Socioeconomic inequalities in health among Swedish men and women born 1915-2010: life course and intergenerational effects across the twentieth century

Ilona Koupil
Outline

• Developmental origins of health and disease and health equity studies
• Setting up the Uppsala Birth Cohort Study (UBCoS)
• Early life and intergenerational origins of health, education and reproductive outcome (UBCoS Multigen)
• Methodological issues and challenges for further research and implementation
The "developmental origins of disease" paradigm

• "A reflection of the persistence of immediate homeostatic responses and predictive adaptive responses in humans who now live in very different environments from those within which they evolved" (Gluckman & Hanson, 2004; Gluckman et al. 2005; Bateson et al. 2004)

• Builds upon evidence on "fetal origins of adult disease" (Barker 1980s-)

![Mismatch: The Lifestyle Disease Timebomb](image)

![Mothers, Babies and Health in Later Life](image)
Prof Dr David Barker (1938-2013)

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Evidence from Swedish studies on "developmental origins of disease"

Reduced fetal growth rate and increased risk of death from ischaemic heart disease: cohort study of 15,000 Swedish men and women born 1915-29
David A. Leon, Hans O Lithell, Denny Vågerö, Ilona Koupilová, Rawya Mohsen, Lars Berglund, Ulla-Brigit Lithell, Paul M McKeeight
BMJ 1998

Paternal age and schizophrenia: a population based cohort study
Attila Sipos, Finn Rasmussen, Glynn Harrison, Per Tynelius, Glyn Lewis, David A Leon, David Gunnell

Original Contribution

Growth Trajectory Matters: Interpreting the Associations among Birth Weight, Concurrent Body Size, and Systolic Blood Pressure in a Cohort Study of 378,707 Swedish Men

Debbie A. Lawlor1, David A. Leon2, and Finn Rasmussen3,4

Social and biological determinants of reproductive success in Swedish males and females born 1915–1929
Anna Goodman*, Ilona Koupil*
Persistence of health inequalities in Sweden

• Welfare policies reduced inequalities in income, housing quality, and access to health care (Kautto et al. 2001)

• Inequalities in health are not smaller in Sweden than in other European countries with less generous welfare arrangements (Mackenbach 2012).

• ‘Social causation’ and developmental origins of health: ”the roots of health inequalities in adult life may lie in social or biological differences experienced in the womb and during childhood”

• ‘Social selection’: people may be socially mobile (or stable) partially on the basis of health-relevant characteristics

• Both models emphasize how early circumstances and exposures can shape later outcomes
Modelling health determinants and pathways to health inequities

• **Social causation** perspective: social position determines health through intermediary factors
  – material conditions, psychosocial mechanisms, behaviours, social cohesion, health care...

• **Social selection** perspective: health determines socioeconomic position

• **Life course** perspective: importance of time and timing in understanding causal links between exposure and outcomes
  – within an individual’s lifecourse
  – across generations
  – in population-level disease trends
Life course and intergenerational determinants of health

Figure 2. How poor childhood circumstances may compromise adult health.
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Uppsala Birth Cohort Multigenerational Study (UBCoS Multigen)

- 14,192 live births at the Uppsala Academic Hospital in 1915-1929 – “generation 1” (Leon et al. 1998)

- Subsequent generations born up till 2009 traced through Multi-Generation Register (Koupil 2007; Koupil & Goodman 2010)
Data collection from Census 1930 and 1940
Uppsala Birth Cohort Multigen Study (UBCoS Multigen)
Main social and health indicators used in analyses of UBCoS study subjects

<table>
<thead>
<tr>
<th>Generation</th>
<th>Main socioeconomic and demographic indicators (from archive and register data)</th>
<th>Main health indicators (from archive and register data)</th>
</tr>
</thead>
<tbody>
<tr>
<td>Parents (born 1867-1913)</td>
<td>Education, occupation, income, wealth, marital status, family composition, reproduction, place of residence</td>
<td>Reproductive health and pregnancy complications, early adult mortality</td>
</tr>
<tr>
<td>Original ‘UBCoS’ cohort (born 1915-1929)</td>
<td>Education, occupation, income, marital status, family composition, reproduction, residence</td>
<td>Birth characteristics, mortality from childhood to old age, inpatient and outpatient care, cardiovascular risk factors, pregnancy complications and outcomes</td>
</tr>
</tbody>
</table>
Effect of low birth weight on mortality across the lifecourse in UBCoS Multigen cohort members born 1915-1929


Reduced fetal growth rate and increased risk of death from ischaemic heart disease: cohort study of 15 000 Swedish men and women born 1915-29

David A Leon, Hans O Lithell, Denny Vågerö, Ilena Koupilová, Rawya Mohsen, Lars Berglund, Ulla-Britt Lithell, Paul M McKeigue

The effect of early life factors on 28 day case fatality after acute myocardial infarction

Does the strength of the association between foetal growth rate and ischaemic heart disease mortality differ by social circumstances in early or later life?

K Rajaleid, O Manor and I Koupil

J. Epidemiol. Community Health 2008;62:6-
doi:10.1136/jech.2006.059147

Conclusions: Weight for gestational age was inversely associated with the risk of IHD death in men and women; this effect was present in men of non-manual adult social class only but did not appear to be modified by adult social class in women or by social class at birth in either men or women.

...effect strongest among men of non-manual adult social class...
Length of gestation is associated with mortality from cerebrovascular disease

Ilona Koupil, David A Leon, Hans O Lithell


- Shorter length of gestation is associated with higher mortality from cerebrovascular disease but not with ischaemic heart disease.
- The risk of death from occlusive stroke in particular is decreased in subjects born after 36 or more weeks of gestation.

Fig. 3 Hazard ratios for deaths from cerebrovascular disease in 11,474 men and women born 1915–1929, by length of gestation. Adjusted for age, period, gender, social characteristics, and weight for gestational age. Adapted from Koupil et al. J Epidemiol Community Health 2005; 59: 473–4 with permission from the BMJ Publishing Group.

Further findings on circulatory disease:

Low fetal growth rate rather than placental weight predictive of IHD (and thrombotic stroke) but strong effect of social class at birth not mediated by fetal growth rate
(Heshmati & Koupil J DOHaD 2014)

Offspring whose mothers had a small or flat pelvis at increased risk of stroke
(Heshmati et al. under review)
Balancing multiple outcomes

<table>
<thead>
<tr>
<th>Outcome and subgroup</th>
<th>Participants</th>
<th>Deaths</th>
<th>HR$^a$ IV, fixed, 95% CI</th>
<th>HR$^a$ IV, fixed, 95% CI</th>
</tr>
</thead>
<tbody>
<tr>
<td>All-cause mortality</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>All causes women</td>
<td>185,553</td>
<td>12,995</td>
<td>0.93 (0.90–0.96)</td>
<td></td>
</tr>
<tr>
<td>All causes men</td>
<td>208,509</td>
<td>23,839</td>
<td>0.95 (0.93–0.97)</td>
<td></td>
</tr>
<tr>
<td>All causes total</td>
<td>394,062</td>
<td>36,834</td>
<td>0.94 (0.92–0.97)</td>
<td></td>
</tr>
<tr>
<td>Heterogeneity: $\chi^2=1.02$ (P=0.31) $\beta^2=2%$</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Test for overall effect: Z=5.80 (P&lt;0.00001)</td>
<td></td>
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</tr>
</tbody>
</table>

<table>
<thead>
<tr>
<th>Results for CVD mortality</th>
<th></th>
<th></th>
<th></th>
<th></th>
</tr>
</thead>
<tbody>
<tr>
<td>CVD women</td>
<td>149,452</td>
<td>2796</td>
<td>0.88 (0.82–0.95)</td>
<td></td>
</tr>
<tr>
<td>CVD men</td>
<td>176,590</td>
<td>8570</td>
<td>0.88 (0.84–0.91)</td>
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<tr>
<td>CVD total</td>
<td>325,982</td>
<td>11,996</td>
<td>0.88 (0.85–0.91)</td>
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</tr>
<tr>
<td>Heterogeneity: $\chi^2=0.00$ (P=1.00) $\beta^2=0%$</td>
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<td></td>
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<tr>
<td>Test for overall effect: Z=7.03 (P&lt;0.00001)</td>
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</tbody>
</table>

<table>
<thead>
<tr>
<th>Results for cancer mortality</th>
<th></th>
<th></th>
<th></th>
<th></th>
</tr>
</thead>
<tbody>
<tr>
<td>Cancer women</td>
<td>132,820</td>
<td>4208</td>
<td>1.04 (0.98–1.10)</td>
<td></td>
</tr>
<tr>
<td>Cancer men</td>
<td>144,803</td>
<td>4176</td>
<td>1.13 (1.07–1.19)</td>
<td></td>
</tr>
<tr>
<td>Cancer total</td>
<td>277,623</td>
<td>8384</td>
<td>1.09 (1.05–1.13)</td>
<td></td>
</tr>
<tr>
<td>Heterogeneity: $\chi^2=4.71$ (P=0.03) $\beta^2=79%$</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Test for overall effect: Z=4.06 (P&lt;0.00001)</td>
<td></td>
<td></td>
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<td></td>
</tr>
</tbody>
</table>


$^a$The most fully adjusted estimate from studies were entered analyses

Figure 2: Forest plots with sex-stratified results of meta-analyses assessing the association between birthweight and adult mortality from all-causes, CVD and cancer. HRs with 95% CIs per kg increase in birthweight.
Suicide and fractures

...among adult and old people, early life characteristics found to be associated with suicide rates in adolescents and young adults in previous studies may no longer be as significant. ...adult life circumstances, such as social class and marital status, were found to be most strongly related to suicide in our cohort (Danziger et al., 2011).

Birth weight is associated with bone mineral content but this association does not translate into an association with risk of fracture in men and women aged 50-94 years (Byberg et al., In press).
Life-course determinants of dementia: childhood cognitive ability, education, and occupational complexity.

Lowest risk was found in the group with both higher childhood cognitive ability and high occupational complexity with data.

High occupational complexity could not compensate for the effect of low childhood cognitive ability, whereas dementia risk was reduced in those with higher cognitive ability, irrespective of occupational complexity.
Schematic representation of life course of function (e.g. lung, muscle) ... cognitive function ...

taken from Strachan (1997)

Ben Shlomo & Kuh 2002
Socio-economic position over the life course and all-cause, and circulatory diseases mortality at age 50–87 years: results from a Swedish birth cohort

Gita Devi Mishra · Flaminia Chiesa · Anna Goodman · Bianca De Stavola · Ilona Koupil

All-cause mortality in both genders: the sensitive period model best described influence of SEP across the life course with a heightened effect in later adult life.

Circulatory disease mortality: effect of SEP in males was cumulative while a sensitive period model due to SEP in later adult life was selected for women.

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Intergenerational transfer of health inequalities in UBCoS Multigen

Generation

G0
Great-grandparents

G1
Grandparents

G2
Parents

G3
Children

Socioeconomic position

Social class

Education

School marks

Education

School marks

Education

School marks

Health, growth, development

Foetal growth

(Birth weight)

Adult height

Foetal growth

Length of gestation

Adult height

Length of gestation

Later health
Education and social inequalities

• Educational inequalities predict adverse future health across the life-course

• Early life characteristics linked to educational outcomes in earlier studies (Record et al. 1969, Bhutta et al. 2002, Shenkin et al. 2004, Bjerkedal et al. 2007, Lawlor et al. 2006, Björklund et al. 2003...Yang et al. 2010)

• Education a major route whereby social inequalities are recreated across generations in Sweden (Jonsson 2004)

• Equalising educational opportunities and outcomes a major political goal in Sweden during the twentieth century (Husén and Boalt 1967, Björklund et al. 2003)
Birth characteristics and early-life social characteristics predict unequal educational outcomes across the life course and across generations

Data from a Swedish cohort born 1915-1929 and their grandchildren born 1973-1980

Anna Goodman
London School of Hygiene and Tropical Medicine, Centre for Health Equity Studies, Stockholm University/Karolinska Institute
Marit D Giesselmann
Centre for Health Equity Studies, Stockholm University/Karolinska Institute
Ilona Koupiil
Centre for Health Equity Studies, Stockholm University/Karolinska Institute

Which early-life characteristics independently predict

• school achievement?
• education continuation?
Uppsala Multigenerational Birth Cohort Study

First cohort: Generation 1 or ‘G1s’
Uppsala birth cohort: all
14,192 (100%) live births born
1915-1929

1518 (11%) died/emigrated by age 20

12,674 in study population*

Second cohort: Generation 3 or ‘G3s’
Swedish-born grandchildren: all
10,036 (100%) live births born
1973-1980**

239 (2%) died/emigrated by age 20
91 (1%) adopted

9706 in study population*

Link generations

*multiple imputation rather than exclude 18.5%
with missing education data

** Years determined by
coverage of register information

Educational outcomes

- School achievement: Standardised mean grades in primary school
  - Third grade (age 10) in G1s
  - Ninth grade (age 16) in G3s

Limitation: grades from different ages - birth characteristics have stronger effects at younger ages
Educational outcomes

• School achievement: Standardised mean grades in primary school
  - Third grade (age 10) in G1s
  - Ninth grade (age 16) in G3s

• Education continuation 1: Completing senior school

• Education continuation 2: Entering higher education.

Limitation: grades from different ages - birth characteristics have stronger effects at younger ages

Similar results: focus on higher education
Early-life characteristics of study subjects from the Uppsala Birth Cohort (G1s, born 1915-1929) and their grandchildren (G3s, born 1973-1980).

<table>
<thead>
<tr>
<th>Early-life characteristics</th>
<th>Range/categories</th>
<th>Percent in G1 (N=12674)</th>
<th>Percent in G3 (N=9706)</th>
</tr>
</thead>
<tbody>
<tr>
<td>Gender</td>
<td>Male/Female</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Birthweight</td>
<td>&lt;2500g</td>
<td>4.4</td>
<td>3.5</td>
</tr>
<tr>
<td></td>
<td>2500-3000g</td>
<td>14.3</td>
<td>13.0</td>
</tr>
<tr>
<td></td>
<td>3000-3500g</td>
<td>36.1</td>
<td>34.2</td>
</tr>
<tr>
<td></td>
<td>3500-4000g</td>
<td>32.7</td>
<td>33.8</td>
</tr>
<tr>
<td></td>
<td>≥4000g</td>
<td>12.5</td>
<td>15.6</td>
</tr>
<tr>
<td>Gestational age</td>
<td>Pre-term (≤36 weeks)</td>
<td>7.3</td>
<td>4.5</td>
</tr>
<tr>
<td></td>
<td>Term (37-42 weeks)</td>
<td>80.6</td>
<td>81.4</td>
</tr>
<tr>
<td></td>
<td>Postterm (≥42 weeks)</td>
<td>12.0</td>
<td>14.0</td>
</tr>
<tr>
<td>Birth multiplicity</td>
<td>Singleton</td>
<td>97.3</td>
<td>98.4</td>
</tr>
<tr>
<td></td>
<td>Twin/triplet</td>
<td>2.7</td>
<td>1.6</td>
</tr>
<tr>
<td>Birth order</td>
<td>1</td>
<td>39.2</td>
<td>47.2</td>
</tr>
<tr>
<td></td>
<td>2-3</td>
<td>36.8</td>
<td>49.6</td>
</tr>
<tr>
<td></td>
<td>4-5</td>
<td>13.5</td>
<td>3.0</td>
</tr>
<tr>
<td></td>
<td>6-16 [G1] / 6-7 [G3]</td>
<td>10.5</td>
<td>0.2</td>
</tr>
<tr>
<td>Mother’s age at birth</td>
<td>Five year categories</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Mother’s marital status</td>
<td>Married</td>
<td>79.6</td>
<td>59.4</td>
</tr>
<tr>
<td></td>
<td>Unmarried</td>
<td>19.6</td>
<td>39.0</td>
</tr>
<tr>
<td></td>
<td>Widowed/divorced</td>
<td>0.8</td>
<td>1.6</td>
</tr>
<tr>
<td>Family social class</td>
<td>High/mediate non-manual</td>
<td>8.7</td>
<td>38.0</td>
</tr>
<tr>
<td></td>
<td>Low non-manual</td>
<td>6.8</td>
<td>13.3</td>
</tr>
<tr>
<td></td>
<td>Skilled manual</td>
<td>14.3</td>
<td>19.1</td>
</tr>
<tr>
<td></td>
<td>Semi/unskilled manual</td>
<td>47.1</td>
<td>16.7</td>
</tr>
<tr>
<td></td>
<td>Self-employed</td>
<td>3.2</td>
<td>7.2</td>
</tr>
<tr>
<td></td>
<td>Farmer</td>
<td>14.5</td>
<td>2.2</td>
</tr>
<tr>
<td></td>
<td>Housedaughter</td>
<td>5.5</td>
<td>[not used]</td>
</tr>
<tr>
<td></td>
<td>Retired, student, other</td>
<td>[not used]</td>
<td>3.6</td>
</tr>
</tbody>
</table>

Additional adjustments for family size, maternal and paternal education in G3

Goodman et al. 2010
Two mechanisms for creating educational inequalities

'Primary mechanism': via poorer school performance

Early-life predictor → Poorer school achievement (e.g. school grades) → Lower education continuation (e.g. going to university) → Adverse effect on adult health, employment & living conditions.

'Secondary mechanism': direct effect on educational continuation

How far are effects on education continuation mediated by school achievement?
Some good news!

- Education continuation became more common, more 'meritocratic' & less gender discriminating...

Goodman et al. 2010
Table 2: Early-life characteristics and school achievement among subjects from the Uppsala Birth Cohort (G1s, born 1915-1929) and their grandchildren (G3s, born 1973-1980)

<table>
<thead>
<tr>
<th>Gender</th>
<th>Male</th>
<th>Female</th>
</tr>
</thead>
<tbody>
<tr>
<td>G1 characteristics predicting G1 schoolmarks: linear regression, regression coefficients and 95% CI</td>
<td>Minimally adjusted†</td>
<td>Multivariable: all early-life characteristics</td>
</tr>
<tr>
<td>N</td>
<td>12,674</td>
<td>12,674</td>
</tr>
<tr>
<td>Gender</td>
<td>Male</td>
<td>Female</td>
</tr>
<tr>
<td>Birth weight</td>
<td>0.35 (0.30, 0.41)</td>
<td>0.37 (0.32, 0.43)</td>
</tr>
<tr>
<td>&lt;2,500g</td>
<td>-0.13 (-0.22, -0.04)</td>
<td>-0.13 (-0.23, -0.04)</td>
</tr>
<tr>
<td>2,500-3,000g</td>
<td>-0.09 (-0.17, -0.01)</td>
<td>-0.09 (-0.17, -0.02)</td>
</tr>
<tr>
<td>3,000-3,500g</td>
<td>0**</td>
<td>0**</td>
</tr>
<tr>
<td>3,500-4,000g</td>
<td>0.01 (-0.04, 0.05)</td>
<td>0.02 (-0.03, 0.07)</td>
</tr>
<tr>
<td>≥4,000g</td>
<td>0.01 (-0.06, 0.08)</td>
<td>0.04 (-0.04, 0.11)</td>
</tr>
<tr>
<td>Gestational age</td>
<td>Pre-term</td>
<td>-0.10 (-0.17, -0.02)</td>
</tr>
<tr>
<td>Term</td>
<td>0**</td>
<td>0</td>
</tr>
<tr>
<td>Birth age</td>
<td>Post-term</td>
<td>-0.06 (-0.11, 0.00)</td>
</tr>
<tr>
<td>Singleton</td>
<td>0</td>
<td>0</td>
</tr>
<tr>
<td>multiplicity</td>
<td>Twin/triplet</td>
<td>-0.10 (-0.24, 0.05)</td>
</tr>
</tbody>
</table>

Minimal adjustment for gender and birth year.
Multivariable model includes birth order, mother’s age, civil status, family social class.
Some good news!? 

- Education continuation became more common, more 'meritocratic' & less gender discriminating...?

Goodman et al. 2010
...AND schoolmarks only partly explain why family & social class predict education continuation

Multivariable analyses of education outcomes

<table>
<thead>
<tr>
<th></th>
<th>G1 early-life to G1 outcome</th>
<th>G3 early-life to G3 outcome</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>Schoolmarks, early-life only</td>
<td>Higher education, early-life only</td>
</tr>
<tr>
<td>Lower birthweight</td>
<td>↓**</td>
<td>↓*</td>
</tr>
<tr>
<td>Preterm birth</td>
<td>-</td>
<td>-</td>
</tr>
<tr>
<td>Postterm birth</td>
<td>[↓*]</td>
<td>↓*</td>
</tr>
<tr>
<td>Twin status</td>
<td>-</td>
<td>-</td>
</tr>
<tr>
<td>High birth order</td>
<td>↓***</td>
<td>↓***</td>
</tr>
<tr>
<td>Younger mother</td>
<td>↓**</td>
<td>↓***</td>
</tr>
<tr>
<td>Unmarried mother</td>
<td>↓***</td>
<td>↓*</td>
</tr>
<tr>
<td>Low social class</td>
<td>↓***</td>
<td>↓***</td>
</tr>
</tbody>
</table>

*p<0.05, **p<0.01, ***p<0.001

All analyses adjust for sex and birth year
Effects also seen across generations

Multivariable analyses of G1 characteristics predicting G3 education

<table>
<thead>
<tr>
<th>G1 characteristic</th>
<th>G3 schoolmarks</th>
<th>G3 tertiary education</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>Early-life only</td>
<td>Early-life + G3 childhood SEP†</td>
</tr>
<tr>
<td>Lower birthweight</td>
<td>↓*</td>
<td>↓*</td>
</tr>
<tr>
<td>Preterm birth</td>
<td>-</td>
<td>-</td>
</tr>
<tr>
<td>Postterm birth</td>
<td>↓**</td>
<td>-</td>
</tr>
<tr>
<td>Twin status</td>
<td>-</td>
<td></td>
</tr>
<tr>
<td>High birth order</td>
<td>↓***</td>
<td></td>
</tr>
<tr>
<td>Younger mother</td>
<td>-</td>
<td></td>
</tr>
<tr>
<td>Unmarried mother</td>
<td>-</td>
<td></td>
</tr>
<tr>
<td>Low social class</td>
<td>↓***</td>
<td></td>
</tr>
</tbody>
</table>

† G3 SEP = mother’s education, father’s education, family social class in childhood

*p<0.05, **p<0.01, ***p<0.001

4 generations!
...but almost totally explained by intervening socio-economic position

Multivariable analyses of G1 characteristics predicting G3 education

<table>
<thead>
<tr>
<th>G1 characteristic</th>
<th></th>
<th></th>
<th></th>
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</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>G3 schoolmarks</td>
<td></td>
<td>G3 tertiary education</td>
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<td></td>
</tr>
<tr>
<td></td>
<td>Early-life only</td>
<td>Early-life + G3 childhood SEP†</td>
<td></td>
<td>Early-life only</td>
<td>Early-life + G3 childhood SEP†</td>
<td></td>
</tr>
<tr>
<td>Lower birthweight</td>
<td>↓*</td>
<td>-</td>
<td>-</td>
<td>↓*</td>
<td>-</td>
<td>-</td>
</tr>
<tr>
<td>Preterm birth</td>
<td>-</td>
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<td>-</td>
<td>-</td>
<td>-</td>
</tr>
<tr>
<td>Postterm birth</td>
<td>↓**</td>
<td>-</td>
<td>-</td>
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<td>-</td>
<td>-</td>
</tr>
<tr>
<td>Twin status</td>
<td>-</td>
<td>-</td>
<td>-</td>
<td>-</td>
<td>-</td>
<td>-</td>
</tr>
<tr>
<td>High birth order</td>
<td>↓***</td>
<td>-</td>
<td>-</td>
<td>↓***</td>
<td>-</td>
<td>-</td>
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<tr>
<td>Younger mother</td>
<td>-</td>
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<tr>
<td>Unmarried mother</td>
<td>-</td>
<td>-</td>
<td>-</td>
<td>↓*</td>
<td>-</td>
<td>-</td>
</tr>
<tr>
<td>Low social class</td>
<td>↓***</td>
<td>↓**</td>
<td>↓***</td>
<td>-</td>
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</tr>
</tbody>
</table>

(4-fold decrease in effect size)

*p<0.05, **p<0.01, ***p<0.001

† G3 SEP = mother’s education, father’s education, family social class in childhood
Reproductive success associated with social and biological characteristics at birth

A higher birthweight for gestational age, a term birth and a younger mother were independently associated with a greater number of descendants in both sexes.

A married mother and higher family socio-economic position were also associated a greater number of descendants in males, while in females higher birth order was associated with higher reproductive success.

These effects were mediated by sex-specific effects upon the probability of marriage.

The effect of school performance on probability of marriage in men was largely mediated by adult SEP.

Marriage was also affected by other early life characteristics including birthweight, indicating how ‘biological’ characteristics may operate via social pathways.

Number of grandchildren increased with increasing number of children in both sexes.

Sex specific effects on marriage:

Effect of parental (G0) fertility and socioeconomic position on descendant socioeconomic success:

- Low fertility and high SEP predict increased descendant socioeconomic success across four generations.
- Low fertility and higher SEP do not, however, predict increased descendant reproductive success.
- Differences in fertility and SEP can have important long-term effects on the persistence of social inequalities across generations.

(Goodman et al. Proc R Soc B 2012)
Growing up with several older (as opposed to several younger siblings) is predictive of relatively poor performance on school tests and a lower likelihood of progression to tertiary education.

(Lawson et al. PLOS One 2013)
The later-born disadvantage also holds across generations, with the children of those with many older siblings achieving lower levels of educational attainment.

(Lawson et al. PLOS One 2013)
How much intergenerational continuities in size at birth depend on social disadvantage?

shared environment ~12-14% of the intergenerational correlations in standardized size at birth

no substantial difference between grandparental type

Figure 1. Biometric model for size at birth in first generation (G1) and third generation (G3) participants in the Uppsala Birth Cohort Study, Uppsala, Sweden, 1915–2002. Circles represent latent variables and rectangles represent observed variables. Dotted lines within rectangles represent other manifest variables for the latent variable C. F, shared fetal genetic component; M, shared maternal genetic component; C, shared intergenerational (common) environment; E, unshared environment.

De Stavola, Leon & Koupil. AJE 2011
Outline

- Developmental origins of health and disease and health equity studies
- Setting up the Uppsala Birth Cohort Study (UBCoS)
- Early life and intergenerational origins of health, education and reproductive outcome (UBCoS Multigen)
- Methodological issues and challenges for further research and implementation
Methodological challenges to be resolved...

• Address issues in register based research
• Implement developments from causal inference into life course and intergenerational research
• Identify and compare life course models across historical and social contexts (and gender)
• Balance multiple, short- and long term outcomes
• Integrate genomics (epigenetics) into health equity research
• Model social mobility across generations
Social causation and social selection models both draw on a life course perspective, in that both emphasize how early circumstances and exposures can shape later outcomes.

Although often presented as alternatives, the two processes are in fact both likely to operate simultaneously to some extent.

However, their relative contribution may differ to an important degree across time and place.
"A new science of human development is emerging, which has the capacity to transform the way we understand the origins of health and disease...

Despite the fact that biological embedding has established credibility in the scientific literature, the transformative power of the new science has yet to be fully realized in policy and practice."

Annu Rev Public Health 2013

http://www.earlylearning.ubc.ca/WHO
Importance of early child development

• Pregnancy as a sensitive period in life course and intergenerational perspective

• Early childhood period is considered to be the most important developmental phase throughout the lifespan.

• Healthy early child development (physical, social/emotional and language/cognitive) is fundamental to success and happiness throughout the life course.

• Early child development strongly influences health, obesity/stunting, mental health, heart disease, educational achievement, criminality and economic participation throughout life (Maggi et al 2010)

• ”Investment in early childhood is the most powerful investment a country can make” (Schweinhart 2004)
Irwin et al. 2007.

Thank you

- Current funding: Swedish Research Council; Swedish Research Council for Health, Working Life and Welfare; Stockholm University, Sweden
- Study web site: [www.chess.su.se/ubcosmg/](http://www.chess.su.se/ubcosmg/)