ESTIMATING THE LIFETIME COST OF CHILDHOOD OBESITY: WHAT HAVE WE DONE, WHAT REMAINS TO BE DONE

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WP4 Leader
JANPA COSTING MODEL

JANPA WP4 was very ambitious: first lifetime costing study that developed and applied a standard methodology in more than one country (8 EU countries)

Aims:
• Describe the lifetime cost of childhood obesity
• Assess the effect of reducing mean childhood BMI by 1% and 5%

Conducted within model principles; eg
• Societal economic perspective
• Transparency
• Maximising the use of resources
• Building capacity
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<tr>
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<th>HUMAN IMPACTS</th>
<th>FINANCIAL COSTS</th>
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<tbody>
<tr>
<td>ADULT OBESITY/OVERWEIGHT</td>
<td>Prevalence</td>
<td>Lifetime Income Losses</td>
</tr>
<tr>
<td>MORBIDITY</td>
<td>Incidence Prevalence Years Lost due to Disability (YLD) Quality Adjusted Life Years (QALY)</td>
<td>Direct healthcare costs Productivity losses due to absenteeism</td>
</tr>
<tr>
<td>MORTALITY</td>
<td>Premature death Years of Life Lost (YLL)</td>
<td>Productivity losses due to premature death</td>
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CONCEPTUAL FRAMEWORK

OBESE CHILD

Increased morbidity in adulthood

Obese adult

Increased morbidity in childhood

HEALTH CARE COSTS

PRODUCTIVITY LOSSES (ABSENTEEISM)

PRODUCTIVITY LOSSES (PREMATURE DEATH)

Heightened mortality

LIFETIME INCOME LOSSES

PRODUCTIVITY LOSSES

Adaptation of Fernandes (2010)
COHORT SIMULATIONS

- RR
- Obesity-related disease
- Obesity-related treatment & death

Deaths from other causes

Productivity loss:
- Premature death
- Absenteeism

Lifetime income loss

Legend:
- Forecast of (sex-age) population BMI distribution
- Individual BMI trajectory
USING COHORT SIMULATIONS

Can be used to describe either:

1. Experiences of a population alive in some future year
2. Lifetime experiences of a population as they age

These

• Are conducted differently (births, immigration, emigration)
• Require different data (forecasts of population, disease and mortality)
• Are reported differently (base population)

Second type of cohort simulations generate lifetime costs
EXCESS AND EFFECT METRICS

Excess costs attributable to childhood obesity/overweight

Cost (Obese/Overweight as child) – Cost (Healthy weight as child)

Effect of reductions in mean childhood BMI

Total cost (current BMI) – Total cost (reduced BMI)
SOFTWARE IMPLEMENTATION

WP4 Lead Team and UKHF modified UKHF’s existing software to implement the JANPA costing model.

Existing software:

- Mostly used for first type of cohort simulation
- Adult chronic disease model
- Direct healthcare costs

Substantial modifications were required.
WORKFLOW

1. Data collation
2. Pre-simulation data processing
3. Simulation modelling
4. Post-simulation review
5. Reporting
### DATA REQUIREMENTS

<table>
<thead>
<tr>
<th>Category</th>
<th>Requirements</th>
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<tbody>
<tr>
<td><strong>Population</strong></td>
<td>Childhood population size</td>
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<tr>
<td><strong>BMI</strong></td>
<td>Historical BMI distribution (all ages)</td>
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</table>
| **Disease parameters**                    | • Annual incidence rates  
                                       | • Annual prevalence rates  
                                       | • One-year survival probabilities  
                                       | • Annual mortality rates              |
| **Direct healthcare costs**               | Annual per case direct healthcare costs                                      |
| **Lifetime income losses**                | Annual average income                                                       |
| **Productivity losses due to premature mortality** |                                                                 |
| **Productivity losses due to absenteeism** | • Average number of days absent  
                                       | • Social welfare payments                                                    |
| **Other**                                 | Life expectancies at birth, Minimum legal working age, Retirement age         |
SOME DATA ISSUES (DISEASE)

Mismatch between disease definitions identified in evidence reviews and those used in collated data

Mixture of “Bottom-up” and “Top-down” approaches used to calculate disease parameters (prevalence, incidence, survival, mortality). Approach varies with the country and disease

Extensive use of global, international & regional proxy data

Incidence and survival data often estimated from other disease parameters (eg CHD, stroke, hypertension)
SOME DATA ISSUES (COSTS)

Direct healthcare cost areas (hospital, primary care and pharmaceuticals) often not complete.

Mixture of “Bottom-up” and “Top-down” methods used to calculate annual per case costs. Approach varies with the country, disease and healthcare cost area.

Discounting (at annual discount rate of 5% pa) is used on human impacts (health outcomes) as well as financial costs.

Extensive use of global, international & regional proxy data.
Lifetime impacts and costs attributable to childhood obesity/overweight in Republic of Ireland

Total Lifetime Cost
€4,518,100,000

People
Premature deaths 55,056

Health Services
Higher risk of adult obesity/overweight
Lifetime (direct) healthcare costs €944.7m

Economy
Productivity losses due to premature mortality €2,795.4m

Productivity losses due to absenteeism €521.9m

Social Services
Republic of Ireland’s 0-5 year olds

Percent who will die prematurely...

At age 40  At age 50  At age 60  At age 70

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<td>at age 18</td>
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<tr>
<td>2.5%</td>
<td>3.4%</td>
<td>4.4%</td>
<td>6.5%</td>
<td>9.2%</td>
<td>14.6%</td>
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<td>23.6%</td>
<td>39.3%</td>
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<td>Overweight and obese at age 18</td>
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<td>1.5%</td>
<td>2.7%</td>
<td>2.8%</td>
<td>6.0%</td>
<td>6.1%</td>
<td>14.4%</td>
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<td>14.7%</td>
<td>33.2%</td>
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<td>Current impacts &amp; costs of childhood obesity/overweight (2015)</td>
<td>Savings if mean childhood BMI reduced by 5%</td>
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<tr>
<td>Number of premature deaths</td>
<td>55,056</td>
<td>9,269 ↓</td>
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<tr>
<td>Years lost due to premature mortality (YLL)</td>
<td>46,737.3</td>
<td>7,180 ↓</td>
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<td>Lifetime income loss</td>
<td>€256.1m</td>
<td>€61.4m ↓</td>
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<td>Direct healthcare cost</td>
<td>€944.7m</td>
<td>€245.7m ↓</td>
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<tr>
<td>Productivity loss due to premature mortality</td>
<td>€2,795.4m</td>
<td>€671.0m ↓</td>
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<tr>
<td>Productivity loss due to absenteeism</td>
<td>€521.9m</td>
<td>€149.0m ↓</td>
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<tr>
<td><strong>Total costs</strong></td>
<td><strong>€4,518.1m</strong></td>
<td><strong>€1,127.1m ↓</strong></td>
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CONCLUSIONS - REPUBLIC OF IRELAND (1)

• Total financial costs (€4,518.1M) account for 1.6% of GDP in 2015

• Lifetime financial cost is €16,036 per person

• Direct healthcare costs (€944.7M) account for 4.8% of public health expenditure in 2015.

• Premature deaths (55,056) account for 1 in 10 of all premature deaths

• Societal costs are larger than direct healthcare costs

• Premature death is a larger cause of productivity loss than absenteeism (€2,795.4M vs €521.9M)
CONCLUSIONS - REPUBLIC OF IRELAND (2)

Gender differences:

• Male productivity losses due to prematue mortality and lifetime income losses are higher
• Female direct healthcare costs and productivity losses due to absenteeism are higher

Northern Ireland comparison highlights importance of context:

• Direct health care costs are relatively higher in Northern Ireland
• Indirect (societal) costs are relatively higher in Republic of Ireland

Large savings (€1,127M) with modest changes in childhood BM
BIGGEST DATA GAPS

Recommend greater co-ordination of information systems across the EU:

• Obesity surveillance (particularly early years, adolescence and later adult years)
• Surveillance of obesity-related diseases (particularly incidence and survival)
• Healthcare costs (particularly primary care and pharmaceutical costs)
• Approach to data use
BIGGEST RESEARCH GAPS

• Psychosocial impacts of childhood obesity and their implications for human capital and the economy
• Sensitivity audit (uncertainty intervals and validation)
• Multi-morbidity
• Independent scientific review of JANPA costing model and its development
• Longitudinal studies with long term follow-up
CONCLUSIONS

Very ambitious project. It is the first lifetime costing study of childhood obesity/overweight that developed and applied standard methodology to multiple countries (8 EU countries).

JANPAWP4 encountered unforeseen difficulties but established that reliable estimates of lifetime cost of childhood obesity/overweight could be obtained in more than one country.

Estimates highlight the large cost and the large savings that could follow from a modest change in childhood BMI.

If we deal with the unforeseen difficulties, the other valuable data that has been collated can produce reliable and meaningful estimates in the remaining countries.
JANPA COSTING MODEL TOOLBOX

- Evidence paper and study protocols
- Local materials survey
- Data sources survey
- Data proposal template
- Data request form
- Model input form
- Model output tables template
- Metric calculations template
- Technical appendix
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<tr>
<th>COUNTRY</th>
<th>ORGANISATION</th>
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<tr>
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<td>Sub-contractor&lt;br&gt;Pre-modelling data processing&lt;br&gt;Simulation modelling and cost estimation</td>
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<td>Greece</td>
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<td>Romania</td>
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<td>Associate Prof Jennifer Baker, Institute of Preventive Medicine in Denmark and the University of Copenhagen. Denmark</td>
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<td>Dr Pepijn Vemer, Department of Pharmacoepidemiology &amp; Pharmacoeconomy, University of Groningen. Netherlands</td>
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Thank you

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WP4 Leader

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