

**SUPPLEMENTAL MATERIAL (Spencer et al)****Contents**

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Supplement Table S1. Chronic Conditions Assessment Methods by Cohort

Cohort	Age	Year	Duration	Activity Limiting Definition	Any Chronic Health Condition Definition
MCS UK	10-11 yrs	2010-2011	≥12 mos	Maternal Report <i>“Do any of these conditions or illnesses reduce CHILD’s ability to carry out day-to-day activities?”</i>	Maternal Report <i>“Does CHILD have any physical or mental health conditions or illnesses lasting or expected to last 12 mos or more?”</i> <i>“Do any of these conditions or illnesses affect CHILD in any of the following areas?”</i> (Conditions listed in Harmonization Table)
ABIS Sweden	10-11 yrs	2007-2009	n/a	n/a	ICD codes from medical records (Conditions listed in Harmonization Table)
GenR Rotterdam Netherlands	5-6 yrs	2011-2014	≥4 mos; ≥12 mos	Maternal Report <i>“During the past 12 months, was CHILD restricted in his/her daily activities due to these nasal problems?”</i> <i>“During the past 4 months, was CHILD restricted in one of the following activities due to health problems?...activities that require a lot of effort, such as playing football or running?...activities that require some effort, such as cycling or skating?...bending, lifting or bending over?”</i> <i>“During the past 4 months, was CHILD restricted in the amount of time he/she was able to spend on schoolwork or activities with friends due to emotional problems or problems related to his/her behavior?”</i> <i>“During the past 4 months, was CHILD restricted in the type of schoolwork or activities with friends that he/she could undertake due to problems with his/her physical health?...pain?”</i>	Is CHILD restricted in any of the following ways?

Cohort	Age	Year	Duration	Activity Limiting Definition	Any Chronic Health Condition Definition
LSAC K Australia	10-11 yrs	2014-2015	≥6 mos	Maternal Report <i>“Still thinking of conditions lasting 6 mos or more, is CHILD restricted in everyday activities because of any of the chronic conditions listed?”</i>	Maternal Report <i>“Does the CHILD have a medical condition or disability that has lasted for 6 months or more?”</i> <i>“Which medical condtions or disabilities does the CHILD have?”</i> (Conditions listed in Harmonization Table) <i>“Does CHILD have any of these ongoing conditions? (ongoing conditions exist for some period of time (weeks, months, or years) or re-occur regularly. They do not have to be diagnosed by a doctor.)”</i> (Conditions listed in Harmonization Table) <i>“Has a doctor ever told you that CHILD has asthma?”</i>
NLSCY Canada	10-11 yrs	2004-2005	“Long-term”	Maternal Report <i>“Does [asthma] prevent or limit CHILD’s participation in school, at play, or any other activity normal for a child his/her age?”</i> <i>“Does a physical condition or mental condition or health problem reduce the amount or the kind of activity this child can do...at home? ...at work or at school? ...in other activities, for example, transportation, play, sports, or games?”</i> <i>“Does this child have any difficulty hearing, seeing, communicating, walking, climbing stairs, bending, learning, or doing any similar activities?”</i>	Maternal Report <i>“What type of academic program is this child enrolled in....school program for hearing or visually impaired students?”</i> <i>“Has a health professional diagnosed any of the following long-term conditions for this child?”</i> (Conditions listed in Harmonization Table)
US NLSY USA	9-12 yrs	1998-2008	Anytime (<1 yr to Lifetime)	Maternal Report <i>“Does CHILD have any physical, emotional, or mental condition that limits or prevents his/her ability to...attend school regularly?...do regular school work?...do usual childhood activities such as play, or participate in games or sports?”</i>	Maternal Report <i>“What are CHILD’s health condition(s) or limitation(s)?</i> (Conditions listed in Harmonization Table)

Supplement Table S2. Any Chronic Health Conditions Harmonization Across Cohorts

	US NLSY USA	Canada	Australia	LSAC K	Netherlands	GenR	Sweden	ABIS	MCS UK	
	X	X								Allergies
	X	X	X				X			Asthma
	X	X	X							Respiratory / Sinus Infections / Nasal Problems
			X				X			Bone / Joint / Muscle Problem / Muscle Disorders
	X		X							Disfigurement / Deformity / Crippled / Orthopedic Handicap
			X				X	X		Mobility / Limited use of legs or feet
			X				X	X		Dexterity / Limited use arms/fingers / Difficulty gripping things
	X		X				X	X		Vision / Sight Problems / Blindness
	X		X				X	X		Hearing
	X							X		Ear Infections
	X		X							Speech Problems / Impairment
	X	X	X					X		Learning Difficulties / Learning Disability
								X		Memory
	X	X					X			Mental Handicap / Mental Retardation / Intellectual Disability
			X				X	X		Autism / Aspergers / Pervasive Developmental Disorders
	X	X	X				X	X		ADHD
			X							Anxiety / Depression
	X	X			X			X		Emotional / Psychological / Nervous / Mental Health
	X	X					X			Heart Condition / Congenital Heart Disease
			X							Diabetes
	X	X	X							Epilepsy / Seizure Disorder
			X							Blackouts / Loss of Consciousness
		X					X			Cerebral Palsy / Other Paraplegias
	X									Blood disorder / Immue Deficiency (Sickle Cell Anemia)
		X								Kidney Condition
			X					X		Stamina / Chronic Fatigue
					X					Pain
	X	X			X			X		Other / Health Problems / Physical Health

Supplemental material

Epidemiol Community Health

**Supplement Table S3. Unadjusted (Bivariate) Risk Ratios for ALCHC in Late Childhood by Income and Maternal Education and Confounders at Baseline (weighted data)**

Variables	MCS UK	ABIS Sweden	LSAC K Australia	GenR Netherlands	NLSY Canada	USNLSY USA	
	Risk Ratio (95% Confidence Interval)						
Household Income at Baseline	Q1 (richest) (Reference)	Reference	Reference	Reference	Reference	Reference	
	Q2	1.01 (0.83, 1.24)	0.83 (0.50, 1.40)	1.09 (0.84, 1.40)	1.06 (0.80, 1.40)	1.36 (0.77, 2.4)	1.11 (0.64, 1.92)
	Q3	1.05 (0.86, 1.29)	1.09 (0.66, 1.80)	1.38 (1.14, 1.68)	1.51 (1.17, 1.97)	2.16 (1.11, 4.18)	1.27 (0.73, 2.23)
	Q4	1.10 (0.90, 1.34)	1.13 (0.68, 1.89)	1.82 (1.48, 2.24)	1.56 (1.21, 2.00)	1.37 (0.72, 2.59)	1.53 (0.87, 2.67)
	Q5 (poorest)	1.30 (1.07, 1.58)	1.68 (1.06, 2.64)	2.15 (1.78, 2.60)	1.86 (1.45, 2.39)	2.86 (1.43, 5.74)	1.92 (1.18, 3.14)
Maternal Education at Baseline	High (Reference)	Reference	Reference	Reference	Reference	Reference	
	Medium	1.11 (0.96, 1.28)	1.33 (0.90, 1.95)	1.29 (1.12, 1.49)	1.33 (1.11, 1.59)	1.61 (0.97, 2.64)	1.35 (0.95, 1.92)
	Low	1.68 (1.37, 2.07)	1.89 (1.14, 3.11)	1.43 (1.21, 1.68)	1.61 (1.31, 1.99)	2.2 (1.31, 3.72)	1.54 (0.97, 2.43)
Child Sex	Girl (Reference)	Reference	Reference	Reference	Reference	Reference	
	Boy	1.64 (1.44, 1.87)	1.54 (1.08, 2.19)	1.22 (1.07, 1.38)	1.52 (1.31, 1.77)	1.52 (0.99, 2.35)	2.00 (1.45, 2.76)
Mother Ethnicity	Ethnic Majority / Born in country (Reference)	Reference	Reference	Reference	Reference	Reference	
	Ethnic Minority / Born outside of country	0.93 (0.72, 1.20)	1.12 (0.80, 1.57)	1.40 (1.23, 1.59)	0.84 (0.66, 1.06)	0.44 (0.05, 3.7)	0.99 (0.76, 1.29)
Multiple Births	No (Reference)	Reference	Reference	Reference	Reference	Reference	
	Yes	1.10 (0.74, 1.63)	0.83 (0.29, 2.35)	0.95 (0.63, 1.44)	1.08 (0.66, 1.75)	2.52 (0.73, 8.75)	0.71 (0.23, 2.12)
Mother Age at Child Birth <sup>a</sup>	<20 yrs	2.02 (1.37, 2.99)	1.48 (0.63, 3.47)	1.83 (1.20, 2.79)	1.21 (0.87, 1.68)	1.98 (0.88, 4.44)	n/a
	20-29 yrs	1.09 (0.96, 1.24)	0.90 (0.64, 1.26)	1.33 (1.17, 1.52)	1.30 (1.12, 1.52)	1.76 (0.79, 3.92)	0.89 (0.66, 1.21)
	30-39 yrs (Reference)	Reference	Reference	Reference	Reference	Reference	Reference
	40+ yrs	0.90 (0.54, 1.48)	0.64 (0.26, 1.60)	1.34 (0.92, 1.94)	1.25 (0.72, 2.17)	1.15 (0.51, 2.59)	n/a

Note. <sup>a</sup>Mother Age at Child Birth categories differed for NLSY (Canada): 15-24, 25-29, 30-34, 35+, Missing. Sample size may differ from baseline N reported in Table 1 due to missing data for SES exposure in early childhood or ALCHC in late childhood, or cohort attrition.

### Supplementary File S1 Details of Data Analysis by cohort.

Cohort	Software	Sampling weights	Censoring weights
NLSCY	R v 3.6.1	Yes	Yes
GenR	R v 3.6.1	No	Yes
ABIS	Stata v 15	No	No
LSAC	Stata v 15	Yes	Yes
MCS	SPSS v 25	Yes	Yes
USNLSY	SPSS v 27	Yes	No

NLSCY (Canada all provinces) data were analyzed using R version 3.6.1. Longitudinal weights were applied to adjust both for sampling design and loss to follow up (Statistics Canada. Special Surveys Division., 2006). These weights were estimated by first identifying homogenous groups whereby participants with similar likelihood of response (estimated using logistic regression) are grouped together and sample design weights for respondents are adjusted to account for non-response. Then, post-stratification adjustment is carried out so that the weighted estimates reflect the reference population, in this case all Canadian children eligible for selection into the study at baseline (1994).

MCS (UK) data were analyzed using SPSS version 25. Weights used by MCS are described in detail elsewhere (Mostafa, 2014). In brief: single and multiple imputation were first used to estimate missing response values. Then, a logit model was applied to estimate probability of non-response using imputed datasets. The predicted probabilities were used to estimate weights that adjust both for attrition and sampling design.

LSAC (Australia) data were analyzed using Stata version 15. Weights were used to adjust for sampling distribution so that the population of children at follow-up could represent the population originally sampled. In addition, the weights adjusted for non-response at every wave of the survey (Norton & Monahan, 2015).

GenR (Rotterdam) data were analyzed using R version 3.6.1. Generalized linear models with a log link were used with stabilized inverse probability weights to adjust for differential non-response. Generalized estimating equations were used for robust variance estimation using package *geepack*. Censoring weights were built using the methodology proposed by Hernan and Robins (Hernán & Robins, 2020). In brief, the denominator of weights was defined as the probability of not being censored and was estimated using a logistic regression with hypothesized predictors of loss to follow-up. The numerator was the observed probability of exposure which was the probability of belonging to a specific maternal education tertile (for analyses looking at the effect of maternal education) and income tertiles (for analyses looking at the effect of income tertile).

USNLSY (USA) data were analyzed using SPSS version 27. Custom weights were used to adjust for sample attrition of mothers and children and for oversampling and over-representation of minority samples. Due to the complex survey design, the National Longitudinal Survey provides an online custom weighting program (<http://nlsinfo.org/weights/childya>) used to generate a custom set of survey weights that adjust for both the survey design and for using data across multiple years. Custom weights were obtained for participants included within the analyzed sample (born to USNLSY79 mothers in 1988 to 1996, inclusive).

### Supporting References

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## Supplementary File S2

### Ethics Approval

The authors assert that all procedures of the original birth cohorts involving human participants complied with the ethical standards of their relevant institutional and/or national committees and with the Helsinki Declaration of 1964, and its later amendments. Information summarizing what participation would involve was provided in both oral and written form for all cohorts.

1. Concordia University Human Research Ethics Committee certified the ethical acceptability for EPOCH's secondary data use (#2011028).
2. All Babies in Southeast Sweden (ABIS) initially approved by Regional Ethic Committee at Lund University (Dnr 83-97) and Regional Ethic Committee at Linköping University (Dnr Li287-96); subsequent sub-studies approved by Regional Ethic Committee at Linköping University (Dnr 2003/513; Dnr 2013/253-32).
3. Generation R Study general design, research aims, and specific measurements were approved by Medical Ethical Committee of the Erasmus Medical Center, Rotterdam.
4. Longitudinal Study of Australian Children (LSAC) was approved by Australian Institute of Family Studies (AIFS) Ethics Committee.
5. UK Millennium Cohort Study (MCS) received ethics approval from South West Multi-Centre Research Ethics Committee, London Multi-Centre Research Ethics Committee of the National Health Service Ethical Authority (NHS), & Northern and Yorkshire Multi-Centre Research Ethics Committee of the NHS (MCS1 MREC/01/6/19; MCS2MREC/03/2/022; MCS3 05/MRE02/46; MCS4 07/MRE03/32) and Yorkshire and Humber REC (MCS5 Ref: 11/YH/0203).
6. The National Longitudinal Survey of Children and Youth was developed jointly by Statistics Canada and Human Resources Development Canada. Statistics Canada carried out this national study on behalf of Human Resources Development Canada.
7. The US National Longitudinal Surveys Program (including USNLSY 79 Child & Youth) complies with the U.S. Office of Management and Budget and US Bureau of Labor Statistics procedures and federal laws. In addition, the institutions that managed and conducted the surveys (Ohio State University & NORC at the University of Chicago reviewed and approved the NLSY79 by their institutional review boards). Two Federal laws govern policies and procedures for protecting respondent confidentiality and obtaining informed consent in the NLSY79 program: the Privacy Act of 1974 and the Confidential Informaiton and Protection and Statistical Efficiency Act (CIPSEA) of 2002.