An individual-based model for the study of the obesity epidemic in French adolescents

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Introduction (1)

Obesity: what's the matter?

- dramatic increase during past three decades
- strong socio-spatial disparities
- risk factor for other diseases
- in youth: short & long term heavy consequences

=> a major public health concern
What are the potential causes?

- Genetic factors
- Obesity
- Positive energy balance
- Nutrition
- Physical activity
- Individual & contextual factors

Introductions (2)
Aim and design of the project

- to study contextual influences on PA behaviours
- to study PA behaviours' contribution to the obesity epidemic evolution
- obesity emerges from a complex system of interactions
- individual-based model
Available data (1)

**Individual data**  *(Simon et al. 2004 & 2008, Int J Obes)*

- survey data from intervention (4 years, 2002-2006)
- N ~ 950 individuals (~ 12 yrs in 2002), 8 schools
- health data (height & weight, fat mass...)
- socio-economic data (parents' job, education...)
- nutrition, PA, sedentary & travel behaviours
- psychological data (intention, self-efficacy)
- perceived environment (access to facilities)
Available data (2)

Contextual data

- population census
- land-use database
- sport facilities census
- road network database
- public transportation data
An individual-based model. Why?

- Simulation tool
- Dynamic approach
- Spatially explicit
- Heterogeneity of individuals
- Integrated approach: 2 sub-models
Conceptual model. Weight regulation sub-model

Exercise duration and intensity

Energy expenditure

Energy balance

Body mass composition
- Fat mass
- Fat-free mass

Energy intake

Behaviours sub-model

Body mass index

Source: Abdel-Hamid 2002, System Dynamics Review
Conceptual model. Behaviours sub-model

Context: home & school

- Social environment
- Built environment

Decision process

Time-budget
- Physical activity
- Active travel
- Nutrition

Individual factors
- Age
- Gender
- Weight status
- Psychology

Weight regulation sub-model
Building decision rules

- statistical & spatial analysis $\rightarrow$ "if – then" rules
- empirically derived and litterature data

Model implementation

- choice of the programming environment (Repast? NetLogo?)

Model validation

- internal (sensibility analysis), external (empirical data)
Exploring scenarios

- light environmental changes (e.g. more facilities, improved transport network...)

- heavy environmental changes (house movings...)

- behavioural changes (active transportation, increasing PA levels, nutrition...)

- intervention modelling
Thank you for your attention

Summary

Decision rules
- environmental, individual & temporal data
- statistical & spatial analysis

Decision process

Contextual factors

Individual factors

Weight regulation

Physical activity behaviours

Nutrition

Space

Social

Time

Scenario