Food Choices, Lifestyles and the Prevention of Overweight and Obesity in Children: Evidence from the IDEFICS Cohort and the I.Family Study

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- on behalf of the I.Family consortium -
Partners

1. Strovolos, Cyprus
2. Ghent, Belgium
3. Copenhagen, Denmark
4. Tallin, Estonia
5. Helsinki, Finland
6. Bremen, Germany
7. Pécs, Hungary
8. Avellino, Italy
9. Milan, Italy
10. Utrecht, Netherlands
11. Palma de Mallorca, Spain
12. Zaragoza, Spain
13. Gothenburg, Sweden
14. Bristol, United Kingdom
15. Lancaster, United Kingdom
16. Andover, United Kingdom
Longitudinal design of I.Family and concatenation with IDEFICS

IDEFICS study

Cohort ~16,000 children

Baseline survey

Intervention group

Physical activity
Sleep
Diet

Control group

Evaluation of intervention effects

Intervention phase

2nd & 3rd survey

Cross-sectional

Determinants
Assessment
Diet
Physical activity
Sleep
SES
Genes
Biomarker

Environ. & family life
Parental quest.
School quest.
GIS

Outcome
Assessment
Lifestyle & nutrition related diseases and disorders
Overweight & Obesity
Musculoskeletal disorders
Insulin resistance

Anthropometry
Ultrasoundography
Biomarkers

per child

Funded by the EC, FP 7, Project No. 266044 – Building on IDEFICS study
Timeline of recruitment and follow-up

IDEFICS – I.Family cohort

- **T₃**: Follow-up of index children (plus siblings and parents)
- **CG**: Additional examinations in contrasting groups/sub-groups: fMRI, GPS monitoring, sensory perception, canteen experiments
- **Endpoints**: Food choice, eating behaviour, health indicators (body composition, metabolic profile, bone health)
Exhaustive examination programme:

- Questionnaires, anthropometry, biosamples, accelerometry, physical fitness, taste, GIS, ...
- Standardised according to survey manual
- Central trainings ("train-the-trainer") and subsequent local trainings
- Site visits and re-training if necessary

For an overview see:
The IDEFICS intervention: General approach

IDEFICS Intervention

Community-orientied

Setting-based

Intervention mapping in 5 steps

3 x 2 key messages (diet, stress, physical activity)

Programme: 10 modules at 4 levels

Participation of stakeholders

Community

Involvement of community partners

e.g. Media campaign

Intervention: 6 key messages

**Nutrition**

- Daily water
  - Less soft drinks
- Daily fruit & vegetables

**Physical Activity**

- Safe bicycle lanes
- Outdoor playing

**Stress**

- Spend more time together
  - Family time
- Adequate sleep duration
Excursion:
Did we choose the right messages?

- Results of cross-sectional analysis at baseline
**Intervention: 6 key messages → recommendations**

### Nutrition
- Daily water
  - Less soft drinks
- Daily fruit & vegetables
  - 5/day

### Physical Activity
- Daily PA
  - Safe bicycle lanes
  - Outdoor
- 1hr MVPA/day

### Stress
- Reduce TV-viewing
- Spend more time together
  - Family time
- Adequate sleep duration
  - >10hr/day
  - >11hr/day

### High well-being score
- <1/day
- <1hr/day
- <2hr/day
Sum of 6 key messages*: one point for each recommendation adhered to at baseline

Main drivers: TV time, physical activity and sleep duration

*only based on children (n=5,343) with full information on all 6 variables

... back to the intervention: Methodological approach

IDEFICS Intervention

Community-oriented  
Setting-based

Intervention mapping in 5 steps

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(diet, stress, physical activity)

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e.g. Media campaign

8 intervention centres in 8 European countries

- Control: intervention region in each country
- 500:500 preschoolers & 500:500 primary school children each
- Evaluation of:
  1. Development of the programme (costs, expenditure of time, practical problems & solutions)
  2. Process (participation, feasibility, acceptance, sustainability)
  3. Effect (individual, various endpoints)
… addressing several levels
(non-selective primary prevention & health promotion)

- **Community**
  - environment, social & political dimensions

- **Pre-school/ primary school**
  - education, food preparation (catering), school neighbourhood

- **Household/ family**
  - information, education, motivation

- **Individual**
  - behaviour
Implementation of intervention

- Establishment of
  - Central and local project intervention managers
  - Community platforms: local intervention programme committees IPC (local actors & stakeholders)
- Round tables
- Standardised community intervention programme (CIP) starting from schools/pre-schools:
  - Intervention messages & communication strategies
  - Core settings & dissemination channels
  - Core intervention tools & modules
Evaluation …

... an overview of the intervention & its evaluation

Obesity Reviews

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Special Issue: Prevention of childhood obesity: Results from the IDEFICS study

December 2015

Volume 15, Issue Supplement S2
Pages 1–174

Issue edited by: Stefaan De Henauw, Tom Baranowski, Iris Pigeot
Results ...
Change in BMI z-score – all countries combined

BMIZ-Score, boys

BMI z-Score, girls

### Changes in body composition – all countries combined

<table>
<thead>
<tr>
<th>Indicator</th>
<th>Condition</th>
<th>Boys</th>
<th>Girls</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td></td>
<td>T0 Mean*</td>
<td>T1 Mean*</td>
</tr>
<tr>
<td><strong>BMI z-score</strong></td>
<td>Intervent.</td>
<td>0.439</td>
<td>0.553</td>
</tr>
<tr>
<td></td>
<td>Control</td>
<td>0.377</td>
<td>0.532</td>
</tr>
<tr>
<td><strong>Body fat %</strong></td>
<td>Intervent.</td>
<td>16.942</td>
<td>19.275</td>
</tr>
<tr>
<td></td>
<td>Control</td>
<td>17.038</td>
<td>18.717</td>
</tr>
<tr>
<td><strong>Waist-to-height ratio</strong></td>
<td>Intervent.</td>
<td>0.473</td>
<td>0.462</td>
</tr>
<tr>
<td></td>
<td>Control</td>
<td>0.473</td>
<td>0.458</td>
</tr>
</tbody>
</table>

* Estimated marginal means and p-values calculated by mixed model analysis adjusted for age and parental education with country as a random effect.

# Effect estimates: mean change in intervention group minus mean change in control group, adjusted for baseline values of age, parental education and for cluster factor country (that is, unit of randomisation).
<table>
<thead>
<tr>
<th>Country</th>
<th>ES (95% CI)</th>
</tr>
</thead>
<tbody>
<tr>
<td>Primary intervention</td>
<td></td>
</tr>
<tr>
<td>Italy</td>
<td>0.78 (0.51, 1.17)</td>
</tr>
<tr>
<td>Estonia</td>
<td>1.20 (0.71, 2.02)</td>
</tr>
<tr>
<td>Cyprus</td>
<td>1.17 (0.83, 1.67)</td>
</tr>
<tr>
<td>Belgium</td>
<td>3.22 (1.78, 5.83)</td>
</tr>
<tr>
<td>Sweden</td>
<td>0.75 (0.41, 1.36)</td>
</tr>
<tr>
<td>Germany</td>
<td>0.72 (0.43, 1.23)</td>
</tr>
<tr>
<td>Hungary</td>
<td>0.95 (0.59, 1.52)</td>
</tr>
<tr>
<td>Spain</td>
<td>0.78 (0.49, 1.24)</td>
</tr>
<tr>
<td>Subtotal</td>
<td>1.01 (0.86, 1.20)</td>
</tr>
</tbody>
</table>

Intervention effect by country & covariate adjusted pooled results

Non-overweight at baseline

(Obesity Research, in press)
Further outcomes

- **Biomarkers**
  
  
  ➢ positive as well as negative and null effects; no obvious pattern

- **Sleep**
  
  
  ➢ small intervention effect on weeknight sleep duration

- **Physical activity and sedentary behaviour**
  
  
  ➢ no intervention effects overall, but strong temporal trends

- **Behaviours**
  
  
  ➢ no intervention effects, but strong temporal trends

- Partly large differences between countries, but no obvious pattern
Change in sedentary time and light PA – Belgium

Sedentary time

Light physical activity

Verloigne M et al.: Process evaluation of the IDEFICS school intervention: putting the evaluation of the effect on children's objectively measured physical activity and sedentary time in context. IJO 2015;16(S2):89–102
Summary & Conclusions

- No clear beneficial effect of the intervention on weight status or body composition in children who were normal weight at baseline.
- Greater probability of normalised weight status in children with prevalent overweight/obesity at baseline after 2 years → protective effect of the intervention against persistent overweight/obesity.
- Prevention of unfavourable changes in sedentary time and light physical activity in schools achieving a medium or high intervention dose.
Thank you!
Statistical analysis

- Investigation of potential differences between participants and drop-outs at T₁ ($\chi^2$- and t-tests)
- Investigation of potential differences between intervention and control region at T₀ ($\chi^2$- and t-tests)
- **Intention-to-treat**: mixed effect models (repeated measurements), stratified by sex
  - adjusted for age at baseline, social status (ISCED, max. of both parents)
  - country as random effect
  - setting as random effect
- Interaction effect of time and condition → intervention effect
- **Complete-case analysis** for biomarkers as outcome
- **Country-specific analyses**
Intervention mapping approach: six steps

Step 1: Assess problem and its behavioural and environmental causes

Step 2: Specify who and what will change as a result of the intervention

Step 3: Seek theory best methods for changing behaviours and structures

Step 4: Develop protocol and materials

Step 5: Run programme

Step 6: Evaluate
Lessons learned (I)

- **Process evaluation:**
  - Parental exposure to IDEFICS messages much less pronounced than intended
  - Information via kindergarten better than via communities
  - Differences among countries with respect to various messages

- **Limitations:**
  - High drop-out
  - Imprecise assessment e.g. of dietary behaviour
  - No proof of efficacy of modules before this effectiveness trial
  - Duration of intervention perhaps too short
  - Penetrance too low
  - Expectations on engagement of communities, actors and teachers too high


Lessons learned (II)

- Harmonisation of intervention ⇔ local adaptation ⇒ challenging task
- Extra efforts needed to reach less advantaged SES groups
- Involvement of parents most difficult
- Patience needed to get a programme accepted
  ⇒ local actors have to be convinced
  ⇒ takes some time
- Evaluation perhaps most difficult part
  ⇒ large number of questionnaires reduced willingness to participate
- Addressing individual behaviour not sufficient
  ⇒ “causes of causes”