Asthma and child inequalities: Comparison between seven birth cohorts

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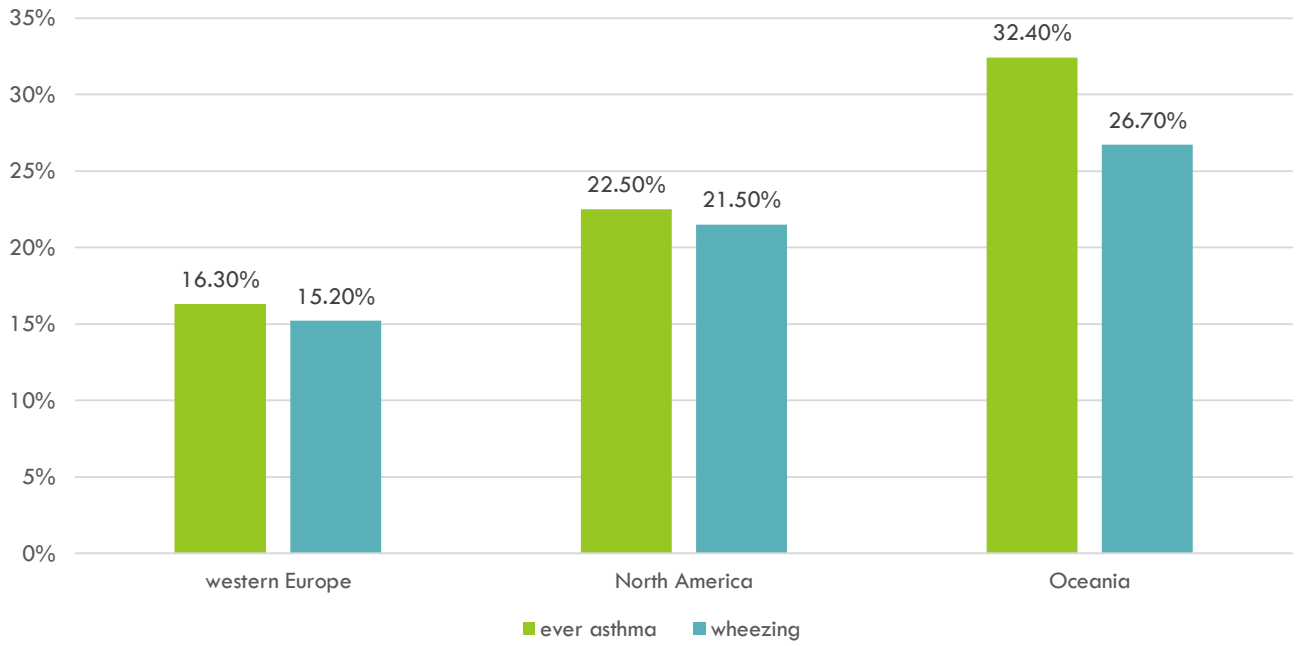
Background

- Asthma is one of the most common chronic conditions in childhood. Wide variations exist in the prevalence of childhood asthma worldwide



Between 2000-2003, among 13-14-year old children, prevalence rate of children ever having asthma and wheezing

EPOCH
Elucidating Pathways of Child Health Inequalities

Background

- Socioeconomic status (SES): household income, caregiver employment, parental education status
- Inconsistent results regarding the association between SES and asthma-related outcomes
- Definitions of SES vary across studies
- Absolute inequality in child asthma-related outcomes provides valuable insights from public health perspectives by accounting for the overall level of asthma prevalence
- Asthma, wheezing/asthma attacks, and use of medication – current symptoms and severity of asthma

Aim

Study the associations both in relative and absolute terms between maternal education and household income during early childhood and the presence of ever asthma, wheezing/asthma attacks, and asthma with medication control later when the children were aged 9-12 years in six countries

Seven Birth Cohorts

Sweden	**ABIS**	All Babies in Southeast Sweden (*Alla Barn I Sydöstra Sverige*)	n=4026
The Netherlands	**GenR**	Generation R	n=4277
Australia	**LSAC**	Longitudinal Study of Australian Children	n=3759
United Kingdom	**MCS**	Millennium Cohort Study	n=13 354
Canada	**NLSCY**	National Longitudinal Study of Children & Youth	n=1356
Quebec	**QLSCD**	Quebec Longitudinal Study Child Development (*Étude Longitudinale du développement des enfants du Québec*)	n=1334
USA	**USNLSY**	US National Longitudinal Study of Youth	n=3104

In total, 31 210 children born between 1988 and 2006

Socioeconomic Status (SES)

Household Income

- Low - Poorest (Q1), Middle (Qs 2-4), High - Richest (Q5)

Maternal Education

- International Standard Classification of Education (ISCED)
- Low (0-II), Middle (III-IV), High (V-VIII)

Outcome

- Ever asthma: parent endorsment of whether their child had ever received a diagnosis of asthma by a health professional
- Wheezing/asthma attacks in the past 12 months:
  - attacks/illness of wheezing (Netherlands and Australia)
  - wheezing or whistling (UK, Sweden and Canada)
  - wheezing or an attack of asthma (USA and Quebec)
- Medication control for asthma: ever diagnosis of asthma and asthma-related medication use in the past 12 months
- At child age 10-11 years, 9-10 years in GenR (Netherlands), 10-12 years in ABIS (Sweden)

Statistical analysis

Relative Risk

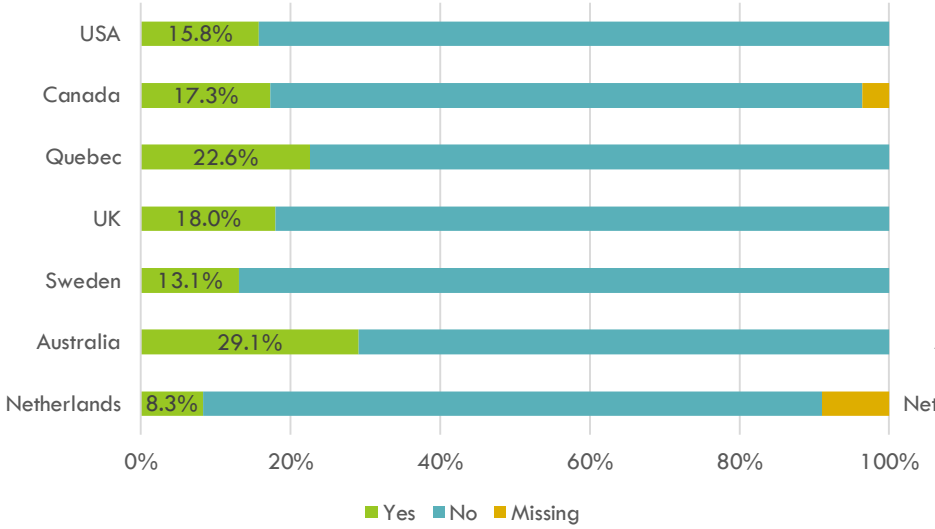
- Risk Ratios (RRs) estimated using Generalized Linear Model with log link and robust variance estimation
- Unadjusted (bivariate; absolute burden of risk) and Adjusted (controlling for confounding variables to isolate effect of SES) RRs were estimated
- Pooling of RRs from all cohorts and estimation of the I^2 and Q statistic ranges to evaluate heterogeneity

Absolute Risk

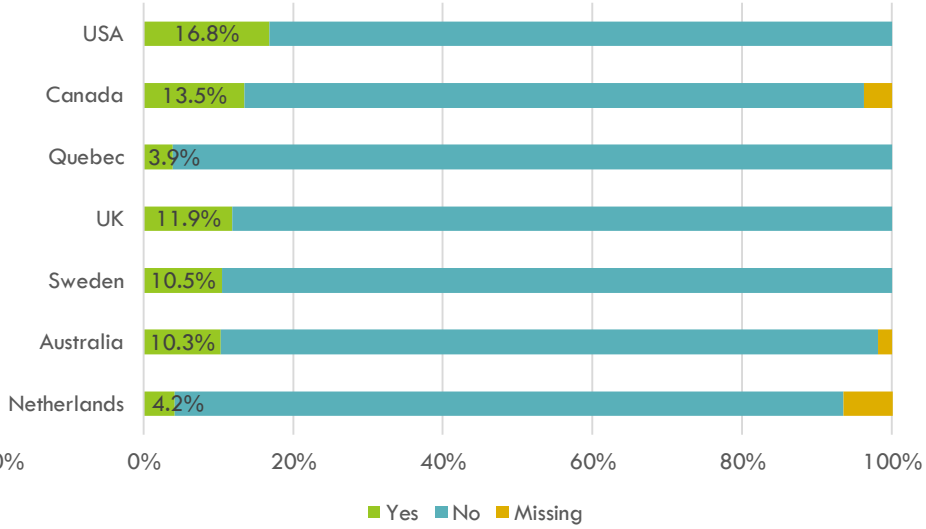
- Slope Index of Inequality (SII) represents absolute difference in prevalence between most and least advantages groups in a population
- Reflect the magnitude of a health outcome within a population; absolute risks convey what **percentage of population** is affected

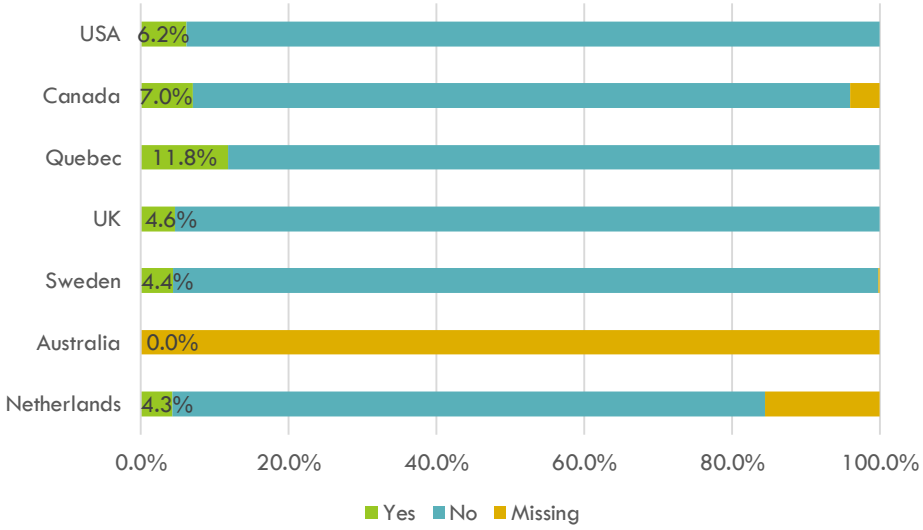
Results

Prevalence of children ever experiences asthma



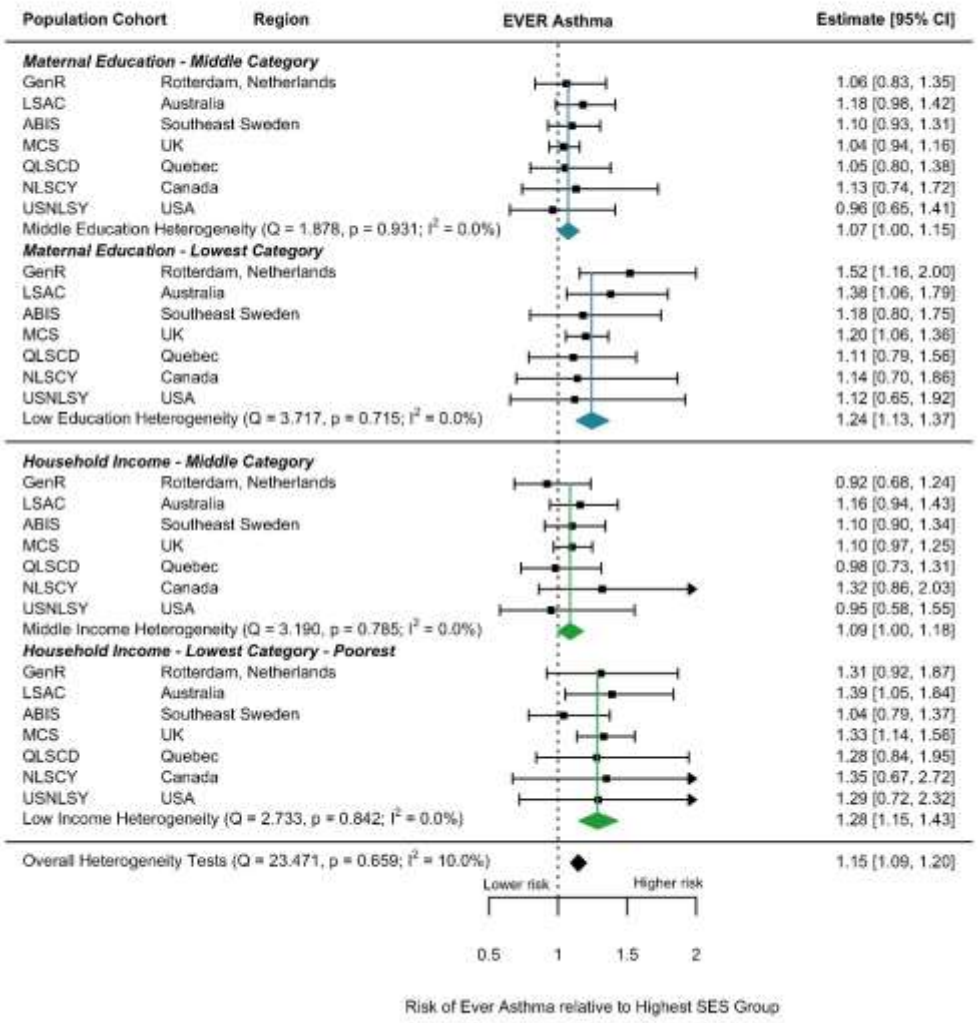
Prevalence of wheezing/asthma attacks



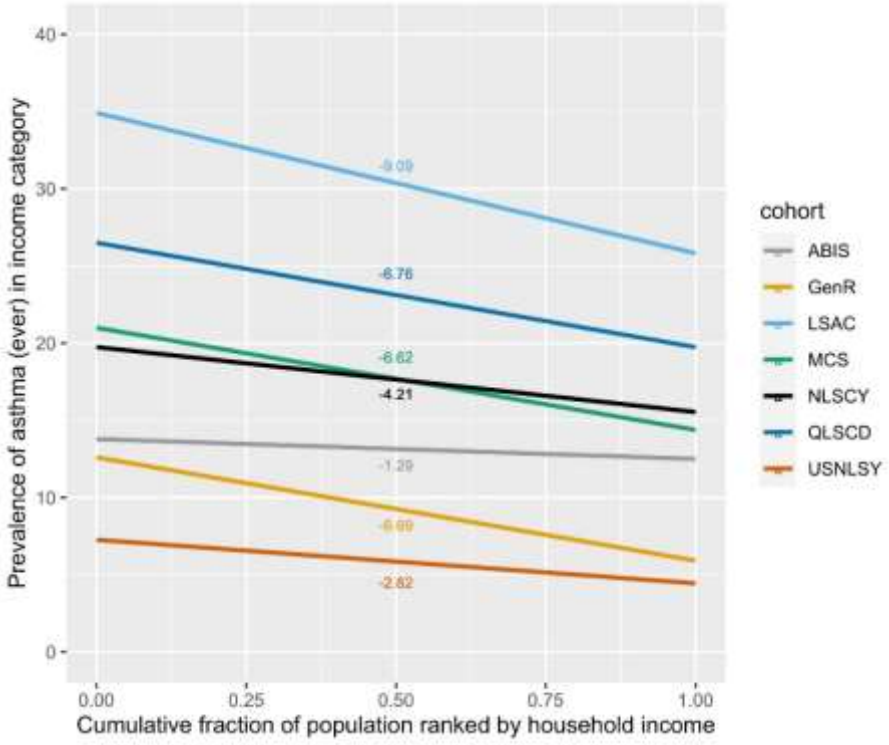


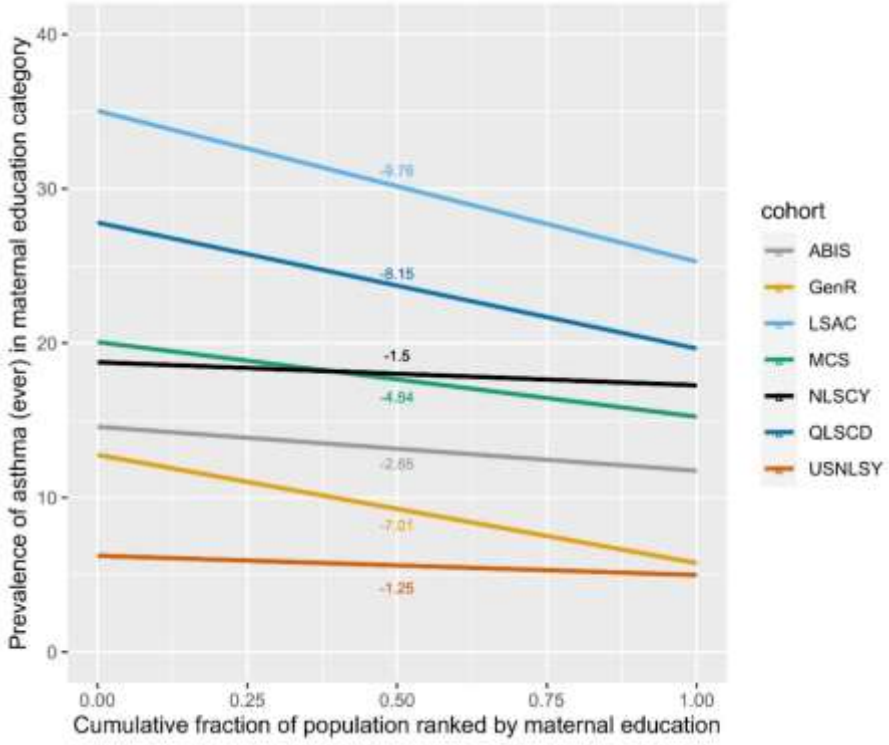
Prevalence of medication control

Ever asthma

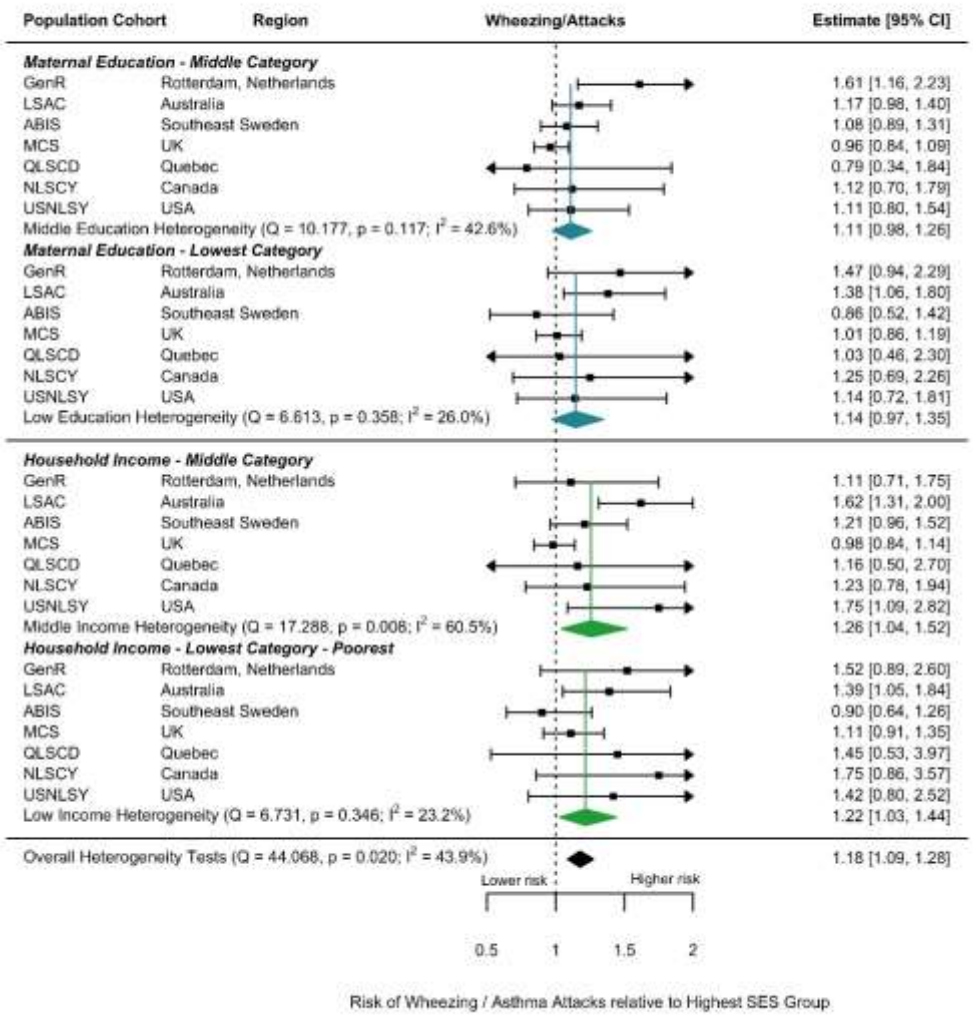

Population Cohort
Region
EVER Asthma
Estimate [95% CI]
Maternal Education - Middle Category
GenR Rotterdam, Netherlands 1.06 [0.83, 1.35]
LSAC Australia 1.18 [0.98, 1.42]
ABIS Southeast Sweden 1.10 [0.93, 1.31]
MCS UK 1.04 [0.94, 1.16]
QLSCD Quebec 1.05 [0.80, 1.38]
NLSCY Canada 1.13 [0.74, 1.72]
USNLSY USA 0.96 [0.65, 1.41]
Middle Education Heterogeneity (Q = 1.878, p = 0.931; I² = 0.0%) 1.07 [1.00, 1.15]
Maternal Education - Lowest Category
GenR Rotterdam, Netherlands 1.52 [1.16, 2.00]
LSAC Australia 1.38 [1.06, 1.79]
ABIS Southeast Sweden 1.18 [0.80, 1.75]
MCS UK 1.20 [1.06, 1.36]
QLSCD Quebec 1.11 [0.79, 1.56]
NLSCY Canada 1.14 [0.70, 1.86]
USNLSY USA 1.12 [0.65, 1.92]
Low Education Heterogeneity (Q = 3.717, p = 0.715; I² = 0.0%) 1.24 [1.13, 1.37]
Household Income - Middle Category
GenR Rotterdam, Netherlands 0.92 [0.68, 1.24]
LSAC Australia 1.16 [0.94, 1.43]
ABIS Southeast Sweden 1.10 [0.90, 1.34]
MCS UK 1.10 [0.97, 1.25]
QLSCD Quebec 0.98 [0.73, 1.31]
NLSCY Canada 1.32 [0.86, 2.03]
USNLSY USA 0.95 [0.58, 1.55]
Middle Income Heterogeneity (Q = 3.190, p = 0.785; I² = 0.0%) 1.09 [1.00, 1.18]
Household Income - Lowest Category - Poorest
GenR Rotterdam, Netherlands 1.31 [0.92, 1.87]
LSAC Australia 1.39 [1.05, 1.84]
ABIS Southeast Sweden 1.04 [0.79, 1.37]
MCS UK 1.33 [1.14, 1.56]
QLSCD Quebec 1.28 [0.84, 1.95]
NLSCY Canada 1.35 [0.67, 2.72]
USNLSY USA 1.29 [0.72, 2.32]
Low Income Heterogeneity (Q = 2.733, p = 0.842; I² = 0.0%) 1.28 [1.15, 1.43]
Overall Heterogeneity Tests (Q = 23.471, p = 0.659; I² = 10.0%) 1.15 [1.09, 1.20]
Lower risk
Higher risk
0.5
1
1.5
2
Risk of Ever Asthma relative to Highest SES Group

Ever asthma

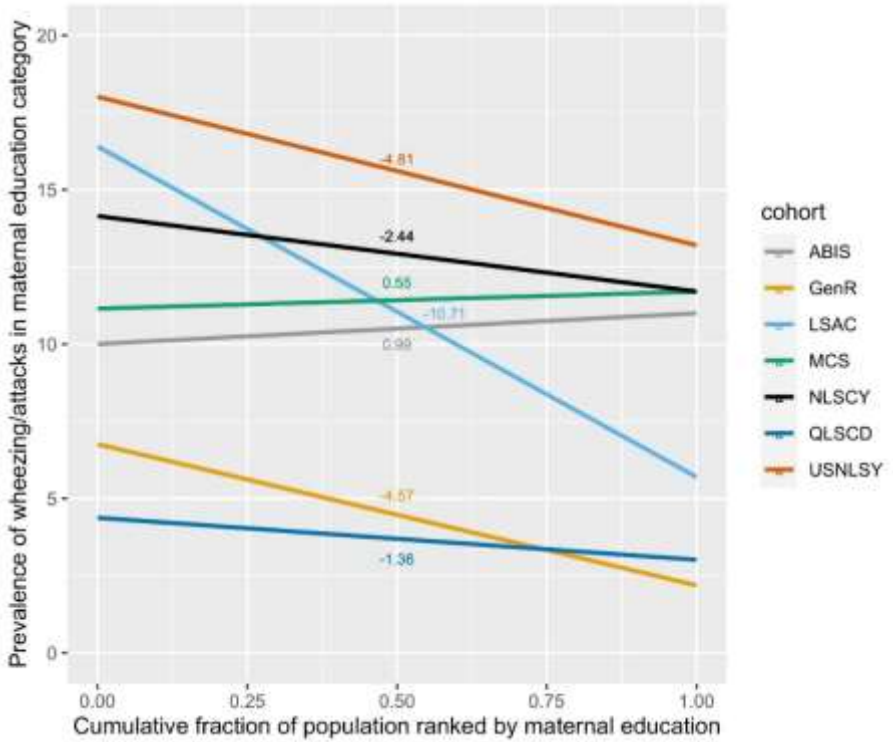

Prevalence of asthma (ever) in income category
40
30
20
10
0
-9.09
-6.76
-6.62
-4.21
-1.29
-6.99
-2.62
0.00
0.25
0.50
0.75
1.00
Cumulative fraction of population ranked by household income
cohort
ABIS
GenR
LSAC
MCS
NLSCY
QLSCD
USNLSY

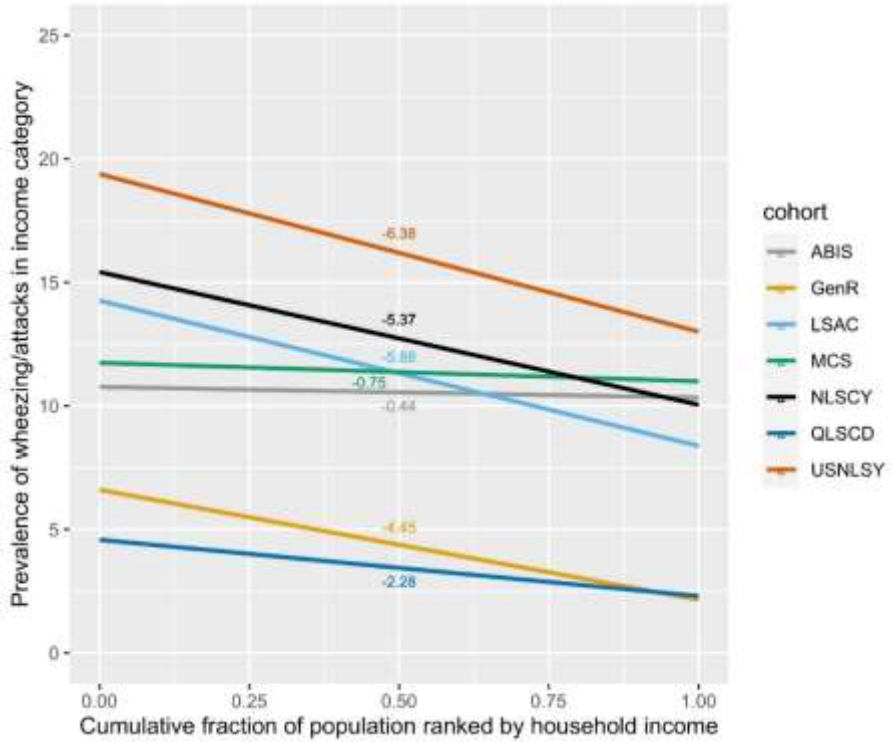

Prevalence of asthma (ever) in maternal education category
40
30
20
10
0
-9.78
-8.15
-1.5
-4.94
-2.65
-7.01
-1.25
0.00
0.25
0.50
0.75
1.00
Cumulative fraction of population ranked by maternal education
cohort
ABIS
GenR
LSAC
MCS
NLSCY
QLSCD
USNLSY

Wheezing/asthma attacks

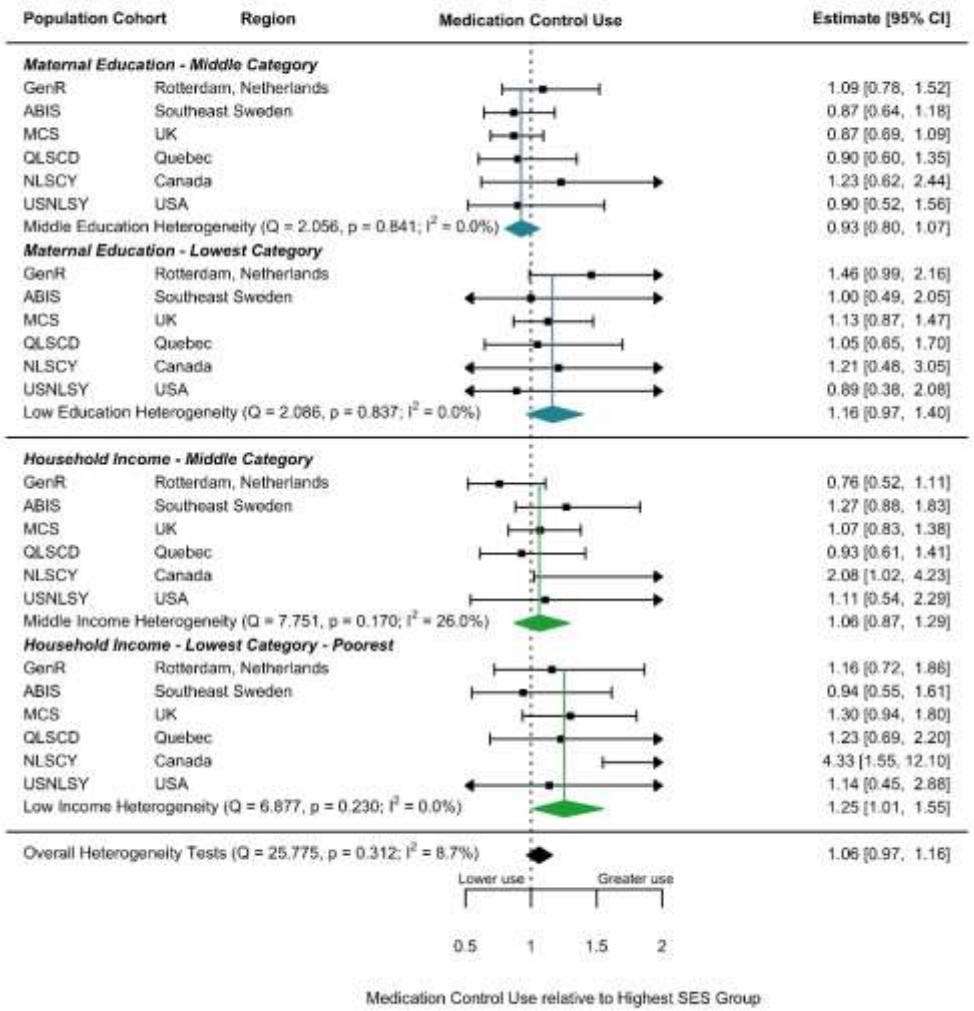


Wheezing/asthma attacks

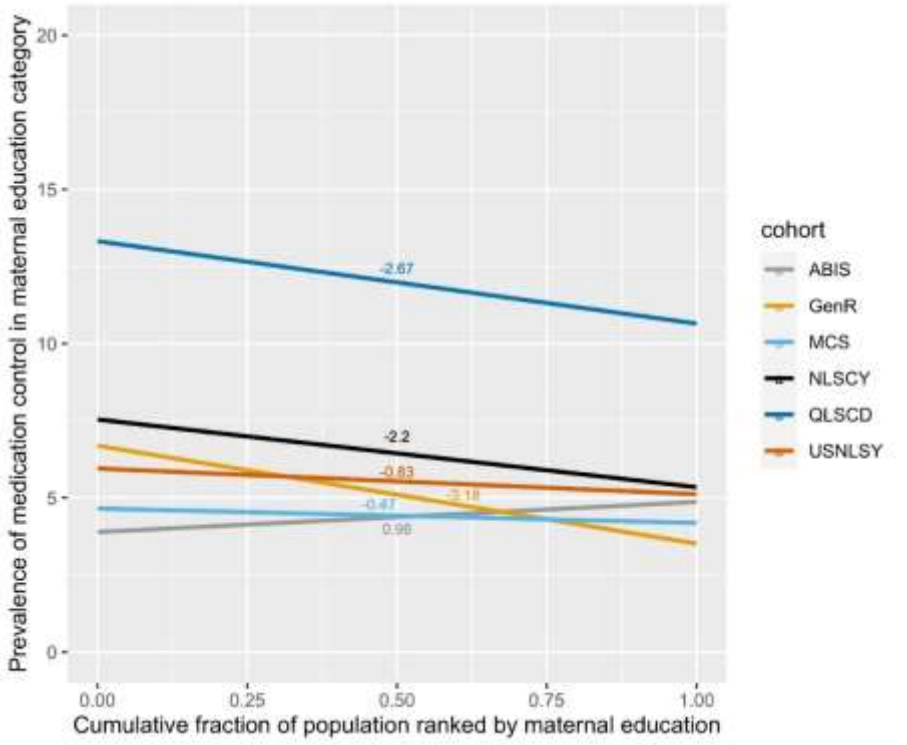


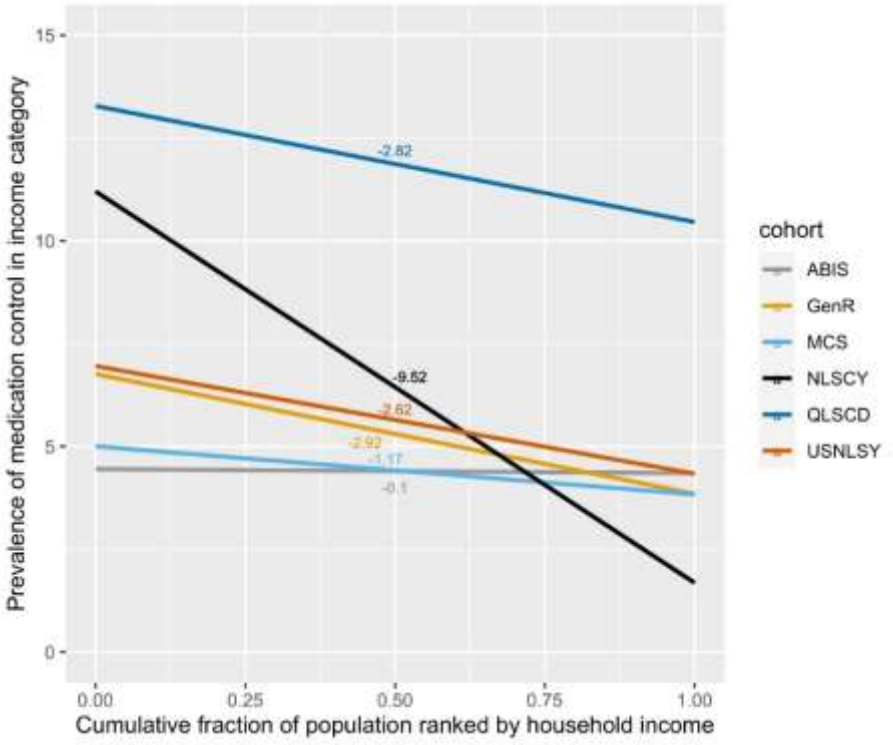


Medication control



Medication control





Discussion

- **Pooled estimate for ever asthma was consistent with increased relative risk by maternal education**
- **Pooled estimates for wheezing/asthma attacks and asthma medication control were in the expected direction, their confidence intervals crossed unity**
- **Absolute risk by income and maternal education was in the expected direction for all outcomes and complemented the findings for relative risk, except for wheezing by maternal education in the UK cohort and by income in the Swedish cohort**

Prevalence

- **The prevalence of child asthma ranged from 8.3% to 29.1%**
- **Lower than the findings of phase III (2000-2003) of the International Study of Asthma and Allergies in Childhood (ISAAC)**
- **Data for all cohorts were collected after the ISAAC phase III period, except for the USA cohort that had overlapping years**
- **Asthma prevalence has plateaued or even decreased in recent years**
- **Still particularly high in English-speaking countries, Western Europe, and some of the more affluent Asian countries**

Absolute inequality

- **The largest potential reduction in asthma prevalence, according to higher maternal educational levels, would be observed in Australia and the Netherlands (reduction in asthma: 10% and 8%, respectively)**

- **Higher household income would be associated with the largest reductions in Australia (reduction in asthma: 9%) as well as Quebec, the Netherlands, and UK (similar reduction in asthma: all 7%)**

Homes

- **Traditional relation between lower SES and higher asthma prevalence is evident until children are age 9 years**
- **Among older children and adolescents, mixed results were reported**
- **As children grow older, a larger portion of their day will be spent in school and the neighborhood. The impact of poor housing conditions, to which children from lower SES families tend to be exposed, may be a less salient risk factor during later childhood**

Improving Asthma Control

- Avoid triggers (home, school)
- Increased knowledge for both parents and teachers (e.g., school nurses, specialized asthma nurses)
- Trust in the doctor
- Optimism about the possible effect of the treatment

Thank you