I.Family: key results and suggestions for future priorities in research on childhood obesity

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- on behalf of the I.Family consortium -

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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

Timeline of recruitment and follow-up

IDEFICS – I.Family cohort

Endpoints: Food choice, eating behaviour, health indicators (body composition, metabolic profile, bone health)
MAIN RESULTS
Dietary behaviours

• Children with **low socioeconomic background** → persistently **unhealthier dietary profiles** over a 2-year period\(^{29}\)

• Dietary patterns rich in **vegetables, wholemeal cereals and fruit** and low in animal products → lower risk of OW/obesity → **less 2-year weight gain**\(^{27,28}\)
Physical activity and the built environment

- Few children meet physical activity (PA) guidelines (60min MVPA/ day)\textsuperscript{32}

- Bidirectional longitudinal association between PA and weight status:
  - Higher fat mass/ fat mass increases $\rightarrow$ subsequent decline in MVPA
  - Just 10 minutes more MVPA per day $\rightarrow$ prevent excess weight gain in children

\[ PA = \text{Physical Activity}; BC = \text{Body Composition} \]
Built environment: moveability index

- Neighbourhood
  - Individual place of residence
  - Network dependent environment
- Walkability measures (Freeman et al., 2013)
  - Population density
  - Land use mix
  - Connectivity (street crossings)
  - Availability of public transport
- Extension (Buck et al., 2011)
  - Public open spaces
- Availability measure (density/ intensity)
  - Anisotrope kernel density estimate
  - Mean intensity per neighbourhood (Buck et al., 2015a)

- **PA-friendliness** of the built environment (=moveability) → **more MVPA** of 596 primary school children in the German study region\(^{34}\)

- **Playground density** and density of playgrounds and parks combined → **positive effects on MVPA\(^{35}\)**
• **Short sleep duration**
  → being **overweight** – particularly in primary school children\(^{36}\)

• Inverse relationship between sleep duration and BMI
  → mainly explained by the inverse association between sleep duration & fat mass
  • Insulin may explain part of this association, in particular in heavier children (at the upper tail of the BMI distribution)\(^{37}\)
Media consumption

• One-third of children exceeded screen time recommendations (max. 2h/day). Children exceeding sedentary guidelines → increased risk of high blood pressure

• Watching TV during meals, having a TV in the children’s bedroom and watching TV more than 1h/day → being OW/obese

• TV exposure → preference for sugary/fatty foods → followed by higher consumption of sugar-sweetened beverages → increased the risk of OW/obesity
To identify sensitive periods affecting health we analysed body mass index (BMI) trajectories during infancy/childhood and later metabolic risk. Starting from birth, rapid BMI growth, especially between 9 months to <6 years, increased later metabolic risk in children.
SUGGESTIONS FOR FUTURE RESEARCH ON CHILDHOOD OBESITY
1. Life-course approach: longitudinal studies

- The causes of obesity can only be understood in a life-course perspective
  - Identification of sensitive periods (including intrauterine life)
  - Accumulation of risks over time
  - Analysis of weight trajectories, rather than single points in time
  - Development of risk prediction models → selective early intervention

- **Birth cohort** followed from prenatal periods to adulthood

- Funding for further **follow-up of existing children cohorts**

- Use of **novel technology** to **monitor & influence** behaviour
  - mHealth (smart phones, accelerometers, …)
System levels of factors influencing the development of obesity

2. Environmental determinants of health behaviours

- To prevent obesity health-related behaviours need to be changed in a favourable direction
- Health behaviours are shaped by the obesogenic environment
  - Built/ physical environment
  - Social & cultural environment
  - Political & regulatory environment
- Our understanding of determinants of diet, physical activity and sedentary behaviours is limited (→ DEDIPAC)
- Future research should focus on the forces driving our health behaviours
3. Effectiveness of policy interventions

- Assess evidence from **existing policy interventions** (e.g. sugar tax) & **learn from other** public health **domains** (e.g. smoking ban, seat belts)
- Monitor & assess **accountability of governments & the private sector** to create healthy food environments
  - Assess implementation of good practice nutrition policies by governments to reduce child obesity
  - Assess comprehensiveness, strength & performance of commitments to reduce child obesity
- Assess **choice architecture** & behavioural public policy
  - Childhood obesity nudges
- Harmonised **monitoring system of childhood obesity** & related behaviours across Europe → Funding for **methods platform**
Thank you!

IDEFICS study

Cohort ~16 600 children

Intervention group

Physical activity
Sleep
Diet

Evaluation of intervention effects

Control group

Baseline survey
Intervention phase
2nd & 3rd survey

Cross-sectional

Transition into adolescence

Environment

School
Family
Peers

I.Family

Contrasting Groups
(stage 2)

Healthy diet maintained
Diet worsened significantly
Unhealthy diet maintained
Diet improved significantly

Enhanced follow-up (stage 1)

Longitudinal

www.idefics.eu

www.ifamilystudy.eu

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Building on

Outcome

Lifestyle & nutrition related diseases and disorders

Overweight & Obesity
Musculoskeletal disorders
Insulin resistance

Assessment

Anthropometry
Ultrasonography
Biomarkers

Determinants

Diet
Physical activity
Sleep
SES
Genes
Biomarker
Environment & family life
Parental quest.
School quest.

Assessment

FFQ
24h dietary recall
Quest. Accelerometers
Quest.
Quest.
Saliva
Urine
Blood

Determinants

Psych. profile
Physical activity
Sleep
Social factors
Body comp.
Biomarker
Family
treed. analysis
Media
Genes
Sensory percept.
Environment
Gene expression
Social environ.
Setting factors

Assessment

Neuro-psych. tests & quest.
Quest. Accelerometers
Quest. Activity monitor
Quest.
Anthropometry
Urine
Blood
Quest.

Approach

24h dietary recall

Outcome

Eating behaviour, diet & food choice

Assessment

FFQ
Web-based 24h dietary recall

Gene expression
microRNA profiling
fMRI
Obesity prevention study

• Although the IDEFICS intervention was developed according to state-of-the-art knowledge, only weak effects were observed after 2 years of follow-up\textsuperscript{55}
• However, beneficial effects after 2 years in children who were already overweight at baseline\textsuperscript{56}
• Moreover, 6 years after the intervention phase parents and children who were exposed to the IDEFICS intervention had lower propensities to consume sugar than control families\textsuperscript{57}