,635 | 29.3 | 543     | 42.3 | 29.3    | 33.8 | 41      | 29.9 |
| 10 to 14 years                              | 465,408 | 34.7 | 539     | 42.0 | 34.7    | 36.1 | 59      | 43.1 |
| 15 to 19 years                              | 482,332 | 36.0 | 201     | 15.7 | 36.0    | 30.1 | 37      | 27.0 |

Note: * NYC population pulled from the 2016 American Community Survey
**eTable 4.** NKI and Rockland* Populations and Variables Used to Create a Sample Weight

| Sociodemographic Variables | Rockland (N = 59,807) | Overall NKI Sample (N = 309) | NKI with Weight | NKI trim weight - 1% trim | NVLD ONLY (n = 30) |
|-----------------------------|-----------------------|------------------------------|----------------|---------------------------|------------------|
|                             | N         | %      | N         | %      | %   | %   | N  | %  |
| **Weighted Variables**      |           |        |           |        |     |     |     |     |
| **Race**                    |           |        |           |        |     |     |     |     |
| White                       | 38336     | 64.1   | 171       | 55.3   | 64.1 | 63.5 | 14  | 46.7|
| Black                       | 5024      | 8.4    | 53        | 17.2   | 8.4  | 8.7  | 6   | 20.0|
| Hispanic                    | 11722     | 19.6   | 57        | 18.5   | 19.6 | 19.9 | 7   | 23.3|
| Other                       | 4725      | 7.9    | 28        | 9.1    | 7.9  | 8.0  | 3   | 10.0|
| **Sex**                     |           |        |           |        |     |     |     |     |
| Male                        | 30502     | 51.0   | 174       | 56.3   | 51.0 | 50.9 | 15  | 50.0|
| Female                      | 29305     | 49.0   | 135       | 43.7   | 49.0 | 49.1 | 15  | 50.0|
| **Poverty**                 |           |        |           |        |     |     |     |     |
| Below Poverty Line          | 14497     | 24.2   | 20        | 6.5    | 24.2 | 22.9 | 5   | 16.7|
| Above Poverty Line          | 44918     | 75.1   | 219       | 70.9   | 75.1 | 76.2 | 19  | 63.3|
| Missing income              | 392       | 0.7    | 70        | 22.7   | 0.7  | 1.0  | 6   | 20.0|
| **Nested Variable**         |           |        |           |        |     |     |     |     |
| Age                         |           |        |           |        |     |     |     |     |
| 6 to 11                     | 30981     | 51.8   | 167       | 54.1   | 51.8 | 52.6 | 25  | 83.3|
| 12 to 17                    | 28826     | 48.2   | 142       | 46.0   | 48.2 | 47.4 | 5   | 16.7|

Note: * Rockland population pulled from the 2016 American Community Survey
Table 5. SYS and Saguenay Populations and Variables Used to Create a Sample Weight

| Sociodemographic Variables | Saguenay (N = 7533) | Overall SYS Sample (N = 1004) | SYS with Weight | SYS trim weight - 1% trim | NVLD (n = 29) |
|----------------------------|---------------------|-------------------------------|----------------|--------------------------|---------------|
|                            | Estimated N %       | N %                           | N %            | %                        | N %           |
| Weighted Variables         |                     |                               |                |                          |               |
| Father's Education         |                     |                               |                |                          |               |
| No certificate, diploma or degree | 980 13.0 | 165 16.4 | 13.0 | 13.0 | 4 | 13.8 |
| High school/trade school certificate or equivalent | 3701 49.1 | 465 46.3 | 49.1 | 49.2 | 18 | 62.1 |
| College, CEGEP or other non-university certificate or diploma | 1396 18.5 | 200 19.9 | 18.5 | 18.6 | 3 | 10.3 |
| university studies not completed | 329 4.4 | 60 6.0 | 4.4 | 4.4 | 0 | 0.0 |
| Bachelor's degree +        | 1127 15.0 | 114 11.4 | 15.0 | 14.9 | 4 | 13.8 |
| Income                     |                     |                               |                |                          |               |
| less than 15000             | 391 5.2 | 71 7.1 | 5.2 | 5.2 | 3 | 10.3 |
| 15000-24999                 | 608 8.1 | 69 6.9 | 8.1 | 8.0 | 1 | 3.5 |
| 25000-34999                 | 727 9.7 | 83 8.3 | 9.7 | 9.7 | 1 | 3.5 |
| 35000-44999                 | 827 11.0 | 119 11.9 | 11.0 | 11.0 | 4 | 13.8 |
| >=45000                    | 4970 66.0 | 653 65.0 | 66.0 | 66.1 | 20 | 69.0 |
| missing                    | 10 0.1 | 9 0.9 | 0.1 | 0.1 | 0 | 0.0 |
| Nested Variable            |                     |                               |                |                          |               |
| Age                        |                     |                               |                |                          |               |
| 12 to 14                   | 2688 35.7 | 413 41.1 | 35.7 | 35.7 | 7 | 24.1 |
| 15 to 19                   | 4845 64.3 | 591 58.9 | 64.3 | 64.3 | 22 | 75.9 |

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**Table 6.** Inflation Rate by Specific Disorder

| Sample | Diagnosis | Sample Rate | Sample Weighted Rate -1% trim | Population Rate* | Inflation Rate** |
|--------|-----------|-------------|--------------------------------|------------------|------------------|
| HBN    | Autism    | 9.59        | 8.52                           | 1.7              | 5.01             |
|        | ADHD      | 56.35       | 53.65                          | 8.7              | 6.17             |
|        | SLD       | 18.71       | 17.55                          | 4.8              | 3.66             |
|        | Anxiety   | 26.81       | 30.29                          | 31.9             | 0.95             |
|        | Depression| 9.9         | 13.07                          | 13.3             | 0.98             |
| NKI    | ADHD      | 22.65       | 26.52                          | 8.7              | 3.05             |
|        | Anxiety   | 13.27       | 16.26                          | 31.9             | 0.51             |
|        | Depression| 3.24        | 4.01                           | 13.3             | 0.30             |

*Population rates for depression, anxiety, and ADHD were obtained from the NIH website (https://www.nimh.nih.gov/health/statistics/index.shtml), rates of Specific Learning Disorder from the National Center for Education Statistics website (https://nces.ed.gov/programs/coe/indicator_cgg.asp), and rates of Autism Spectrum Disorder from the CDC website (https://www.cdc.gov/ncbddd/autism/addm.html); see Supplemental Methods for more details.

**Inflation rate = Sample weighted rate / Population rate.
Table 7. Prevalence of NVLD in HBN Without Excluding ASSQ >19

| Sample     | % meet criteria for NVLD | Adjusted* rate of NVLD among population |
|------------|--------------------------|----------------------------------------|
|            | Unweighted | Weighted | Sensitivity weighted - 1% trim (95% CI) |             |
| HBN        | 9.19       | 17.05    | 15.13 (10.89-19.37)                      | 2.45 (1.76-3.14) |

Note. HBN sample including all records (N=1491) with complete demographic and neuropsychological data.

Methods. Supplemental Methods

Population rates for known disorders
Rates were selected from published prevalence reports using data obtained through diagnostic interview data or child performance measures, rather than parent report of a diagnosis via interview, whenever possible.

Rate of Attention Deficit Hyperactivity Disorder (ADHD) was obtained from the NIMH website (https://www.nimh.nih.gov/health/statistics/attention-deficit-hyperactivity-disorder-adhd.shtml). Data from National Comorbidity Survey–Adolescent Supplement (NCS-A) documents the lifetime prevalence of ADHD among U.S. adolescents aged 13 to 18 years as 8.7 percent.

Rate of Specific Learning Disability (SLD) was calculated based on information obtained from the National Center for Education Statistics website (https://nces.ed.gov/programs/coe/indicator_cgg.asp). The site reported that in 2017-18, 7 million children (14% of all public school students) received special education services, and of these 34 percent had SLD. Accordingly, 2,380,000 children (34% of those receiving special education services) of the total population of 50 million public school children had an SLD classification, yielding a prevalence of 4.8 percent.

Rate of Autism Spectrum Disorder (ASD) was obtained from the Center for Disease Control (CDC) website (https://www.cdc.gov/ncbddd/autism/addm.html). Data from the Autism and Developmental Disabilities Monitoring (ADDM) Network documents that 1 in 59 8-year old children met criteria for ASD.

Rate of anxiety was obtained from the NIMH website (https://www.nimh.nih.gov/health/statistics/any-anxiety-disorder.shtml). Data from National Comorbidity Survey Adolescent Supplement (NCS-A), documents that 31.9 percent of adolescents had any anxiety disorder.

Rate of major depression was obtained from the NIMH website (https://www.nimh.nih.gov/health/statistics/major-depression.shtml). Data from Substance Abuse and Mental Health Services Administration (SAMHSA) documents.
that in 2017, 13.3 percent of adolescents had had at least one major depressive episode.

Coding
R code used for sample weighting procedures is available upon request.

eAppendix. Supplemental Results

Demographic differences in sample frequencies compared with the underlying target populations

Relative to the ACS sample, the unweighted HBN sample had more participants age 6-9 and age 10-14 (42 vs 29%; 42 vs 35% respectively) and fewer age 15-17 (16 vs 36%), more Non-Hispanic White participants (47 vs 25%) and fewer Non-Hispanic Black, Hispanic and Asian/Pacific Islander participants (13 vs 24%; 25 vs 36%; 3 vs 13%, respectively), more males and fewer females (62 vs 51% males), and fewer below the poverty line (4 vs 29%), roughly the same above the poverty line (63 vs 70%) and many more with missing income data (33 vs 1%). All information can be found in Table S3.

Relative to the ACS sample, the unweighted NKI sample had more participants age 6-11 and fewer participants age 11-17 (54 vs 52%; 46 vs 48%, respectively), fewer White (55 vs. 64%) and Hispanic descent (18 vs 20%) and a greater proportion of Black (17 vs. 8%) and other race participants (9 vs. 8%), more males (56 vs 51%), and fewer individuals living below and above the poverty line (6 vs 24%; 71 vs 75%, respectively) and more with missing income data (23 vs 0.7%). All information can be found in Table S4.

Relative to the census, the SYS sample had more participants age 12-14 and fewer participants age 15-19 (41 vs 36%; 59 vs 64%, respectively), fewer participants with more than a Bachelor’s degree and a high school certificate or equivalent (11 vs 15%; 46 vs 49%, respectively), roughly the same among those with College, CEGEP or other non-university certificate or diploma (20 vs 19%), whereas more participants had no certificate, diploma or degree (16 vs 13%), and roughly equal numbers of participants across household annual income categories: higher then 45,000 (65 vs 66%), between 35-44,999 (12 vs 11%), between 25-34,999 (8 vs 10%), between 15-24,999 (7 vs 8%), and less than 15,000 (7 vs 5%). All information can be found in Table S5.

Demographic characteristics of children who met criteria for NVLD
The distribution of NVLD (N = 137) in HBN across demographic groups is similar to the overall breakdown of HBN (Table S3). The highest proportion of participants with NVLD were non-Hispanic White (42%) followed by Hispanic (24%), then Non-Hispanic Black (22%), and male participants made up 65% of those with NVLD. Participants above the poverty line made up the largest proportion of NVLD (69%) followed by those missing income (24%). Last, the age group with the most participants with NVLD was the 10-14 year olds (43%), followed by the 6-9 year olds (30%).
The distribution of NVLD in NKI (N = 30) across demographic groups is similar to the overall breakdown of NKI (Table S4). The highest proportion of participants with NVLD were White (47%) followed by Hispanic (23%), then Non-Hispanic Black (20%), and male participants made up 50% of those with NVLD. Participants above the poverty line made up the largest proportion of NVLD (63%) followed by those missing income (20%). Last, the age group with the most participants with NVLD was the 6-11 year-olds (83%).

The distribution of NVLD in SYS (N = 29) across father's education and income groups differs slightly from the overall SYS sample (Table S5). The highest proportion of participants with NVLD had a father who completed high school/trade school certificate (62%) followed by no diploma/degree or more than a bachelor's degree (both 14%). Participants with a household income of more than $45,000 made up the largest proportion (69%), followed by $35,000-44,999 (14%), and less than $15,000 (10%). No participants with NVLD were missing data on income. Last, the age group with the most participants with NVLD was the 15-19 year-olds (76%).