Integrating the social and biomedical: the MRC National Survey of Health and Development

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MRC National Survey of Health and Development

- **Maternity survey** of all mothers who had a baby in a week in March 1946 in England, Scotland or Wales. Interviewed by health visitors 8 weeks after birth.

- **MRC National Survey of Health and Development** is a sample of 5362 babies from the maternity survey followed up 23 times with ~80% response rates.

- **Social and biological** factors affecting:
  - Pregnancy & childbirth
  - Child health & development
  - Educational progress & life chances
  - Adult health and ageing
Maternity in Great Britain 1948 report

“Need for better care and lower costs” (The Times)
- Medical and other confinement costs
- Maternity clothes
- Layette & equipment

“Needless pain” (Observer) (only 8-52% given pain relief in childbirth)

“Present day maternity services have concentrated on one important object – to make childbirth safe. Now they need to pay more attention to the mother’s feelings and her material needs.” (Daily Mirror)

<table>
<thead>
<tr>
<th></th>
<th>Professional &amp; salaried</th>
<th>Black-coated wage earners</th>
<th>Manual workers</th>
<th>Agricultural workers</th>
</tr>
</thead>
<tbody>
<tr>
<td>First</td>
<td>£58</td>
<td>£45</td>
<td>£36</td>
<td>£31</td>
</tr>
<tr>
<td>Subsequent</td>
<td>£46</td>
<td>£30</td>
<td>£23</td>
<td>£18</td>
</tr>
</tbody>
</table>
# Scientific aims of the 1946 birth cohort the first 60 years (1946-2006)

<table>
<thead>
<tr>
<th>Year Range</th>
<th>Age Range</th>
<th>Scientific Aim</th>
</tr>
</thead>
<tbody>
<tr>
<td>1946</td>
<td>Birth</td>
<td>Decline in fertility and the cost of childbirth</td>
</tr>
<tr>
<td>1947-50</td>
<td>1-4y</td>
<td>Growth &amp; health in relation to SES &amp; care</td>
</tr>
<tr>
<td>1951-59</td>
<td>5-15</td>
<td>Physical &amp; cognitive development in relation to SES &amp; education. The ‘waste of talent’</td>
</tr>
<tr>
<td>1960-76</td>
<td>16-35</td>
<td>Occupation, income, family formation in relation to education &amp; SES. Early influences on respiratory health</td>
</tr>
<tr>
<td>1977-2006</td>
<td>36-60y</td>
<td>Age related change in biological function, functional capacity, morbidity &amp; survival in relation to earlier life factors &amp; lifetime SES</td>
</tr>
</tbody>
</table>

Wadsworth et al IJE 2006
‘Waste of talent’: focus on social inequalities
% at selective secondary school by test score & father’s social class

| Test score at 11 years | Middle class | | Manual working class | | |
|-----------------------|--------------|------------------|---------------------|------------------|
|                       | Upper        | Lower            | Upper               | Lower            |
| 54 or less            | 40.1         | 17.0             | 10.2                | 7.9              |
| 55-60                 | 80.3         | 65.9             | 49.8                | 51.6             |
| 61 and over           | 99.0         | 93.9             | 96.3                | 92.3             |

The Home and the School: 1964
Summary of NSHD data 2-53 years

19 DATA COLLECTIONS 2-31y
- Heights & weights at 2,4,6,7,11,15,20 26y
- Cognitive development assessed at 8,11,15y & educational achievement
- Diet: Breastfeeding, weaning, 24 hr recall at 2y
- Developmental milestones, physical co-ordination
- Behaviour & temperament
- Mortality, hospital admissions, reported health
- Marital, fertility histories
- Work histories
- Social & physical environment at all contacts
- Study of offspring children 4 & 8 y

DATA COLLECTIONS SINCE 36y
- Blood pressure, lung function, body size, mental health at 36,43,53y
- Cognitive performance at 43 & 53 years
  - Verbal memory, search speed & concentration, general ability
- Physical performance at 53y
  - Grip strength, balance, chair rises
- Age at menopause 47-53,57y
- Blood samples at 53 y for DNA & cell lines, HbA1c, lipids
- Mortality & cancer registrations, hospital admissions, health
- Diet, lifestyle, life circumstances
## Summary of NSHD associations between adult health outcomes and childhood factors up to 53y

<table>
<thead>
<tr>
<th>Adult outcome</th>
<th>Early SEP</th>
<th>Physical development</th>
<th>Cognitive development</th>
</tr>
</thead>
<tbody>
<tr>
<td>Cardiovascular</td>
<td>Yes</td>
<td>Yes</td>
<td>?</td>
</tr>
<tr>
<td>Respiratory</td>
<td>Yes</td>
<td>Yes</td>
<td>Yes</td>
</tr>
<tr>
<td>Breast cancer</td>
<td>No</td>
<td>Yes</td>
<td>?</td>
</tr>
<tr>
<td>Mortality</td>
<td>Yes</td>
<td>Yes</td>
<td>Yes</td>
</tr>
<tr>
<td>WHR/BMI</td>
<td>Yes</td>
<td>Yes</td>
<td>Yes</td>
</tr>
<tr>
<td>Phys/cog function</td>
<td>Yes</td>
<td>Yes</td>
<td>Yes</td>
</tr>
<tr>
<td>Reproductive function</td>
<td>Yes</td>
<td>Yes</td>
<td>Yes</td>
</tr>
<tr>
<td>Mental health/wellbeing</td>
<td>Yes</td>
<td>Yes</td>
<td>Yes</td>
</tr>
</tbody>
</table>
MRC National Survey of Health and Development
Data and Scientific framework

CHILD 0-16y

• Sex/gender
• Physical growth & maturation
• Cognitive development
• Milestones
• Illness, behaviour, temperament
• Breastfeeding, diet
• SES & social relations
• Area characteristics

ADULT 16-53y

• Physical & Cognitive capability
• Mental & physical morbidity
• Wellbeing & QoL
• Body size & shape 20y+
• Blood pressure 36y+
• Lung function 36y+
• Reproductive Function 16y+
• Lipids & HbA1c 53y
• Telomere length 53y
• DNA extraction 53y

60-64y

• Activity & heart rate monitoring
• Morbidity, wellbeing, survival
• Physical & cognitive capability
• Imaging/recording
  • Cardiac structure/ function
  • Vascular structure/function
  • Bone and body composition
• Blood/urine biomarkers
  • Lipid profile
  • Liver function
  • Glucose homeostasis
  • Renal function
  • Oxidative stress
  • Neuro-endocrine (thyroid, cortisol, IGF, steroids)
  • Chronic inflammation
  • Endothelial dysfunction
  • Adipocyte function
  • Telomeres
Area based characteristics and physical capability in the NSHD

Strongest association with balance time

Murray et al AJE in press

MRC Medical Research Council
HALCyon Healthy Ageing across the Life Course
Unit for Lifelong Health and Ageing
FTO genotype and BMI over the life course

BMI and rs9939609 in women

Hardy et al HMG 2010
HALCyon is a collaborative research programme:
- 9 UK cohorts born 1921 to 1958
- Cohort investigators, methodologists and specialists in ageing and knowledge transfer
- To investigate how healthy ageing is influenced by factors operating across the whole of life.

Indicators of healthy ageing being studied:
- Capability: the capacity to undertake the physical and mental tasks of daily living
- Wellbeing: psychological and social
- Underlying biology: physiology and genetics
8 integrated work packages

- WP4 Nutrition and dietary patterns
- WP5 Area based characteristics
- WP3 Life history and healthy ageing
- WP1 Life course models of capability
- WP2 Life course models of wellbeing
- WP6 Telomere length
- WP7 Genetics
- WP8 HPA axis

Life course models of capability and wellbeing | Biology of healthy ageing
# Childhood SEP and walking speed

<table>
<thead>
<tr>
<th>Study</th>
<th>Sex</th>
<th>Mean age (y)</th>
<th>Regression coefficient (95% CI)</th>
</tr>
</thead>
<tbody>
<tr>
<td><strong>Father's occupation</strong></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Lothian Birth Cohort 1921</td>
<td>M</td>
<td>79</td>
<td>-0.26 (-0.47, -0.05)</td>
</tr>
<tr>
<td></td>
<td>F</td>
<td></td>
<td>-0.24 (-0.38, -0.10)</td>
</tr>
<tr>
<td>Hertfordshire Ageing Study</td>
<td>M</td>
<td>76</td>
<td>-0.06 (-0.16, 0.04)</td>
</tr>
<tr>
<td></td>
<td>F</td>
<td></td>
<td>-0.01 (-0.14, 0.12)</td>
</tr>
<tr>
<td>Health and Retirement</td>
<td>M</td>
<td>75</td>
<td>-0.13 (-0.18, -0.09)</td>
</tr>
<tr>
<td></td>
<td>F</td>
<td></td>
<td>-0.14 (-0.18, -0.10)</td>
</tr>
<tr>
<td>Caerphilly Study</td>
<td>M</td>
<td>73</td>
<td>-0.06 (-0.09, -0.03)</td>
</tr>
<tr>
<td>PREHCO project</td>
<td>M</td>
<td>72</td>
<td>0.05 (-0.03, 0.12)</td>
</tr>
<tr>
<td></td>
<td>F</td>
<td></td>
<td>0.01 (-0.05, 0.08)</td>
</tr>
<tr>
<td>Boyd Orr</td>
<td>M</td>
<td>71</td>
<td>-0.03 (-0.11, 0.05)</td>
</tr>
<tr>
<td></td>
<td>F</td>
<td></td>
<td>-0.04 (-0.11, 0.03)</td>
</tr>
<tr>
<td>Lothian Birth Cohort 1936</td>
<td>M</td>
<td>69</td>
<td>-0.12 (-0.26, 0.02)</td>
</tr>
<tr>
<td></td>
<td>F</td>
<td></td>
<td>-0.13 (-0.24, -0.02)</td>
</tr>
<tr>
<td>Hertfordshire Cohort Study</td>
<td>M</td>
<td>68</td>
<td>-0.06 (-0.09, -0.03)</td>
</tr>
<tr>
<td></td>
<td>F</td>
<td></td>
<td>-0.04 (-0.11, 0.03)</td>
</tr>
<tr>
<td>ELSA</td>
<td>M</td>
<td>66</td>
<td>-0.16 (-0.20, -0.12)</td>
</tr>
<tr>
<td></td>
<td>F</td>
<td></td>
<td>-0.12 (-0.16, -0.08)</td>
</tr>
<tr>
<td>Aberdeen 1936</td>
<td>M</td>
<td>65</td>
<td>-0.04 (-0.15, 0.07)</td>
</tr>
<tr>
<td></td>
<td>F</td>
<td></td>
<td>-0.13 (-0.22, -0.04)</td>
</tr>
<tr>
<td><strong>Overall (I-squared = 72.3%, p &lt; 0.01)</strong></td>
<td></td>
<td></td>
<td>-0.08 (-0.11, -0.05)</td>
</tr>
</tbody>
</table>

Adjusted for age

Lower SEP=Worse function

Difference in mean walking speed (m/s) comparing lowest with highest SEP

Birnie, Cooper et al, PLoS One 2011
NSHD data collection 2013-18

- Home visit to full sample in 2015-16
  - Update health & life circumstances
  - Repeat tests, biological samples, innovative assessments
- Regular postal questionnaires to full sample
- Clinical sub-studies for more intensive investigations

Enhancing NSHD programme:
- Healthy ageing, managing health and health care needs, the social environment
- Biology of ageing linking epidemiologists & clinicians/biologists for NSHD studies
  - Metabolomic and epigenomic studies
  - ‘Candidate’ approach to biomarkers of ageing
  - Systems-based (e.g. collaboration on the ageing lung)