

Prävalenz und Determinanten des kindlichen Übergewichts – ein europäischer Vergleich –

Wolfgang Ahrens & Iris Pigeot

Symposium
Die Fettleibigkeit der Deutschen - Empirisch-statistische Aspekte
 DAGStat, 23. April 2010, RKI Berlin

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 Sixth Framework Programme

Obesity-related disorders

Psychosocial consequence

- Poor self-esteem

Respiratory tract

- Sleep apnoea
- Asthma

Gastro-intestinal tract

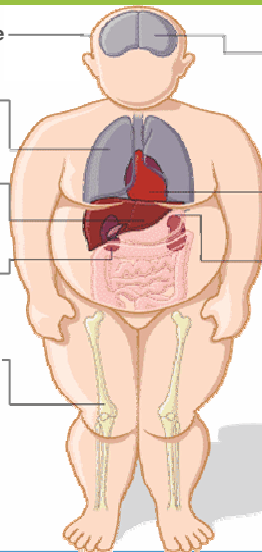
- Gallstones
- Fatty liver disease

Kidney

- Renal insufficiency (due to diabetes)

Musculoskeletal disorders

- Splay-, skew-, flatfeet
- Knock knees, bowlegs
- Femoral head luxation
- Lower arm fractures
- Arthritis
- Back pain



Neurological & psychiatric disorders

- Headache, visual impairment
- Depression
- Eating disorders

Cardiovascular system

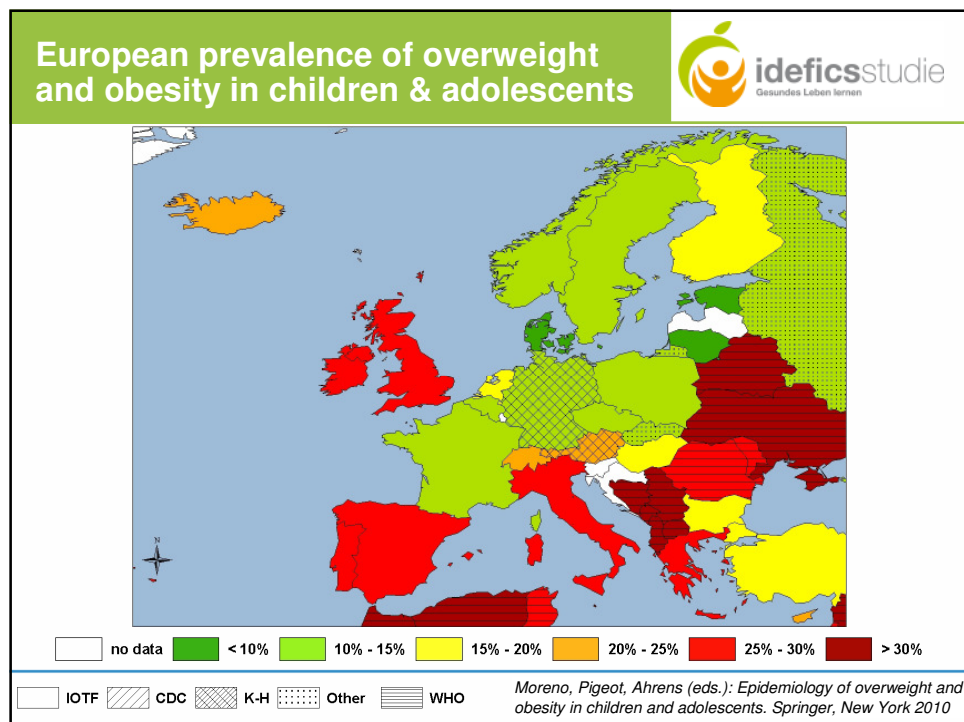
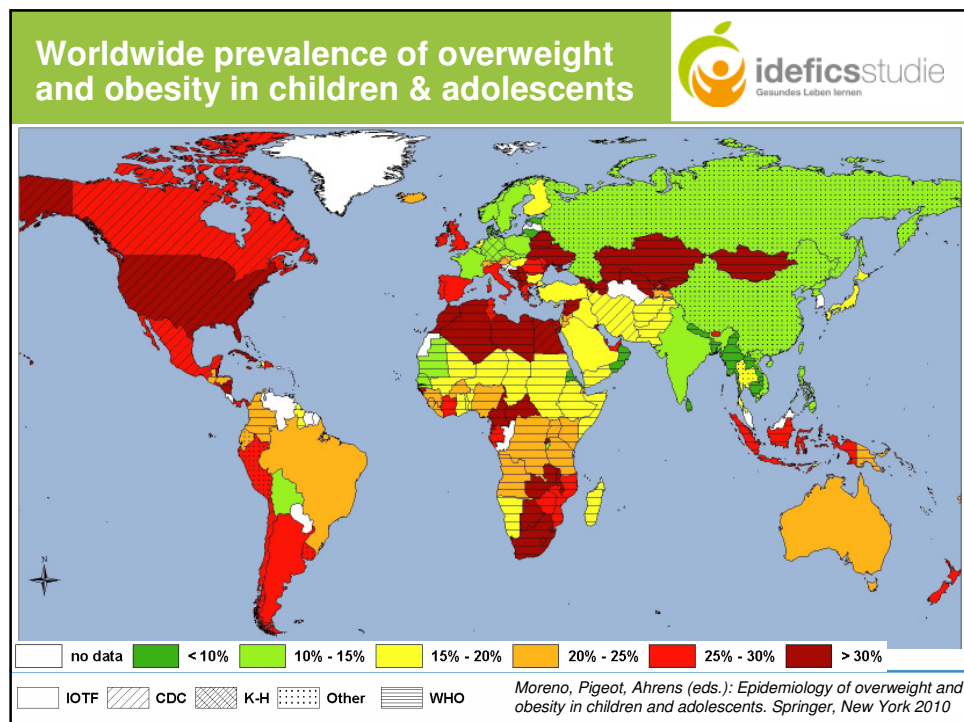
- Lipid metabolism, elevated cholesterol
- Hypertension
- Coagulation disorder, thrombosis
- Chronic blood vessel inflammation
- Water/ mineral imbalance

Hormone system

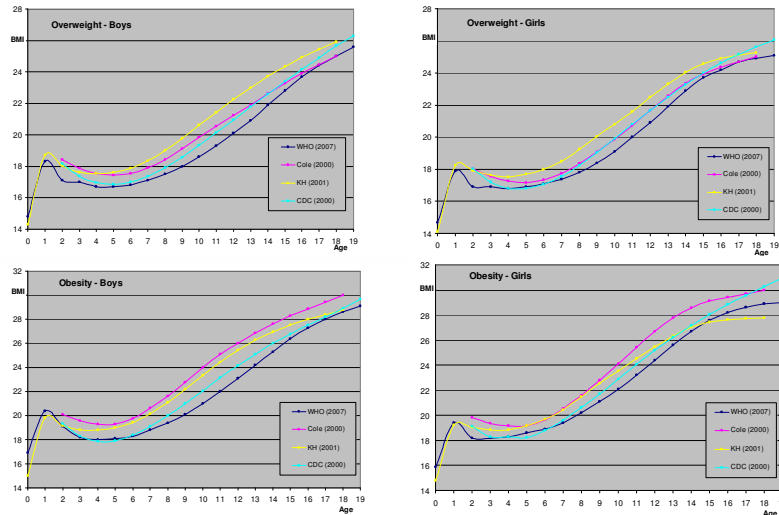
- Type-2 diabetes
- Early puberty
- Ovary cysts
- Testicular atrophy



 Sixth Framework Programme



BMI cut-offs by age and sex for common reference systems to classify overweight and obesity



Moreno, Pigeot, Ahrens (eds.): *Epidemiology of overweight and obesity in children and adolescents*. Springer, New York 2010

There is need for ...

- Comparable data on overweight/ obesity
- Comparable data on risk factors and morbidity
- Identification of determinants that are amenable to primary prevention
- Evidence-based prevention programmes



Identification and prevention of Dietary- and lifestyle-induced health Effects In Children and infantS

- Integrated Project (EU 6th Framework Programme)
- Coordinator: W. Ahrens, Dep. Coordinator: I. Pigeot
- Objectives:
 - enhance knowledge of **health effects of a changing diet & an altered social environment & lifestyle** of children, 2 to 10 years, in Europe,
 - develop, implement & validate specific intervention approaches in order to **reduce prevalence of diet- & lifestyle-related diseases & disorders**.
- ~ 16,000 children
- Approach through schools and kindergartens



Participating countries



Ghent, Belgium
 Strovolos, Cyprus
 Copenhagen, Denmark
 Tallin, Estonia
 Grenoble, France
 Bremen, Germany
 Bremerhaven, Germany
 Dortmund, Germany
 Wuppertal, Germany
 Pécs, Hungary
 Avellino, Italy
 Campobasso, Italy
 Milan, Italy
 Naples, Italy
 Zaragoza, Spain
 Palma de Mallorca, Spain
 Gothenburg, Sweden
 Bristol, United Kingdom
 Glasgow, United Kingdom
 Lancaster, United Kingdom



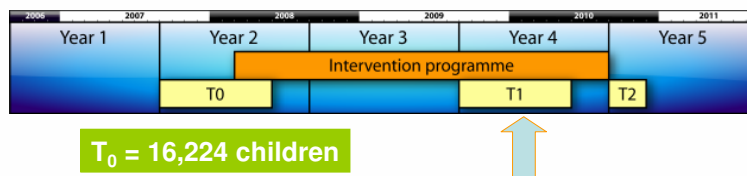
Study design & timeline



➤ Study design

- Longitudinal: comparison of baseline (T_0) with follow-up (T_{1-2})
- Controlled: intervention / control communities with similar socio-demographic profile (non-randomised)

➤ Timeline of surveys and intervention activities

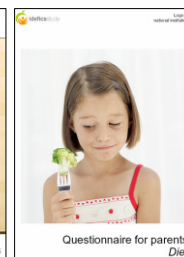


Core variables assessed in all children



▪ Parent questionnaire

- Dietary patterns (FFQ)
- Medical history
- Physical activity
- Social environment
- Consumer behaviour



▪ 24-hours dietary recall + school meals

- **SACINA**: computer-based 24-hours dietary recall

▪ Physical activity

- **Accelerometers** (over 3 days)



Core variables assessed in all children



- Physical examination
 - Blood pressure
 - Musculoskeletal disorders (calcaneal ultrasonometry)
 - Anthropometry
- (Pre-) school environment (in selected centres): GIS
 - Opportunities for physical activity
 - Food supplies
- Biological markers
 - Saliva / mouth swab
 - Urine
 - Blood



Additional variables assessed in subgroups



- Special examinations
 - Food tasting (food preference, taste sensitivity)
 - Aerobic fitness (using parts of the Eurofit test battery for children aged 6 to 10 years)
 - Age-specific motor tests (hand-grip strength, strength of back muscles, hip flexibility test, motor skills)
 - Food advertising effects (media literacy, internal & external triggers)



Survey...



...addresses first strategic objective:

to enhance the knowledge of the
health effects of a changing diet
& an **altered social environment & lifestyle** of children in Europe



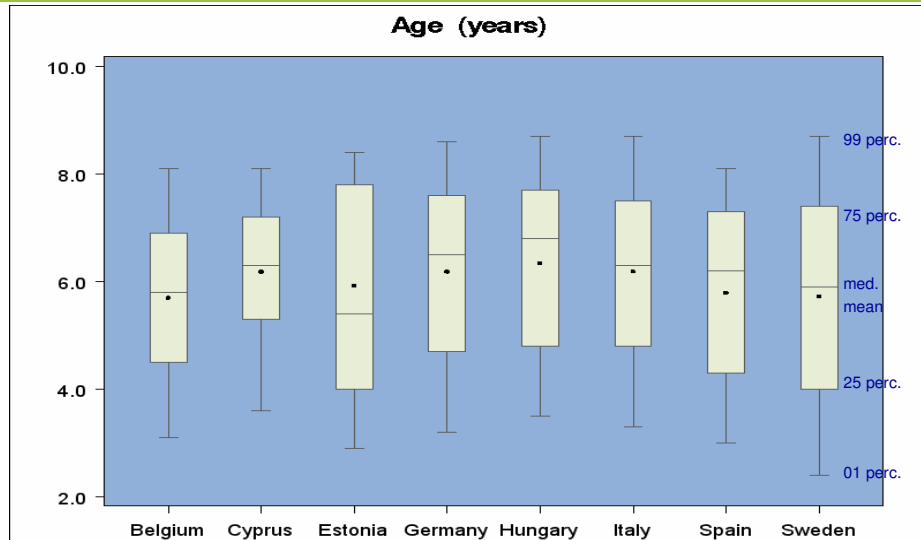
No. of specific measurements and biological samples



	Blood available (venous/ capillary blood)	Venous blood	Saliva	Urine	24h dietary recall (SACINA)	Accelerometer	Heel ultrasonography
%	80%	57%	86%	86%	67%	56%	47%

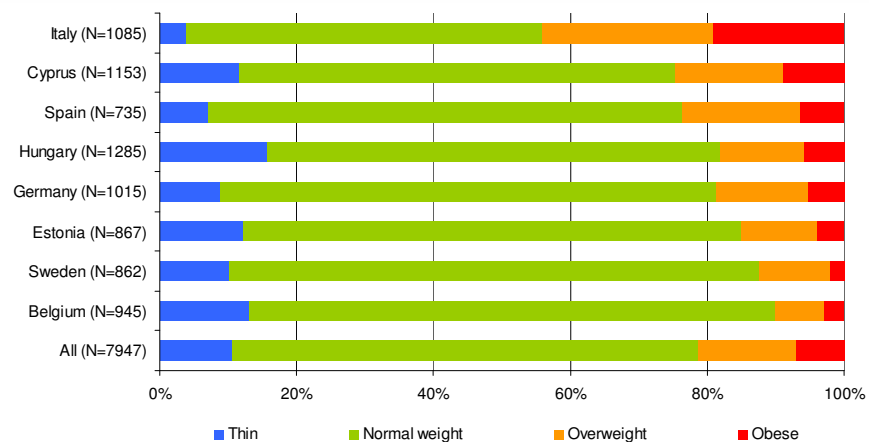


Preliminary results: Age



Distribution of BMI classes (Cole)

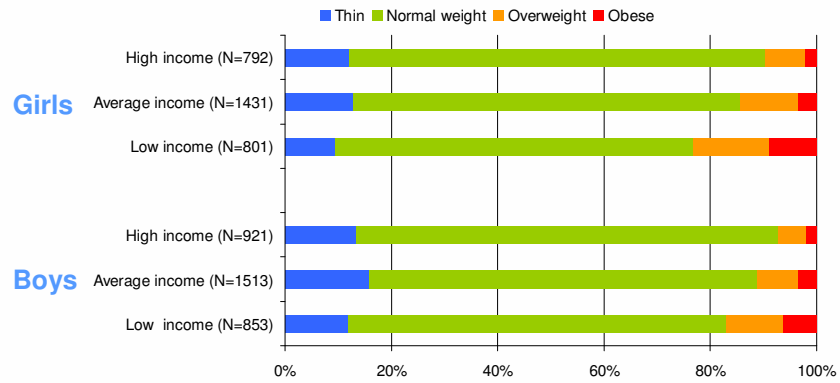
girls, all ages (<= 9 years)



BMI (Cole) by income level (Dataset 19th of August 2009)



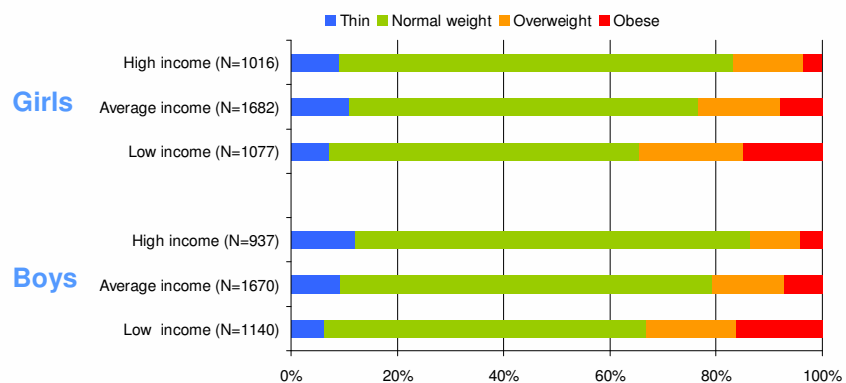
Younger children (2-<6 years)



BMI (Cole) by income level (Dataset 19th of August 2009)



Older children (6-<10 years)

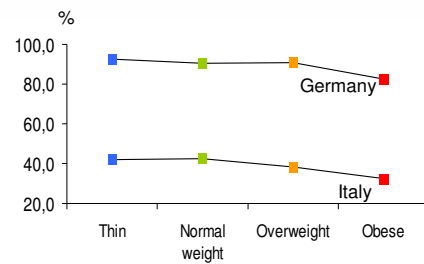


Sleep duration

(acc. to 24h dietary recall [SACINA])



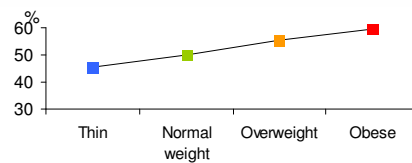
Percentage of 6-9-years-old children with **more than 10 hours sleep / night**



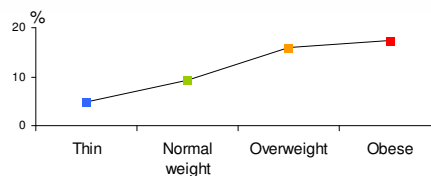
Screentime (audiovisual media) and family lifestyle



Percentage of 6–9-year-olds **watching TV/video/DVD usually for > 1 h/day**



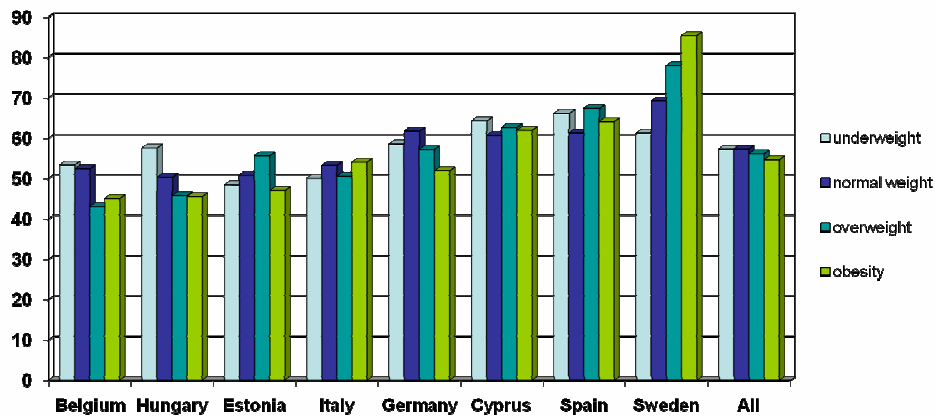
Percentage of parents reporting **“quite boring weekends”**



Preliminary results: Prevalence of fruit consumption



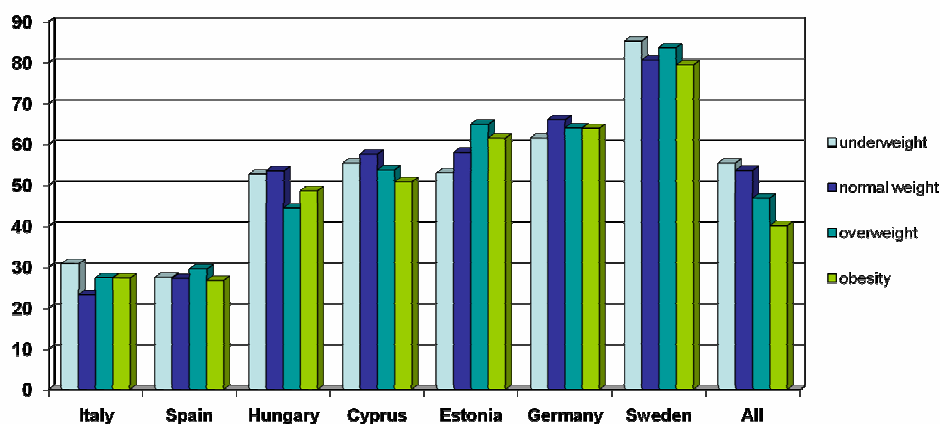
- % consuming fruits at least once a day
- boys and girls / all countries



Preliminary results: Prevalence of vegetable consumption



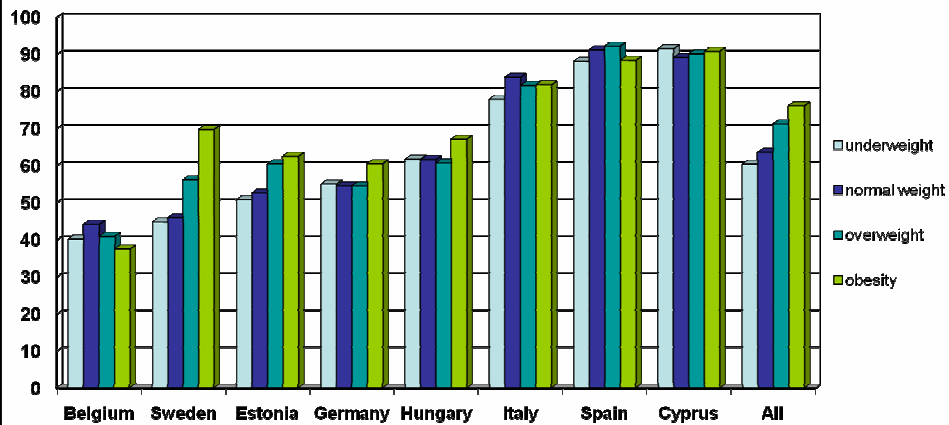
- % consuming raw vegetables at least 4 times per week
- boys and girls / all countries



Preliminary results: Prevalence of consumption of plain water



- % consuming water at least 3 times a day
- boys and girls / all countries

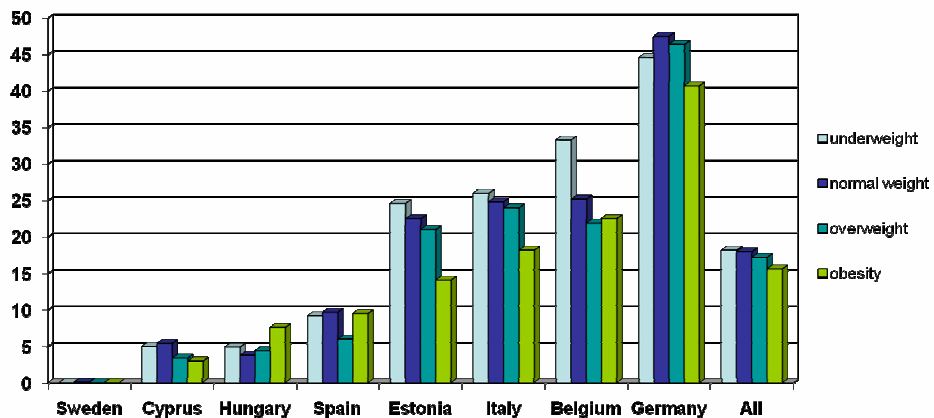


Sixth Framework Programme

Preliminary results: Prevalence of consumption of sweets



- % consuming non-chocolate candies at least 4 times a week
- boys and girls / all countries

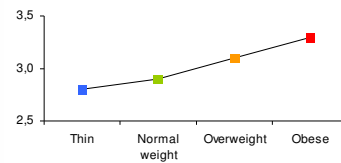


Sixth Framework Programme

Preliminary results: Cholesterol



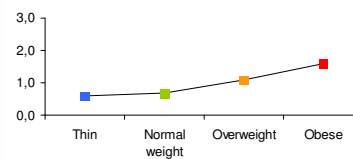
- Total/HDL cholesterol ratio in 6-9-year-old children:



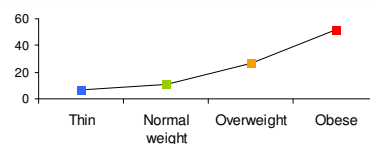
Preliminary results: HOMA index



- HOMA index by 2-9-year-old children:



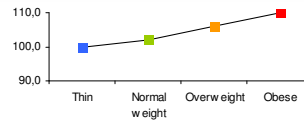
- Percentage of 2-9-year-old-children in which HOMA index exceeds 85%-perc.:



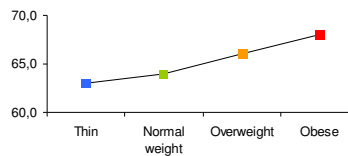
Preliminary results: Blood pressure



- **Systolic** blood pressure [mmHg] in 6-9-year-old children:



- **Diastolic** blood pressure [mmHg] in 6-9-year-old children:



Study outcomes

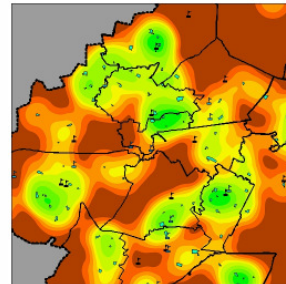


- **Prevalence estimates** on diet- & lifestyle-related diseases & their key risk factors - **comparable across Europe**
- **Risk factors & causal pathways** incl. biomarkers of exposure & effect as well as genetic factors
- Internal & external **triggers of food choices** in children
- **Effective** culturally sensitive **intervention strategies** - easy to implement on a large scale in Europe
- Nutritional, behavioural & ethical **guidelines** for scientists, policy makers, health insurances, stakeholders & channels



Erfassung urbaner Einflussfaktoren durch GeoInformationSysteme

Iris Pigeot, Christoph Buck



Elemente der urbanen Umgebung haben Einfluss auf das Bewegungs- und Ernährungsverhalten

- Verfügbarkeit von Spiel- und Sportplätzen in der näheren Umgebung erhöht körperliche Aktivität bei Kindern (Davison und Lawson 2006)
- Sichere Fuß- und Fahrradwege im Stadtgebiet ermöglichen einen „aktiven Schulweg“ (Davison et al. 2008)
- Räumliche Verfügbarkeit und Preise von Lebensmitteln stehen in Zusammenhang zu Konsumverhalten und BMI (Papas et al. 2007)

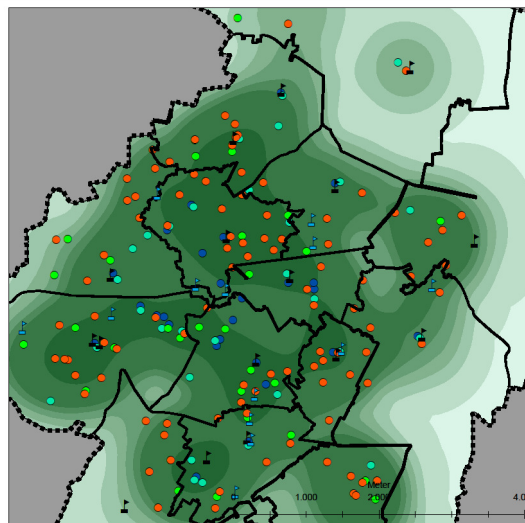


Objektive Erfassung urbaner Elemente für:

- **Bewegung**
 - Infrastruktur (Fuß- und Fahrradwege, Kreuzungen, ÖPNV)
 - Ziele (Spiel- und Sportplätze, Grünflächen)
 - Stadtentwicklung (Einwohnerzahl, Landnutzung)
- **Ernährung**
 - Fast-Food und Convenience-Food (Restaurant, Imbiss)
 - Verbrauchermärkte, Lebensmittelgeschäfte
 - Bäckereien, Kioske, etc.



Intensität von Zielen in DEL Bewegung



Statistische Modellierung von Ernährungsdaten

Iris Pigeot , Claudia Börnhorst



Erhebung

Probleme bei der Erhebung von Ernährungsdaten

- Erinnerungsfehler
- ungenaue Schätzung von Portionsgrößen und Verzehrhäufigkeiten
- Unterschätzung der Energiezufuhr (häufig bewusstes „Underreporting“ in bestimmten Gruppen, z.B. bei Übergewichtigen)
- saisonale und kulturelle Einflüsse auf die Ernährung
- Zeit- und Kostenrestriktionen in Bezug auf die Erhebung
- ...



Schätzung des gewöhnlichen Verzehrs auf Populationsebene



- Datenbasis: 24-Hour Dietary Recalls (24-HDR)
- Wiederholte Erhebung des Lebensmittelverzehr des jeweiligen Vortages in computer-gestützten Interviews



Problem: Verzehrdaten einer limitierten Anzahl an Erhebungstagen pro Individuum nicht repräsentativ für gewöhnlichen Verzehr

→ statistische Modellierung erforderlich, um die Daten in Hinblick auf eine Überschätzung der intra-individuellen Varianz zu korrigieren.



Statistische Schätzmodelle: Gemeinsamer Rahmen



- **Schritt 0:** Adjustierung (Entfernung von Störeffekten wie Interviewabfolge, Wochentag, Jahreszeit, etc.)
- **Schritt 1:** Transformation der Kurzzeitmessungen, um (approximative) Normalverteilung zu erhalten
- **Schritt 2:** Schätzung des gewöhnlichen Verzehrs für jedes der N Individuen auf der transformierten Ebene (Ansatz: Varianzzerlegung in intra- und inter-individuelle Varianz)
- **Schritt 3:** Rücktransformation

Geschätzter gewöhnlicher Verzehr auf Populationsebene:

→ empirische Verteilung der rücktransformierten, korrigierten Werte



- Etablierte Methoden zur Schätzung des gewöhnlichen Verzehrs sind die Slob-, Nusser-, S-Nusser-, Buck-, Wallace-Methode (basieren vorrangig auf Varianzkorrektur)
 - Aktuell werden u.a. die National Cancer Institute (NCI) und Multiple Source Method (MSM) diskutiert (anwendbar bei episodisch konsumierten Lebensmitteln, Hinzunahme von Kovariateninformation)
- ➔ Bisher keine Methode für Kinder entwickelt (höhere intra-individuelle Varianz, andere Fehlerquellen durch Proxy-Reporting)



Varianzkorrektur am Beispiel der S-Nusser Methode

Schätzung des gewöhnlichen Verzehrs $\hat{Z}_i$ auf transformierter Ebene

$$\hat{Z}_i = \frac{\hat{\sigma}_{usual}}{\hat{\sigma}_{\bar{X}}} (\bar{X}_{i.} - \bar{X}_{..}) + \bar{X}_{..}$$

$\bar{X}_{i.}$ = Mittelwert des i -ten Individuums

$\bar{X}_{..}$ = Gesamtmittel

$\hat{\sigma}_{\bar{X}}$ = beobachtete Varianz des mittleren Verzehrs der Individuen

$$\hat{\sigma}_{usual} = \hat{\sigma}_{\bar{X}}^2 - \frac{1}{k} \hat{\sigma}_{\varepsilon}^2 = \text{Varianz des gewöhnlichen Verzehrs}$$

k = Anzahl der Recall - Tage

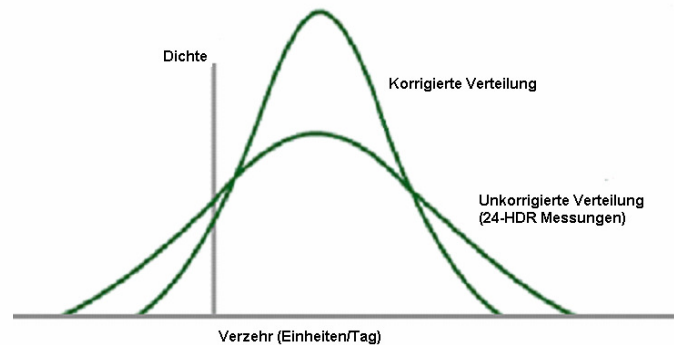
$\hat{\sigma}_{\varepsilon}^2$ = geschätzte durchschnittliche intra - individuelle Varianz



Statistische Schätzmodelle: Gemeinsamer Rahmen



Geschätzte Verteilung des gewöhnlichen Verzehrs ist durch geringere Standardabweichung und folglich engere Perzentilabstände charakterisiert



Neuere Ansätze



Herausforderungen bei nicht täglich (episodisch) konsumierten Lebensmitteln:

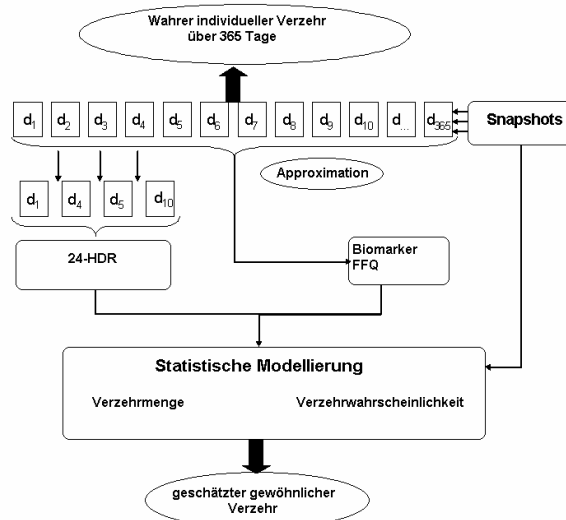
- 24-HDR Messungen ohne Verzehr bedeuten nicht, dass das Lebensmittel gewöhnlich nicht verzehrt wird
- Schiefe oder mehrgipfelige Verteilungen
- Korrelation zwischen Verzehrmenge und Verzehrwahrscheinlichkeit
- Berücksichtigung von Kovariateninformation
- Korrektur für Underreporting

Ansätze:

- Hinzunahme von Biomarkern, Food Frequency Questionnaire (FFQ) Informationen
- Mehrstufige Modelle: separate Schätzung von Verzehrwahrscheinlichkeit/-menge



Schematische Darstellung neuerer Ansätze



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The IDEFICS thanks for y

Symposium IDEFICS

First announcement!!!



Learning healthy living



University of Zaragoza



Gesundes Leben lernen



Child health in Europe

The IDEFICS Study: search for a better understanding of obesity

Main Topics:

- Obesity and cardiometabolic risk factors
- Nutrition behavior and food preferences
- Biological mechanisms
- Physical activity and physical fitness
- Social and environmental factors



Zaragoza, Spain
8th - 9th November, 2010

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Deadline for abstract submission:
31st July 2010



www.idefics.eu

www.bips.uni-bremen.de