Obesity & Child Inequalities: Comparison between seven birth cohorts

INRICH Paris June 2023

Pär Andersson White, MD

Linköping University, Sweden

Introduction

- **Prevalence of overweight and obesity in children and adolescent increased from 1970s to 2000 in high-income countries**
- **Since 2000, levels have plateaued or increased but at slower pace than previous decades**
- **A majority of studies on SES and childhood obesity show increasing social inequalities**

Rationale of the study

- **Direct comparisons of gradients between countries are difficult since definitions of SES and other methodological aspects vary considerably between studies**

- **Using harmonized data from seven prospective birth cohorts in six high-income countries**

- **We aimed to analyse the longitudinal relationships in both relative and absolute terms between early childhood SES and the development of overweight and obesity at age 8-11 years**

Methods

Overweight/Obesity Definition

- Overweight and obesity were defined using International Obesity Task Force (IOTF) cut-offs and measured in late childhood (8-11 years)

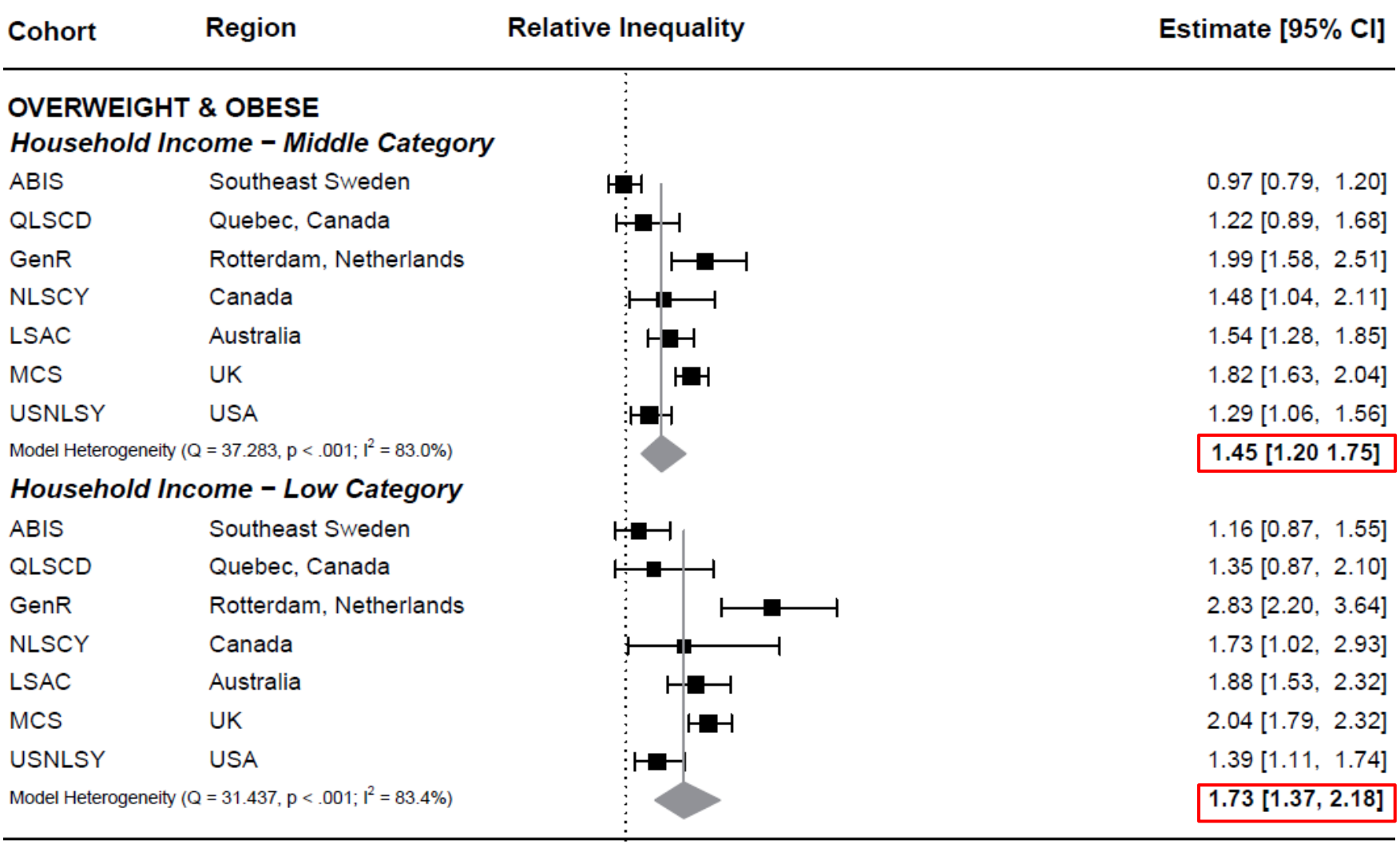
SES Measures

- Maternal Education was classified in three categories according International Standard Classification of Education (ISCED)
- Income in three categories. High income was defined as an income within the 5th quintile, middle income as being within the 4th to 2nd quintile and low income as in the 1st quintile

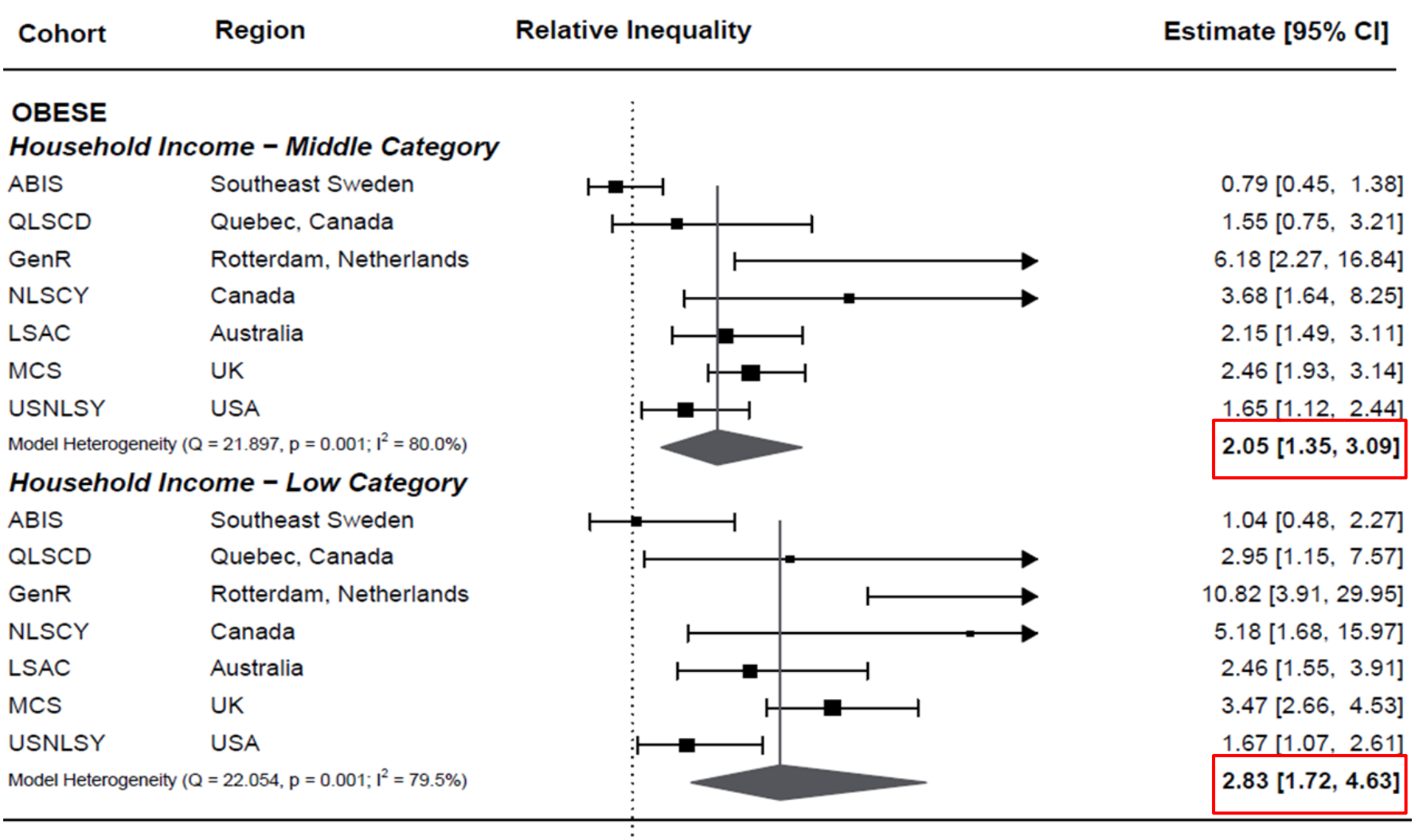
Prevalence (Weighted)

	Overweight/Obese							
	Complete Case Only		Maternal Education (%)			Household Income (%)		
	n	%	Low	Middle	High	Low	Middle	High
ABIS	487	**15.2**	14.3	16.2	13.8	17.4	14.5	15.4
QLSCD	283	**25.9**	27.5	28.6	21.7	29.5	26.5	22.0
GenR	727	**16.7**	31.4	20.8	9.8	28.8	16.1	7.5
NLSCY	361	**26.6**	41.8	32.8	23.7	35.0	33.6	22.9
LSAC-B	926	**24.7**	29.2	27.5	17.8	31.0	25.4	16.7
MCS	3387	**27.4**	30.3	28.5	22.5	30.4	28.5	18.5
USNLSY	957	**37.6**	44.9	37.8	27.6	41.0	35.5	27.4
	Obese							
	Complete Case Only		Maternal Education (%)			Household Income (%)		
	n	%	Low	Middle	High	Low	Middle	High
ABIS	83	**2.6**	4.4	3.1	1.2	3.4	2.3	2.8
QLSCD	71	**6.5**	9.9	6.9	2.6	10.9	5.9	3.8
GenR	135	**3.1**	9.4	3.8	0.9	7.1	2.7	0.5
NLSCY	99	**7.3**	12.2	9.8	6.8	14.9	9.7	5.0
LSAC-B	265	**7.3**	11.5	8.1	4.0	8.9	8.0	3.9
MCS	804	**6.5**	9.1	6.5	3.9	8.6	6.6	3.0
USNLSY	401	**15.8**	17.9	16.1	8.6	16.2	14.0	8.3

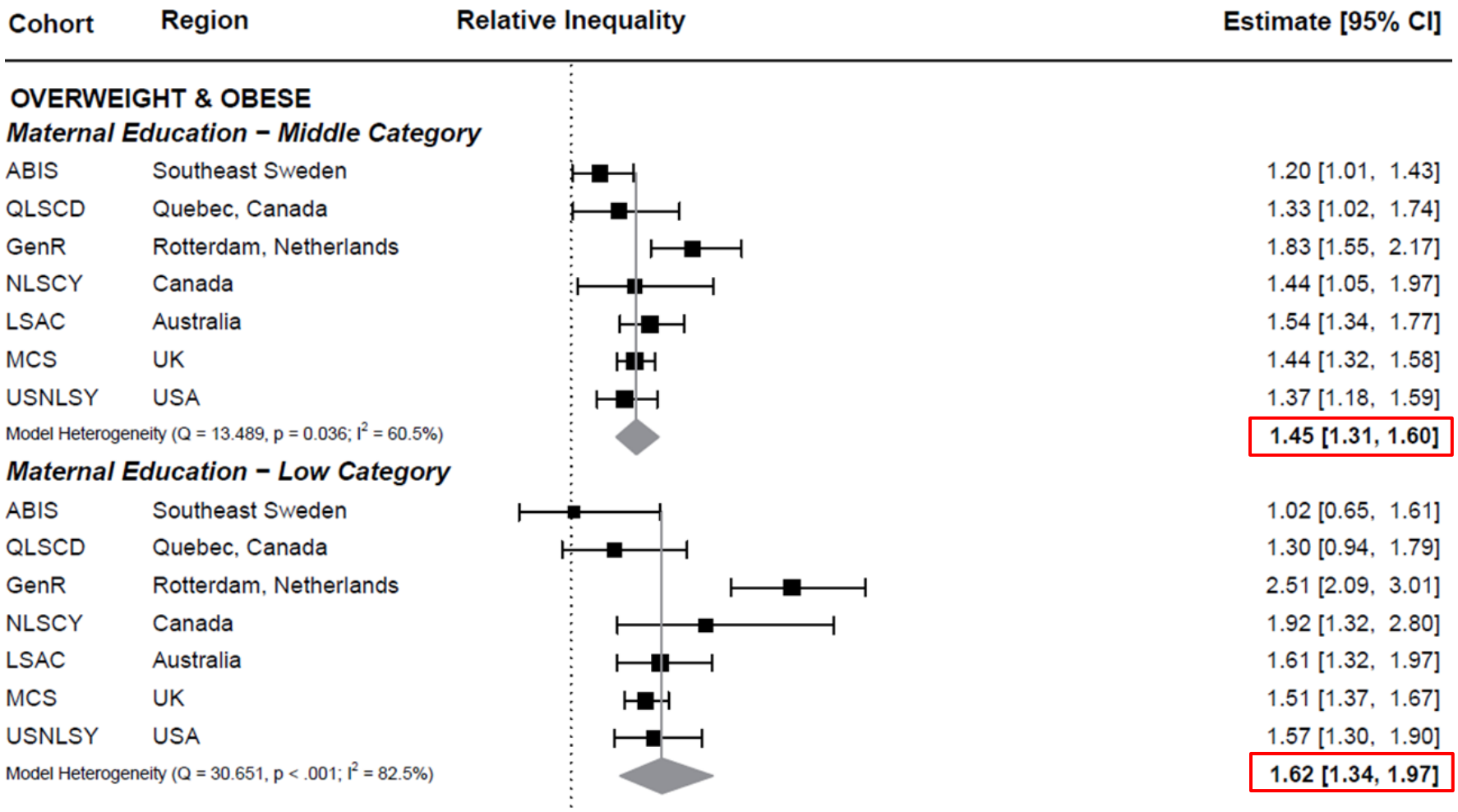
Income and RR of Overweight



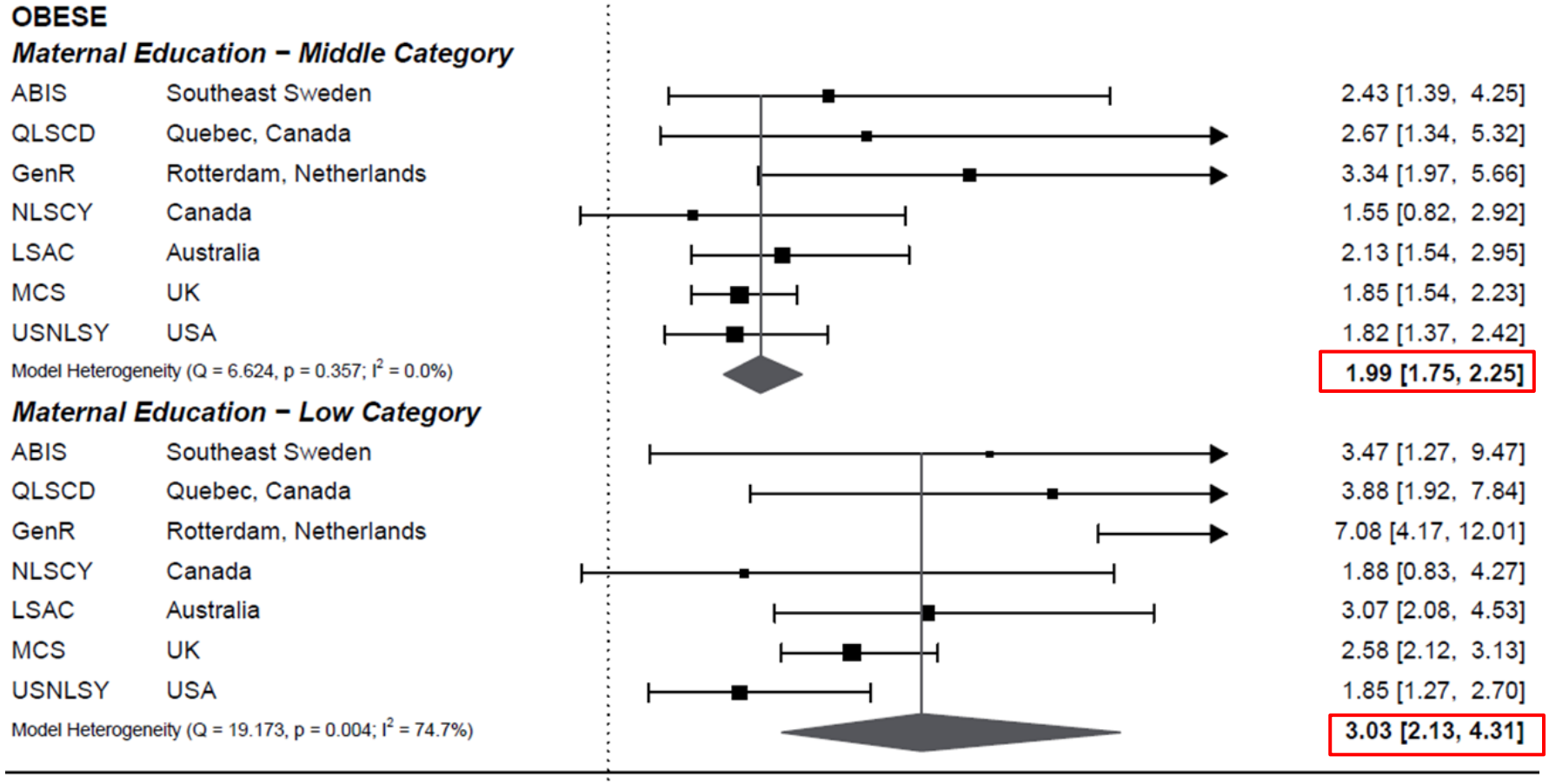
Income and RR of Obesity



Education RRs of Overweight

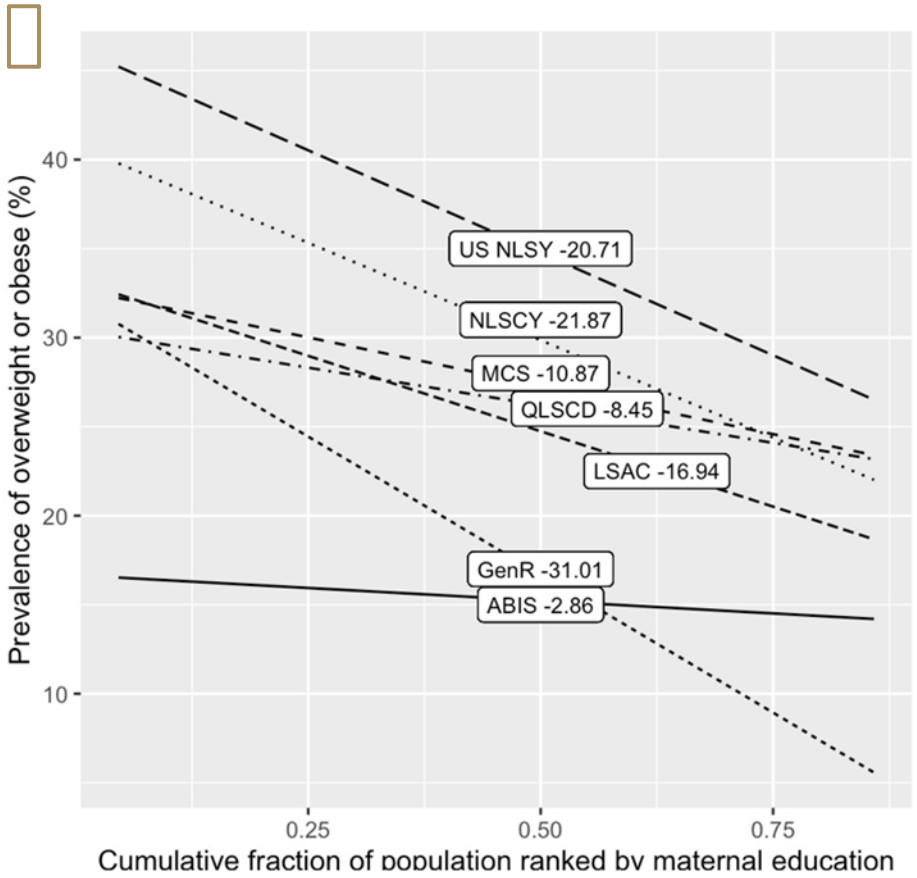


Education RRs of Obesity

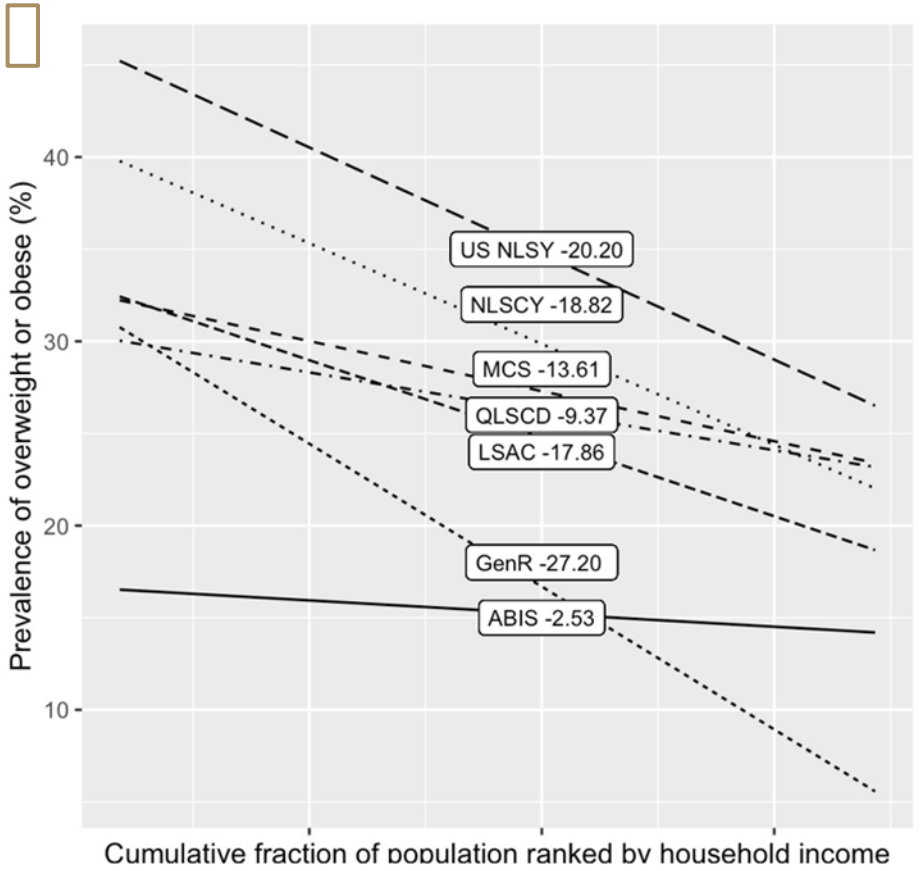


SIIs of Overweight

Maternal education

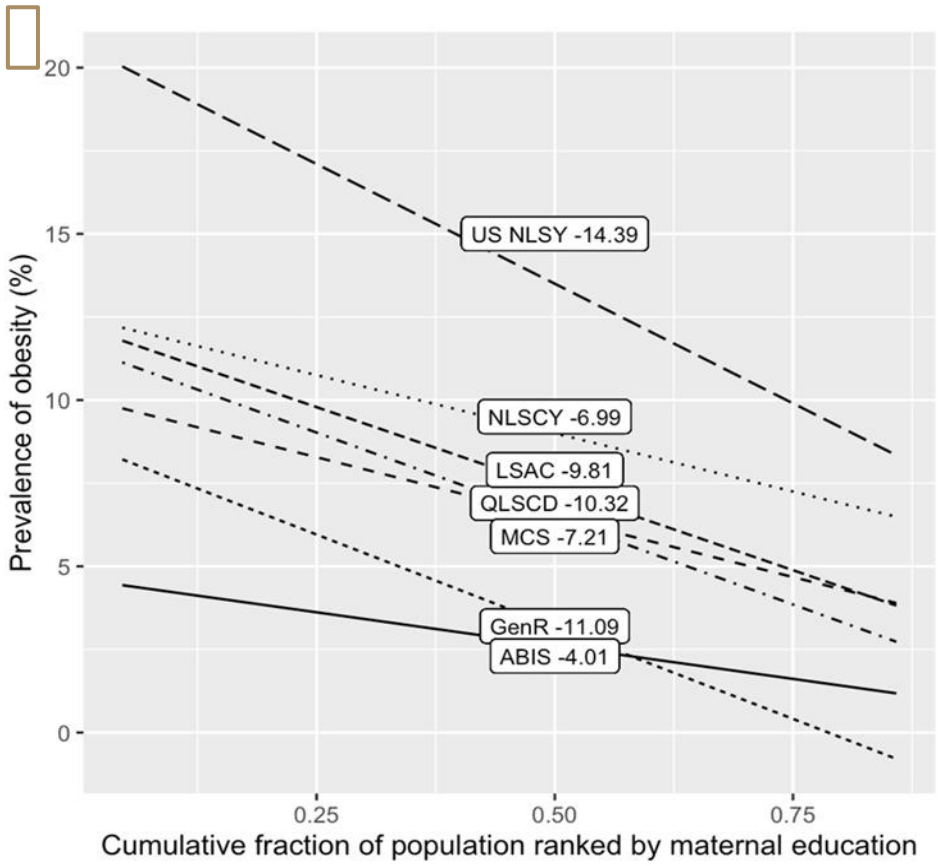


Household Income

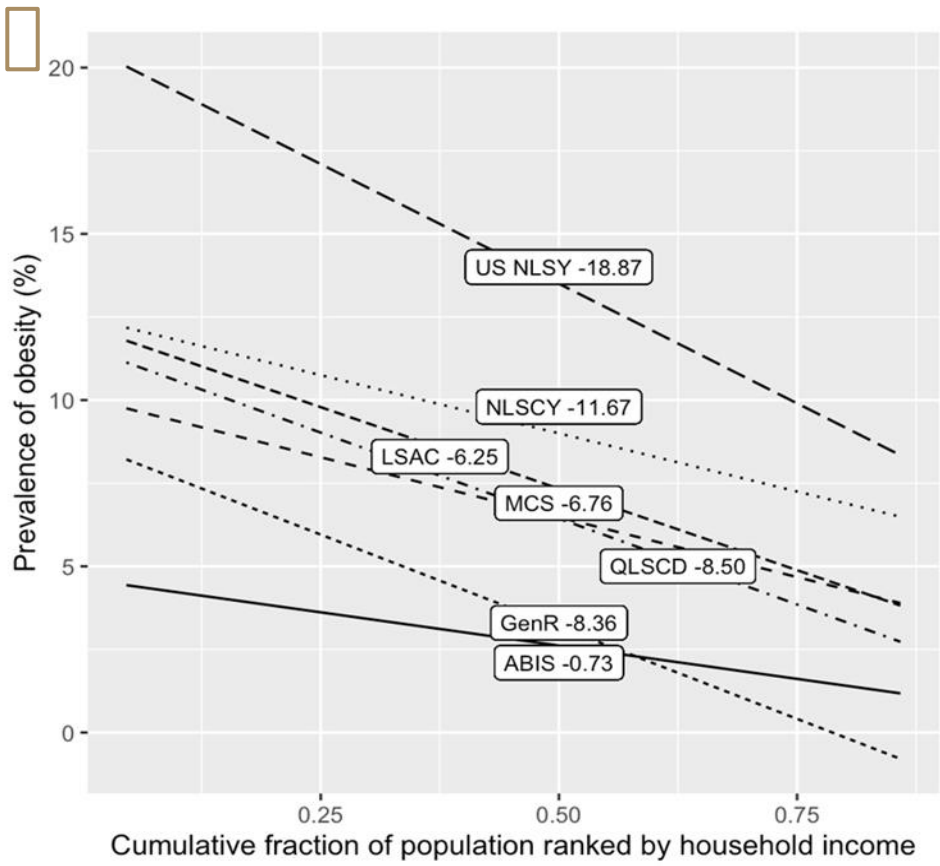


SIIs of Obesity

Maternal education



Household Income



Discussion

- **A social gradient by maternal education and income in childhood overweight and obesity was found in all participating countries**

- **However, the slope of the gradient varied between countries**

Prevalence and inequality

- **Houweling and Johan Mackenbach have shown that relative inequality tends to decrease with increasing prevalence while absolute inequality follows an inverse U shape.**

- **The results from our US study followed this pattern i.e. high prevalence, high absolute inequality but low relative inequality**

- **Swedish and Dutch results showed that, for childhood overweight and obesity, it is possible to have a low prevalence and both high (the Netherlands) and low (Sweden) absolute inequality**

Prevalence and inequality

- **General patterns of overweight and obesity inequalities in relation to prevalence are important when comparing inequality levels across countries**

- **However, our study shows that these general patterns do not fully explain the observed differences, an explanatory theory should account for other factors such as social and economic policy differences across countries**

Policy differences

Policy differences during the study period between participating countries included

- **Universal meals in preschool/school (Sweden)**
- **Universal Preschools (Sweden and Quebec)**
- **Ban on advertisement to children (Sweden and Quebec)**
- **Differences in parental leave regulations**

Acknowledgement

Sincere thanks to all dedicated participants of the EPOCH collaboration a special thanks to:

Jennifer J. McGrath, PI of EPOCH, Concordia University, Canada

Johnny Ludvigsson, PI of the ABIS study, Linköping University, Sweden

Universal free school meals

- **Universal free school meals were adopted in 1946 in Sweden**

- **Recently, universal free school lunches have been shown to reduce obesity, with a stronger effect in low SES children, when introduced in primary schools in the UK**

Universal preschools

Introduced in Sweden in 1973 and in Quebec in 1997

- **An ecological study across 35 OECD countries found that social spending on preschools was associated with reduced child obesity prevalence**
- **The policy reduces the impact of low household income by strengthening the economic situation of low SES families as preschool costs are a significant part of household income in countries that do not have state subsidy**
- **In Sweden preschool include meals (breakfast, morning and afternoon fruit and lunch), influencing early-life eating patterns**

Ban on advertisement

A ban on advertisements aimed at children was adopted in Sweden and Quebec during the studies timeframes

- **These regulations may partly explain the observed difference between the participating cohorts in our study as a reduction in advertisements aimed at children has been shown to be associated with a reduction in overweight/obesity, especially in children from disadvantaged areas**

- **The effectiveness of these regulations has decreased, starting in 1997 with EU regulations that made it possible for TV channels broadcasting from the UK to avoid the Swedish regulations and followed later by internet-based media that bypasses Swedish and Quebec law entirely**

Parental leave regulations

- **Allows for longer duration of breastfeeding**

- **Reduces income differences between parents because subsidized benefit only compensates a portion of the household salary and has an upper limit of compensation**

Policy table (for discussion)

	Sweden	Quebec (Canada)	The Netherlands	Canada(all Provinces)	Australia	United Kingdom	USA
	ABIS	QLSCD	GenR	NLSCY	LSAC-B	MCS	USNLSY
Income Inequality (Gini-coefficient)	27.2	29.5	29.8	31.3	33.1	37.0	40.0
Year (closest to cohort baseline with data available[1])	2000	1998[2]	2004	1994	2004	2000	1994
Paid Maternity Leave (weeks) 2000[1]	58.7	15[4]	16	27	0	18	0
Paid Paternity Leave (weeks) 2000[3]	5.8	0[4]	0	0	0	0	0
Paid Leave for Mothers (weeks) 2017[3]	35	30.0 to 31.3 (in 2006)[5a]	16	27	8	12	0
Paid Leave for Fathers (weeks) 2017[3]	10.9	21.0 to 22.2[5b]	0.4	0	0.8	0.4	0
Maternal Employment Rate (%)[6]	83.1%	78.6%[8]	74.8%	65.7%	73.7%	67.1%	62.9%
Daycare / Preschool Cost (Percentage of household income, family with 2 children; 2004) (%)[9]	7%	5%[10]	18%	27%	21%	39%	29%
Free School Meals during cohort time period	Yes (All children, since 1973)[11]	Eligible children only	No	No	No	Eligible children only[11] Grades R, 1, 2, since 2014)	Eligible children only[12]
Ban on Food Advertisement to Children	Yes (since 1991)[13]	Yes (since 1980)[14]	No	Self-regulated codes[15]	No	Yes (since 2007)[14]	No
Active Transport in Children aged 10-14 yrs (km/yr)[17] Walking Bicycling	275 424	N/A	180 2200	N/A	182 26	396 79	123 N/A

Descriptives

	ABIS Sweden N=3984	QLSCD Quebec N=1334	GenR Netherlands N=7393	NLSCY Canada N=1356	LSAC-B Australia N=4085	MCS UK N=13046	USNLSY USA N=3657
Maternal Education at Baseline (n, %)							
High	1590 (39.9%)	463 (34.7%)	3191 (43.2%)	567 (41.8%)	1481 (36.3%)	4083 (31.3%)	1073 (29.3%)
Middle	2162 (54.3%)	536 (40.2%)	2035 (27.5%)	568 (41.9%)	2202 (53.9%)	5412 (41.5%)	1922 (52.6%)
Low	187 (4.7%)	336 (25.1%)	1488 (20.1%)	187 (13.8%)	400 (9.8%)	3068 (23.5%)	657 (18.0%)
Missing	45 (1.1%)	0	679 (9.2%)	34 (2.5%)	2 (0.1%)	483 (3.7%)	5 (0.01%)
Household Income at Baseline[c] (n, %)							
High	912 (22.9%)	286 (21.4%)	1287 (17.4%)	365 (26.9%)	883 (21.6%)	2251 (17.3%)	570 (15.6%)
Middle	2471 (62.0%)	782 (58.6%)	2997 (40.5%)	874 (64.5%)	2524 (61.8%)	7523 (57.7%)	1581 (43.2%)
Low	597 (15.0%)	210 (15.7%)	1216 (16.4%)	117 (8.6%)	678 (16.6%)	2775 (21.3%)	825 (22.6%)
Missing	4 (0.1%)	56 (4.2%)	1893 (25.6%)	0	0	497 (3.8%)	681 (18.6%)
Child Sex (n, %)							
Male	2101 (52.7%)	635 (47.6%)	3707 (50.1%)	687 (50.7%)	2096 (51.3%)	6592 (50.5%)	1881 (51.4%)
Female	1883 (47.3%)	699 (52.4%)	3685 (49.9%)	669 (49.3%)	1989 (48.7%)	6454 (49.5%)	1776 (48.6%)
Missing	0	0	1 (0.0%)	0	0	0	0
Mother Ethnicity (n, %)							
Ethnic Majority / Born in country	3739 (93.9%)	1224 (91.8%)	3967 (53.7%)	1232 (90.9%)	2650 (64.9%)	10 647 (81.6%)	2050 (56.1%)
Ethnic Minority / Born outside country	207 (5.2%)	109 (8.2%)	3168 (42.9%)	123 (9.1%)	1426 (34.9%)	1910 (14.7%)	1607 (43.9%)
Missing	38 (1.0%)	1 (0.1%)	258 (3.5%)	1 (0.1%)	9 (0.2%)	489 (3.7%)	0
Maternal Age at Child Birth[d] (M, SD)	29.6yr (4.64)	29.0yr (5.1)	30.59yr (5.10)	N/A	31.2yr (5.2)	28.99yr (5.99)	29.68yr (3.12)