

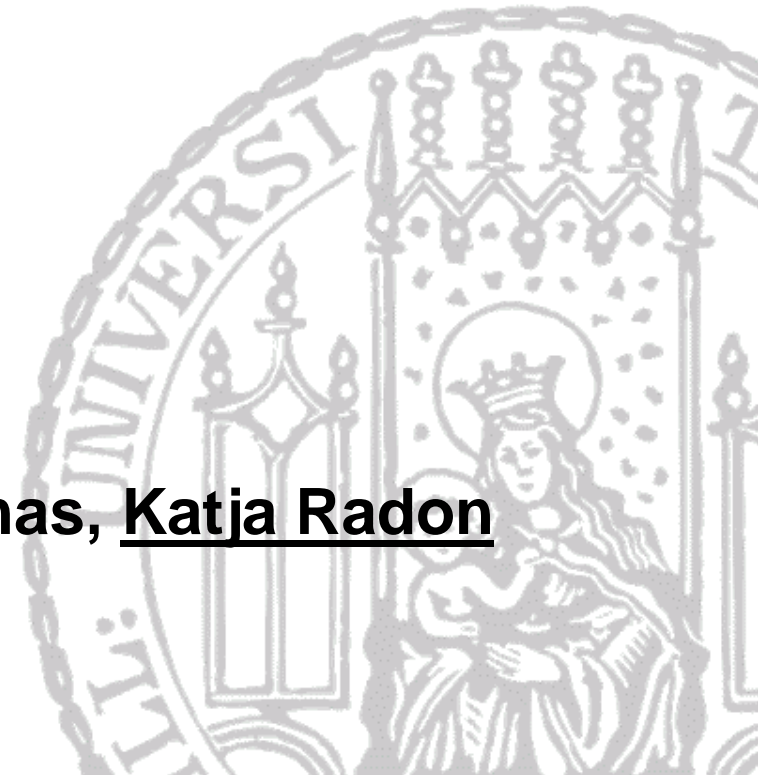


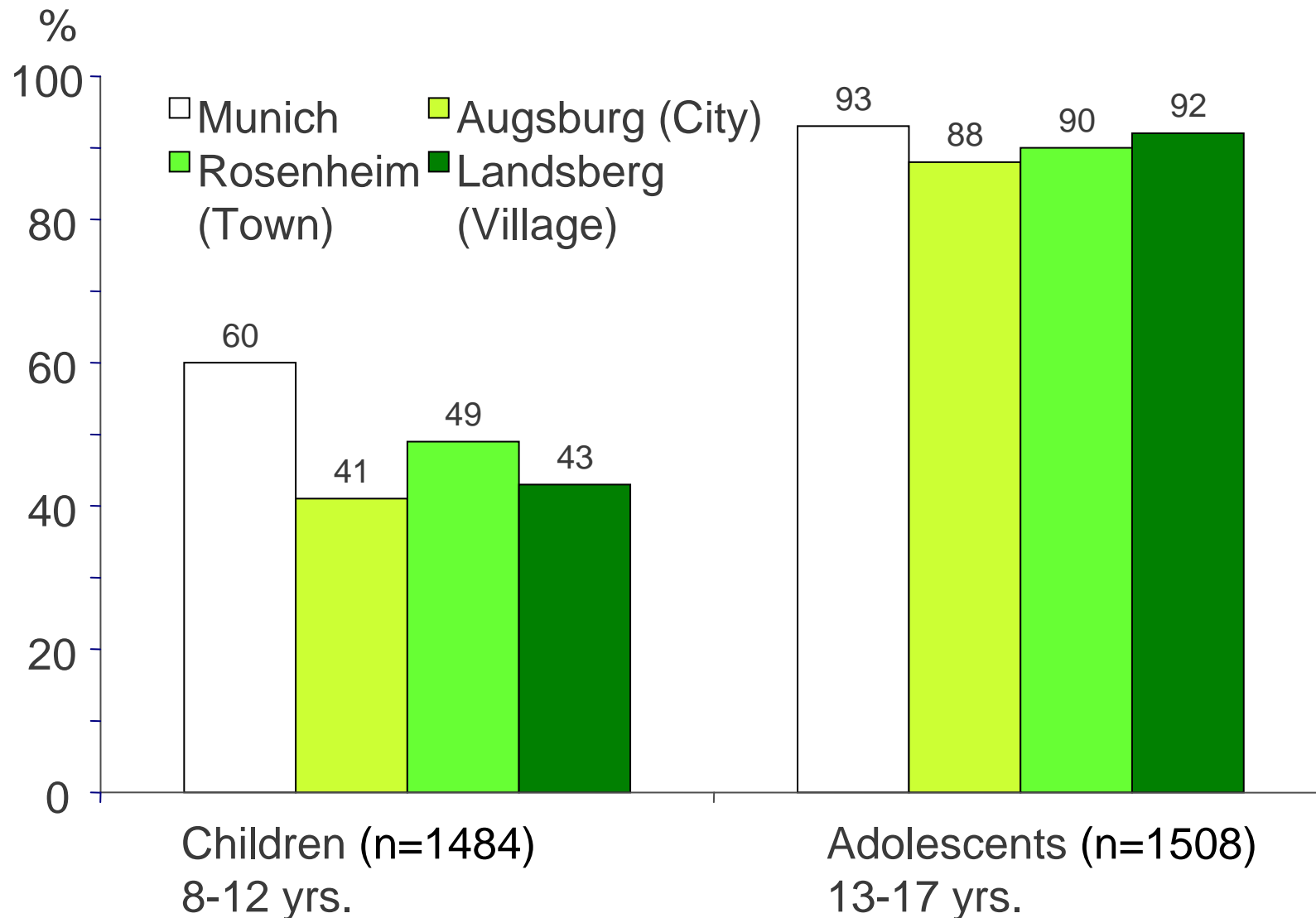
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Ongoing RF research studies and latest findings where available: **Children and adolescents**

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DECT Ownership: 85%



- Potentially greater susceptibility of the developing nervous system
- Childrens' brain tissue more conductive compared to adults'
- RF penetration greater relative to their head size
- Absorption of the relevant RF-EMF energy in the tissues might be higher
- **Higher cumulative lifetime exposure than previous generations**



Studies on RF exposure and well-being

- Australia: Cross-sectional + prospective MoRPhEUStudy
- Denmark: (Birth cohort) study, retrospective exposure assessment
- Germany: Cross-sectional MOBILEE study
- Sweden: Cross-sectional study by Söderqvist et al.
- Finland: Cross-sectional study by Koivusilta et al.
- Germany: Cross-sectional „Quebeeb“ Study

Studies on RF exposure and brain tumours

- Denmark, Norway, Sweden and Switzerland : CEFALO
- Europe, Israel, Australia, Canada: MOBIKIDS
- Studies in Japan and Great Britain



Objectives

- Association between mobile phone exposure and cognitive functions, blood pressure and hearing loss

Methods

- Prospective cohort study (3 yrs.) of Australian teenagers (aged 12-13 yrs.)
- n=317 (response 66%)
- Results available for baseline study (2005/06):
 - Exposure: Self-reported use of cordless and mobile phones (Interphone-Questionnaire)
 - Outcome: Cognitive functions (Different tests)



Results

- Number of voice calls/SMS per week associated with
 - shorter response times on learning tasks but
 - less accurate working memory
- This association was not restricted to a particular task or cognitive ability
 - may be related to an impulsive response style of frequent mobile phone users



Objective

- To test the association between pre- and postnatal exposure to cell phones and behavioural problems at age 7 yrs

Methods

- Based on Danish National Birth Cohort (n=13,159)
- Questionnaire follow-up in 2005/2006
- Exposure:
 - Self-reported cell phone use during pregnancy (mother) assessed at age 7 yrs. of the child
 - Current phone use of the child
- Outcome:
 - Strength and Difficulties Questionnaire (SDQ)



Results

- Outcome: Total behavioural problems

| OR (95% CI) | Postnatal Exposure (ever vs. never) | |
|---------------------------------------|--|------------------|
| | No | Yes |
| Prenatal exposure (ever vs. never) | | |
| No | 1.0 | 1.18 (0.96-1.45) |
| Yes | 1.58 (1.29-1.93) | 1.80 (1.45-2.23) |

Adjusted for sex of child, age of mother, smoking during pregnancy, mother's psychiatric problems, and SES.

Statistically significant associations with pre- and postnatal exposure were also seen for each of the specific behavioural outcomes (emotional problems, hyperactivity, conduct problems, and peer problems)



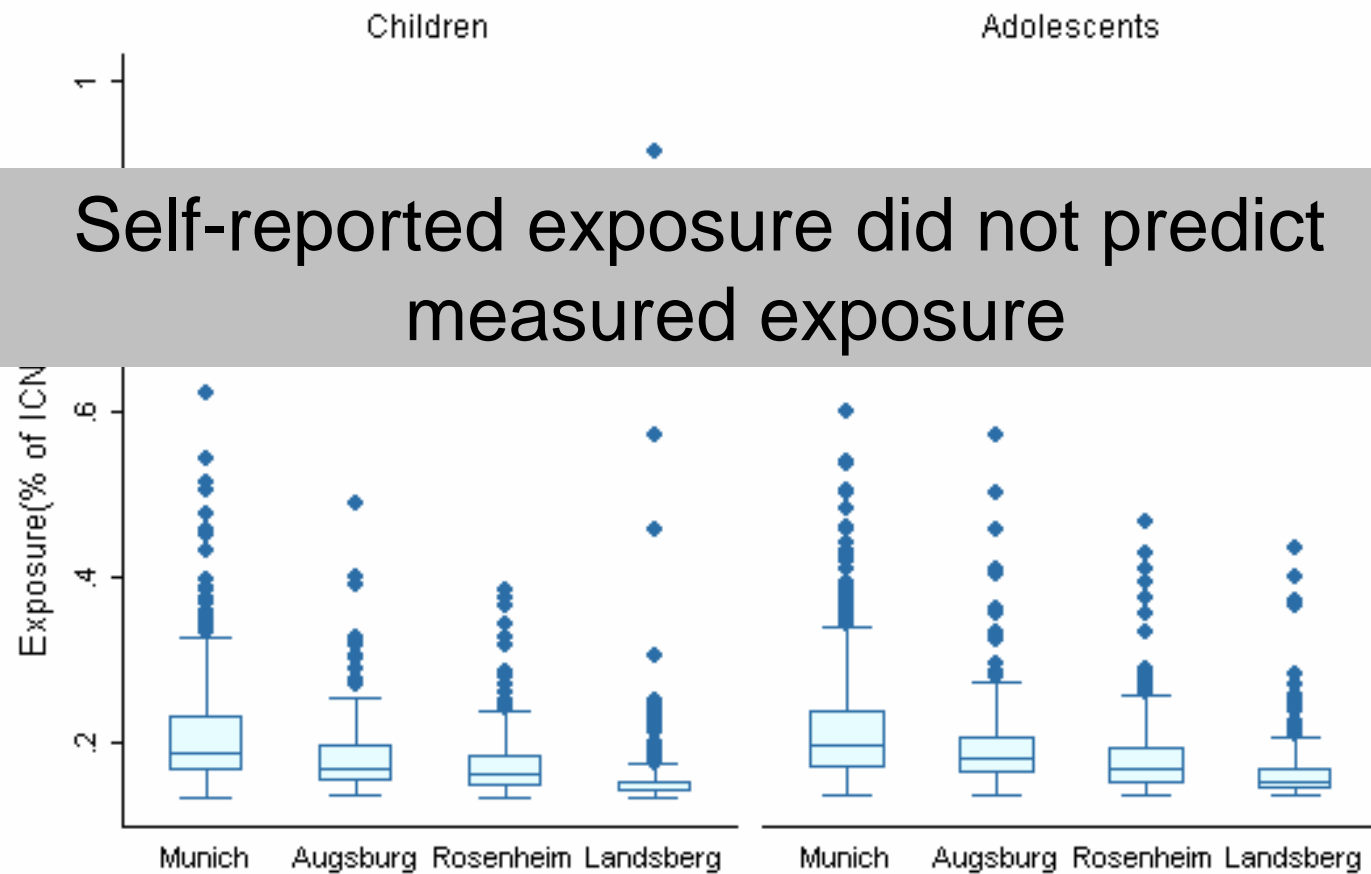
Objectives

- To assess the typical exposure of Bavarian children and adolescents to RF-EMF (cell phone use + base stations)
- To study a possible association between RF-EMF and well-being in children and adolescents

Methods

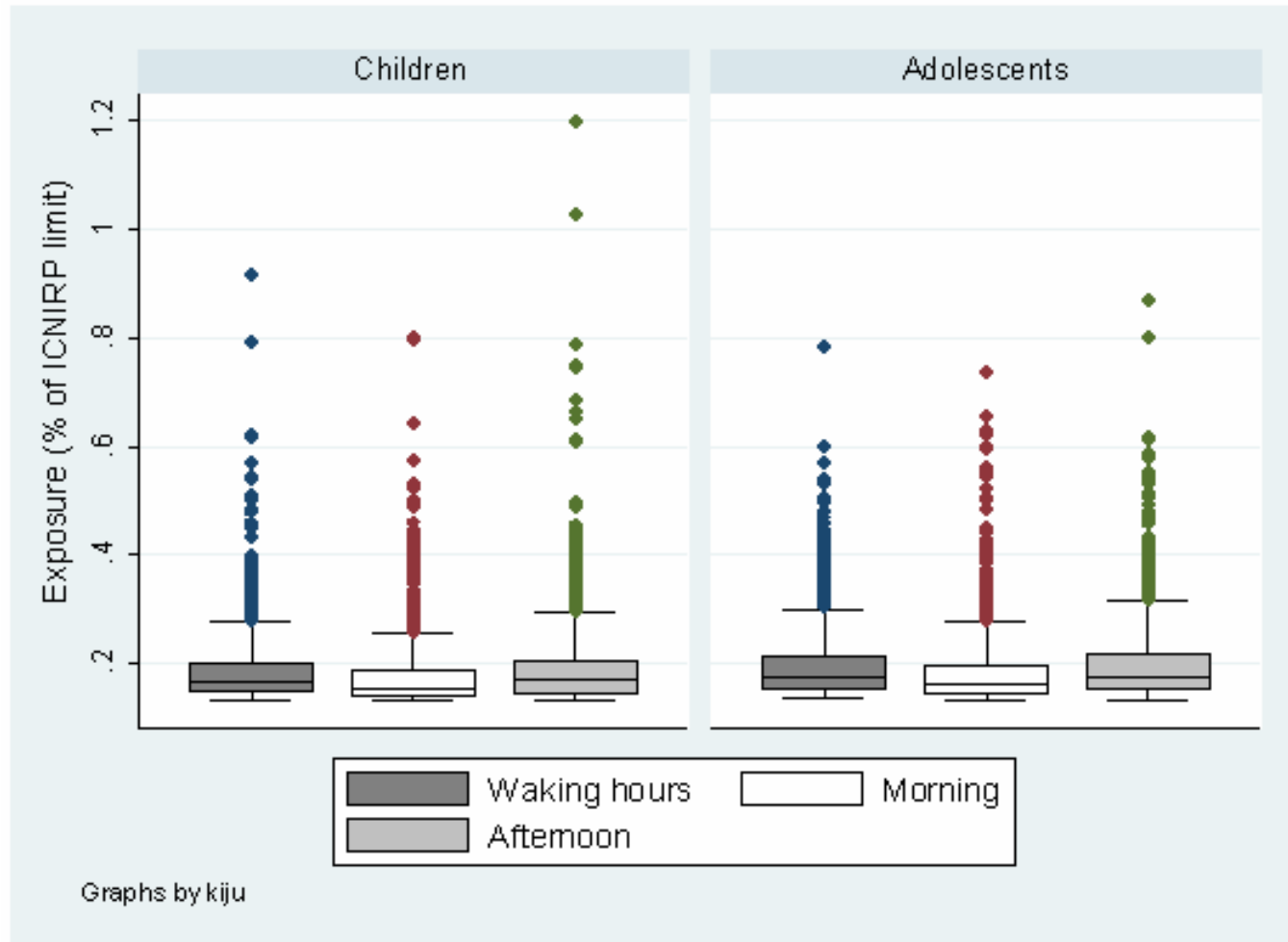
- Population-based cross-sectional study between 2006-2008
- 1477 children (8-12 years) and 1508 adolescents (13-17 years) of 4 Bavarian towns (response 51%)
- Exposure:
 - Personal exposure assessment over 24 hours using exposimeters
- Outcome:
 - Self-reported acute and chronic symptoms

Results: Exposure by population size





Results: Exposure levels by daytime





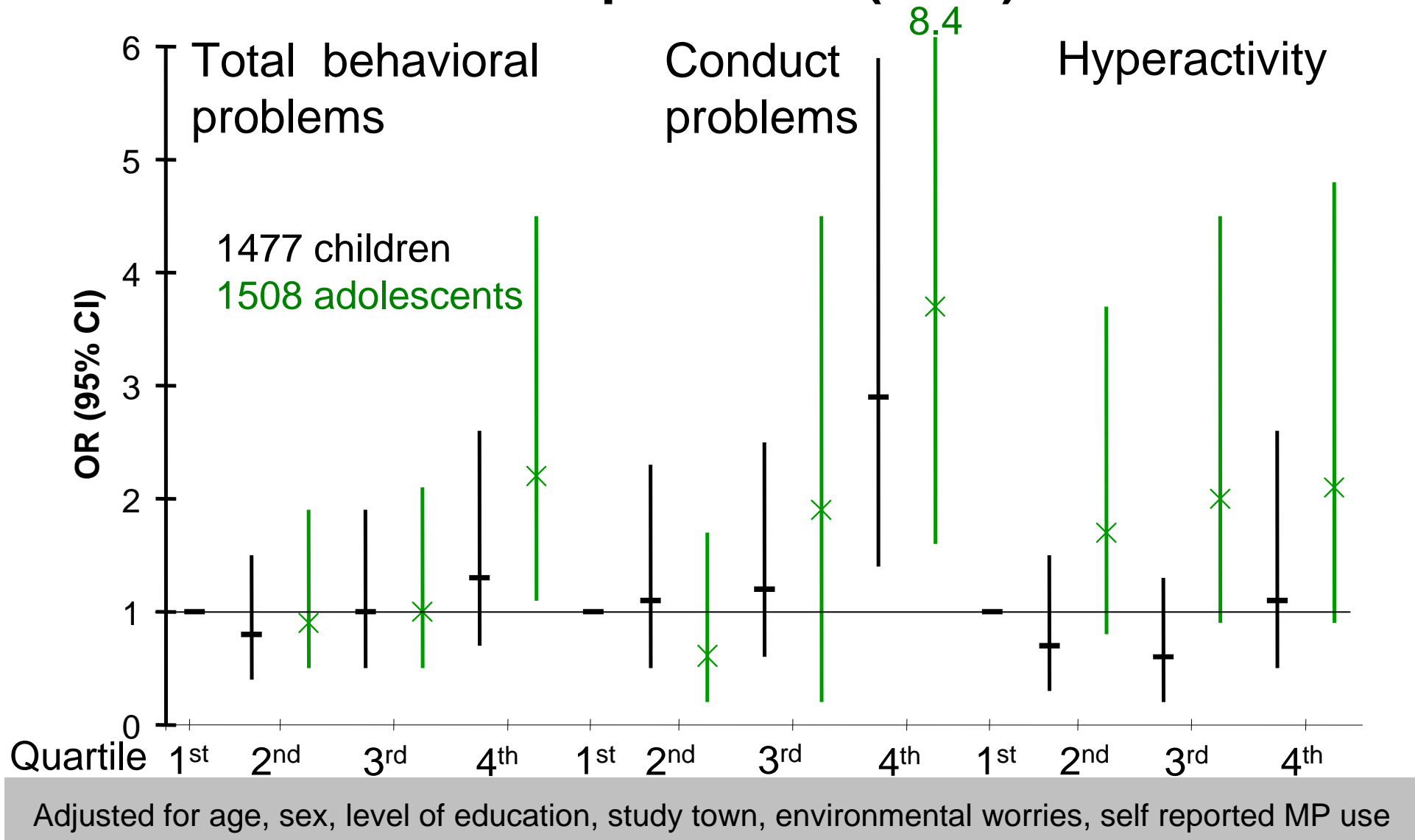
Results: Acute symptoms, 4th vs. 1st exposure quartile

| Symptoms | Noon | | Evening | |
|------------------------|---------------|----------------------|----------------------|----------------------|
| | Children | Adolescents | Children | Adolescents |
| Headache | 1.1 (0.7-1.6) | 1.5 (1.0-2.2) | 0.8 (0.5-1.3) | 1.4 (0.9-2.1) |
| Irritation | 1.0 (0.6-1.6) | 1.5 (1.0-2.1) | 1.4 (0.9-2.2) | 1.8 (1.2-2.6) |
| Nervousness | 0.8 (0.4-1.3) | 1.4 (0.8-2.3) | 1.6 (1.0-2.6) | 1.4 (0.9-2.0) |
| Dizziness | 1.1 (0.6-2.0) | 1.3 (0.9-2.1) | 1.1 (0.6-1.9) | 1.5 (1.0-2.5) |
| Fatigue | 1.4 (1.0-1.9) | 1.4 (1.0-1.9) | 1.0 (0.7-1.4) | 0.9 (0.6-1.3) |
| Concentration problems | 0.9 (0.6-1.3) | 1.0 (0.7-1.4) | 1.6 (1.0-2.4) | 1.1 (0.8-1.5) |

Adjusted for age, sex, level of education, study place, environmental worries



Results: Behavioral problems (SDQ)





Objectives

- To assess the use of wireless phones
- To investigate a possible association between use of wireless phones and self-reported health

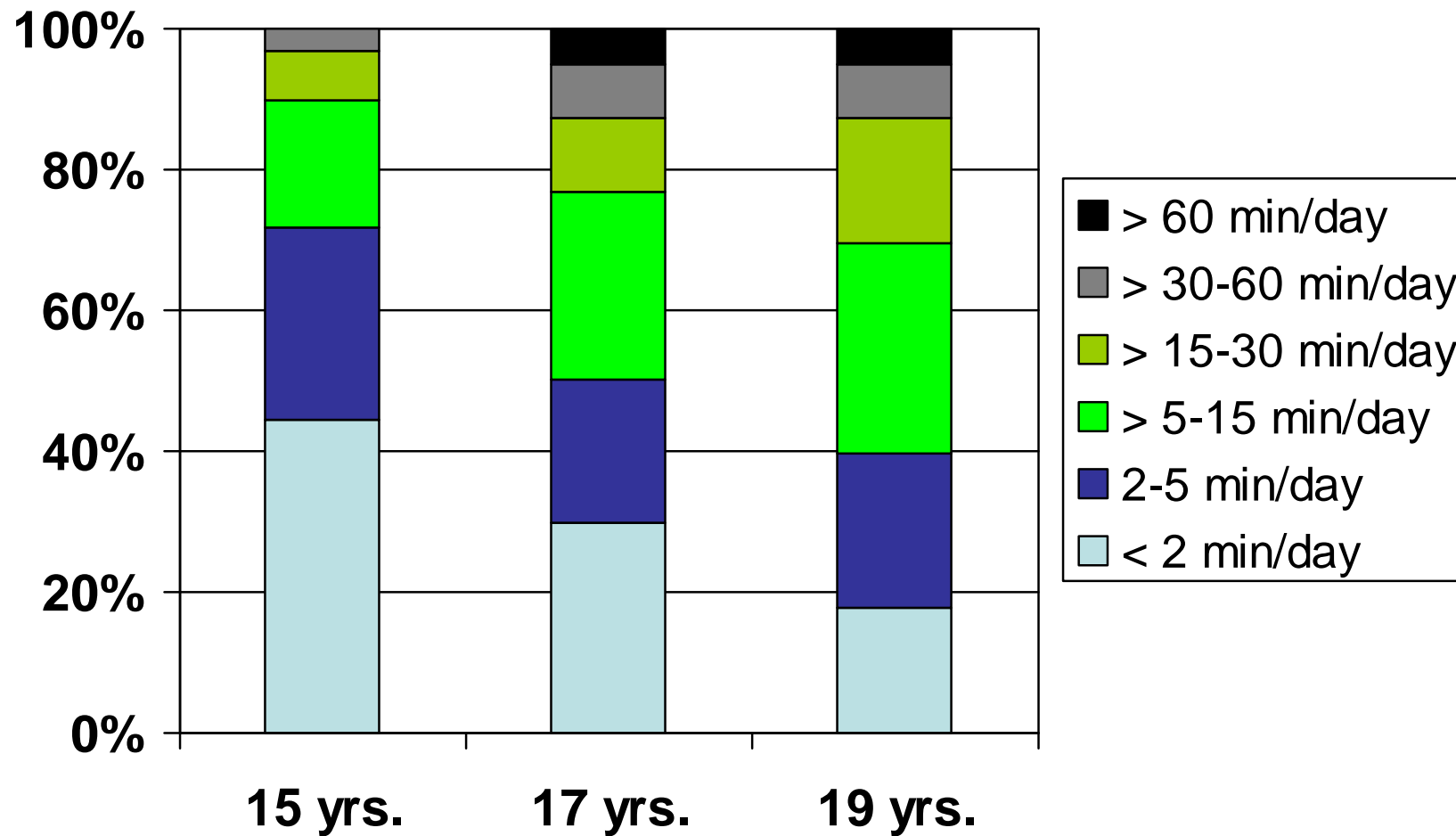
Methods

- Population-based cross-sectional study
- Postal questionnaire in 2005/06
- 1269 of 2000 Swedish adolescents responded (15-19 years; 63.5%)
- Exposure: Self-reported wireless phone use
- Outcome: Self-reported health symptoms



Results

- Nearly 100% of participants had access to a mobile phone





- Regular users (>15 min/day) of cellular phones had (out of 23 symptoms) a statistically significantly increased OR for
 - allergic symptoms, asthma, hay fever,
 - dizziness,
 - headache,
 - concentration difficulties,
 - stress,
 - tiredness.
- Regular users (>15 min/day) of DECT phones had (out of 23 symptoms) a statistically significantly increased OR for
 - hay fever,
 - headache,
 - concentration difficulties,
 - stress.



Objectives

- Gender and age differences in usage of information and communication technology (ICT)
- Investigation of a possible association between ICT and perceived health

Methods

- Population-based mail survey in 2001
- 7292 Finnish adolescents (12-18 years; 70% response)
- Exposure: Self-reported wireless phone use
- Outcome: Self-reported health, daily health complaints, depression, daytime tiredness



Results

- Intensive use of any ICT use was associated with some health problems (e.g. depression, tiredness)
- Strongest association with mobile phone use
- High SES and success at school was independently associated with better perceived health



Objectives

- Phase 1: To estimate the prevalence of concerns about potential health effects of exposure to mobile phone base stations in the general German population
- Phase 2: To assess the possible association between exposure to mobile phone base stations and health disturbances

Methods

Phase I:

- Population based, cross-sectional study in 2004
- 30.047 participants (response 59%) between 14-69 years
- Mailed questionnaire on exposure and health

Phase II:

- 3526 participants (response 85%):
Detailed mailed questionnaire on exposure and health in 2006
- 1808 participants (response 51%):
Bedroom exposure measured by exposimeter



Results for 2665 adolescents (14-19 yrs):

- 16% were concerned about adverse health effects of mobile phone base stations
- 8% attributed adverse health effects to exposure from mobile phone base stations

Overall results:

- Participants attributing adverse health effects to mobile phone base stations reported more sleep disturbances and general health complaints
- No association between measured bedroom exposure and health



| | MOBIKIDS | CEFALO |
|---------------------|---|---|
| Duration | 2009 - 2013 | 2004 - 2008 |
| Centres | 16 | 4 (DK, N, S, CH) |
| Age group | 10-24 years | 7-19 years |
| Number of cases | 2000 | 550 |
| Number of controls | 4000 | 1100 |
| Recruitment | Hospital-based cases and controls (appendicitis, hernia) | Registry data + wards, population-based controls |
| Exposure assessment | <ul style="list-style-type: none">• CAPI• Operator data• Measurements• Exposure models | <ul style="list-style-type: none">• CAPI• Operator data• Information stored on current cell phone |



Cohort study on mobile phone use and brain tumour among children in Japan

- Participants: 4th to 6th graders
- Method: Internet survey (e-mail requests sent every four months), guardians reply
- Challenge: Increase number of participants (1433 guardians, 1605 children; January 2009)



Exposure to mobile phone base stations during pregnancy and cancer during the first 4 years of life (UK)

- Design: Register-based case-control study in the UK 1998-2000
- Exposure: Proximity of place of living during pregnancy to mobile phone base stations, exposure models



- **Exposure**
 - Ownership of cell phones high especially among teenagers
 - Daily use still limited
 - Exposure levels well below ICNIRP limits
- **Outcome: Well-being**
 - Inconsistent results
 - Associations mainly confined to studies where exposure and outcome are self-reported
- **Outcome: Behavioural problems**
 - Association seen in three cross-sectional studies
 - What is cause, what effect?
 - Cohort studies ongoing, more are needed
- **Outcome: (Brain) tumours**
 - Studies are ongoing