Welcome to Equal-Life Training

Early Environmental Quality and Life-course Mental Health Effects.

(Effects of environmental quality on mental well-being in childhood and during an individual's lifetime)

Part of the EU-Human Exposome network

www.equal-life.eu

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European Human Exposome *NETWORK*

This project has received funding from the European Union's Horizon 2020 research and innovation program under grant agreement No 874724

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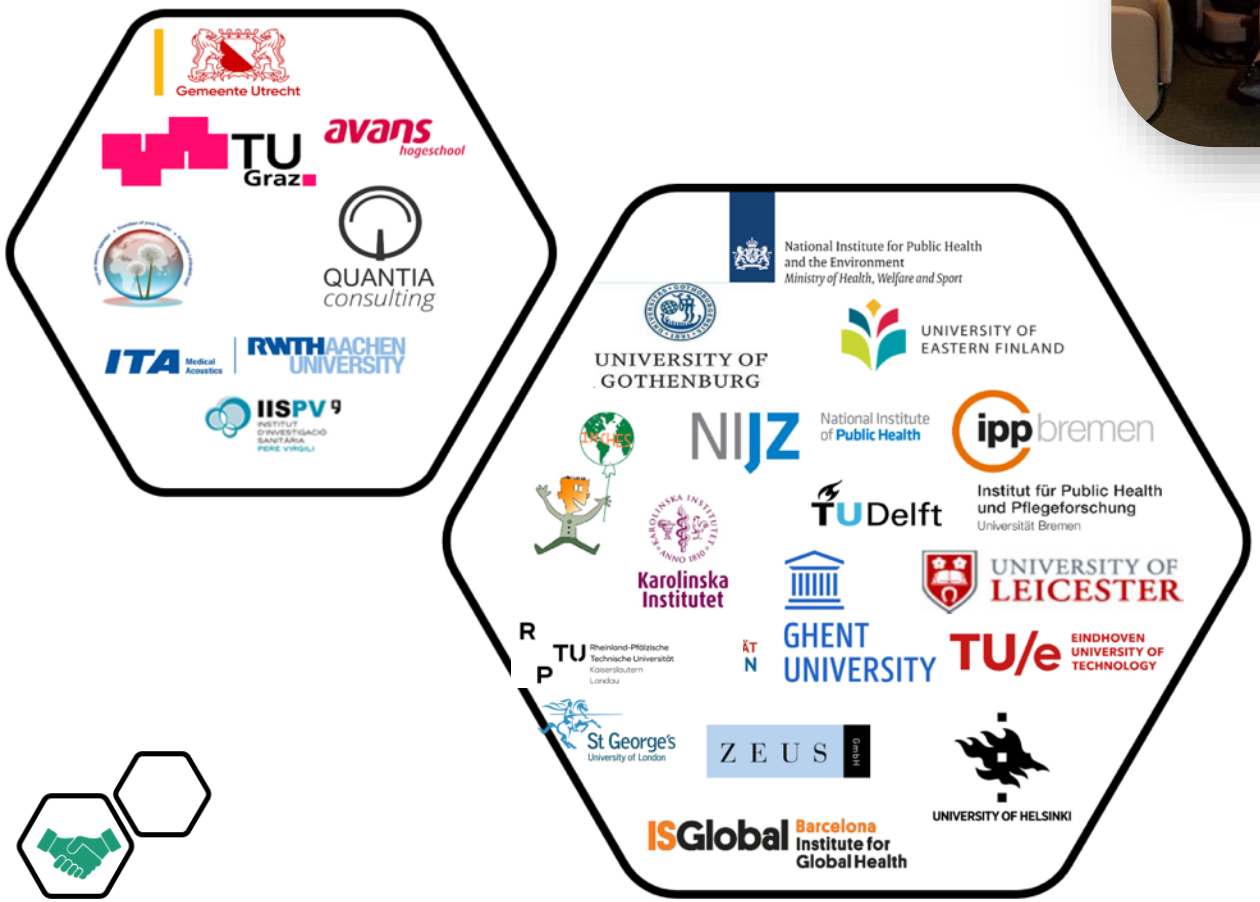
The Consortium

More than 100 experts and researchers from 22 institutions



Why should we study mental health in children?

Studying the exposome concept for a healthier future for all children

https://www.equal-life.eu/en/news/studying-exposome-concept-for-healthier-future-for-all-children

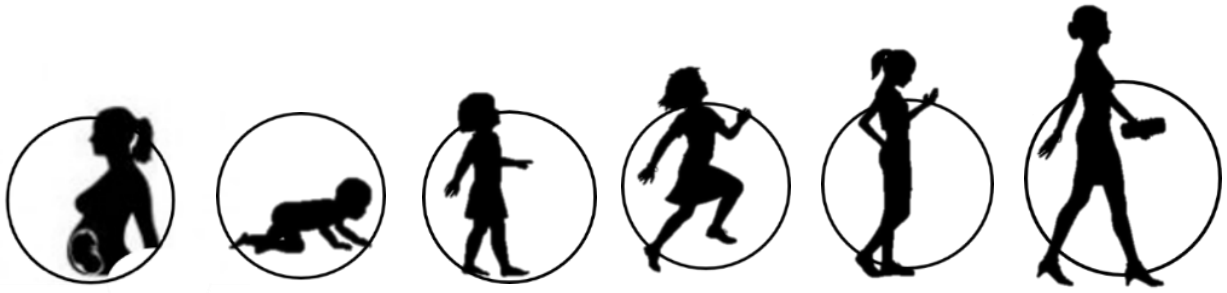
- Mental ill health is one of the **fastest growing public health issues** in Europe.
- At school age, one in ten children has a mental health problem that warrants support and treatment.
- Children's mental ill health predicts to a large extent **mental ill health in later life** with impacts on quality of life and work situation.
- A novel approach is used which looks at exposure data at **a high spatial and temporal resolution combining physical and social aspects** to understand influences on mental health and cognitive development at different ages and developmental stages.

The goal is to propose the best supportive environments for children of different age.

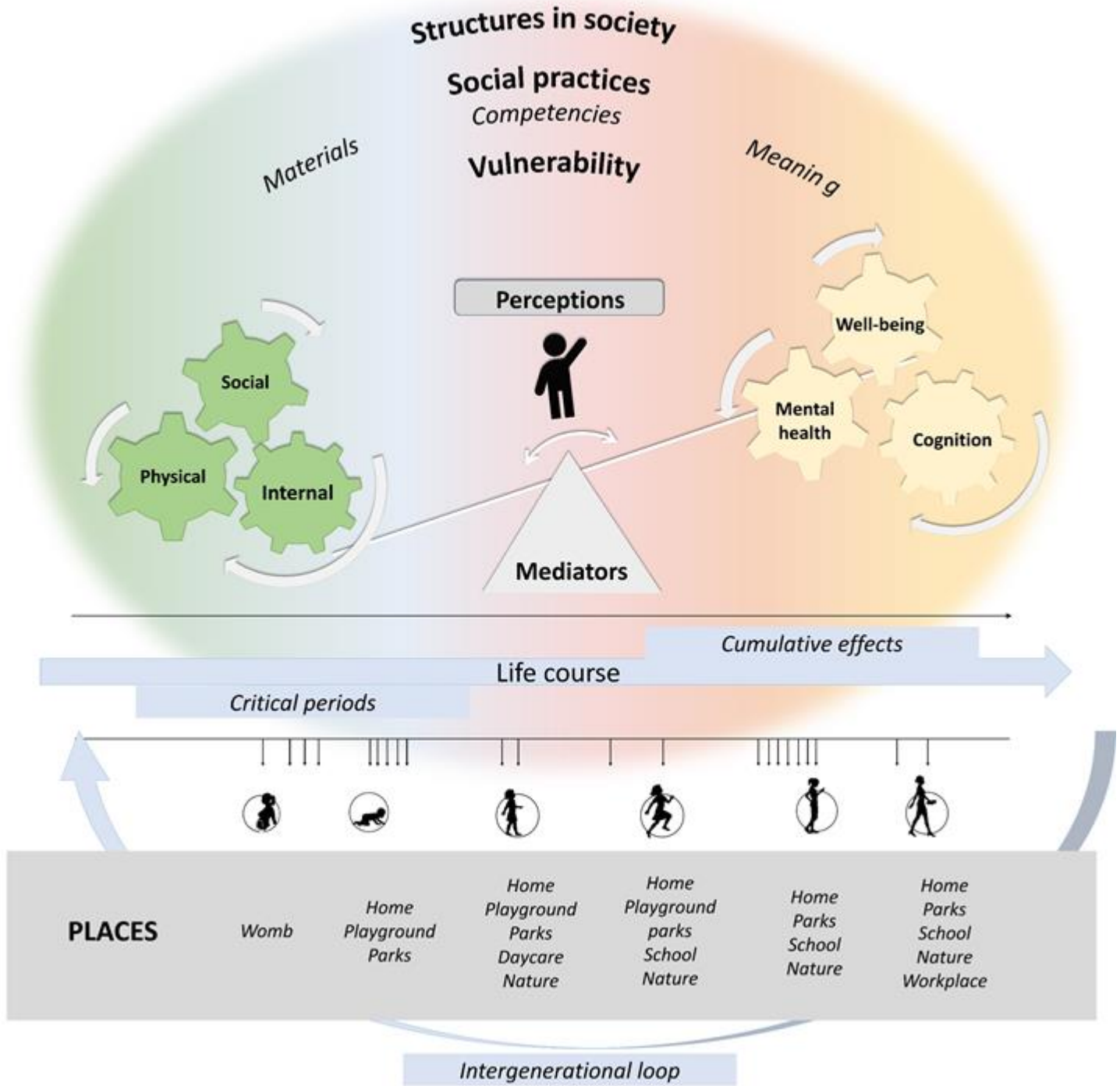
Goal of Equal-Life

Early Environmental Quality and Life-Course Mental Health Effects.

The main goal of the project is to **study the impact of multiple risk *factors-exposures* (in early childhood) on children's mental health and cognitive development.**

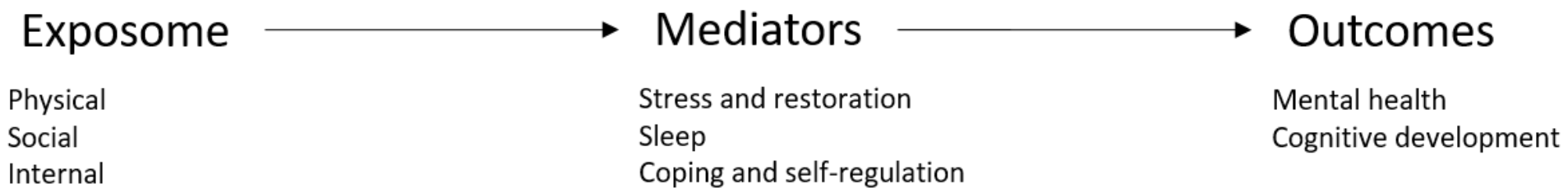


Van Kamp et al. (2022)


Structures in society
Social practices
Competencies
Vulnerability
Materials
Meaning
Perceptions
Social
Physical
Internal
Well-being
Mental health
Cognition
Mediators
Cumulative effects
Life course
Critical periods
PLACES
Womb
Home Playground Parks
Home Playground Parks Daycare Nature
Home Playground parks School Nature
Home Parks School Nature
Home Parks School Nature Workplace
Intergenerational loop

The key concepts

- **Exposome**: Factors to which the population is exposed
- **Mediators**: Variables that can affect the mechanism between a risk factor and outcome
- **Outcomes**: Mental health and cognitive development



Results from cohort data analyses

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Where does our data come from?

Cohorts and studies in schools

Enriched with in-depth studies and several new data sources

- 11 cohorts
- 250,000 children

FAIR
Stockholm | Gothenburg | Malmö
200,000 children | prenatal - 12yo

STARS
Gothenburg | Västra | Götaland
2,283 children | 13yo

FinnTwin12
Finland
5,600 children | 11 - 24yo

ALSPAC
Bristol, Old County
14,541 children | prenatal - 11yo

ABCD
Netherlands (regional)
8,266 children | prenatal - 14yo

PIAMA
Netherlands
4,000 children | prenatal - 20yo

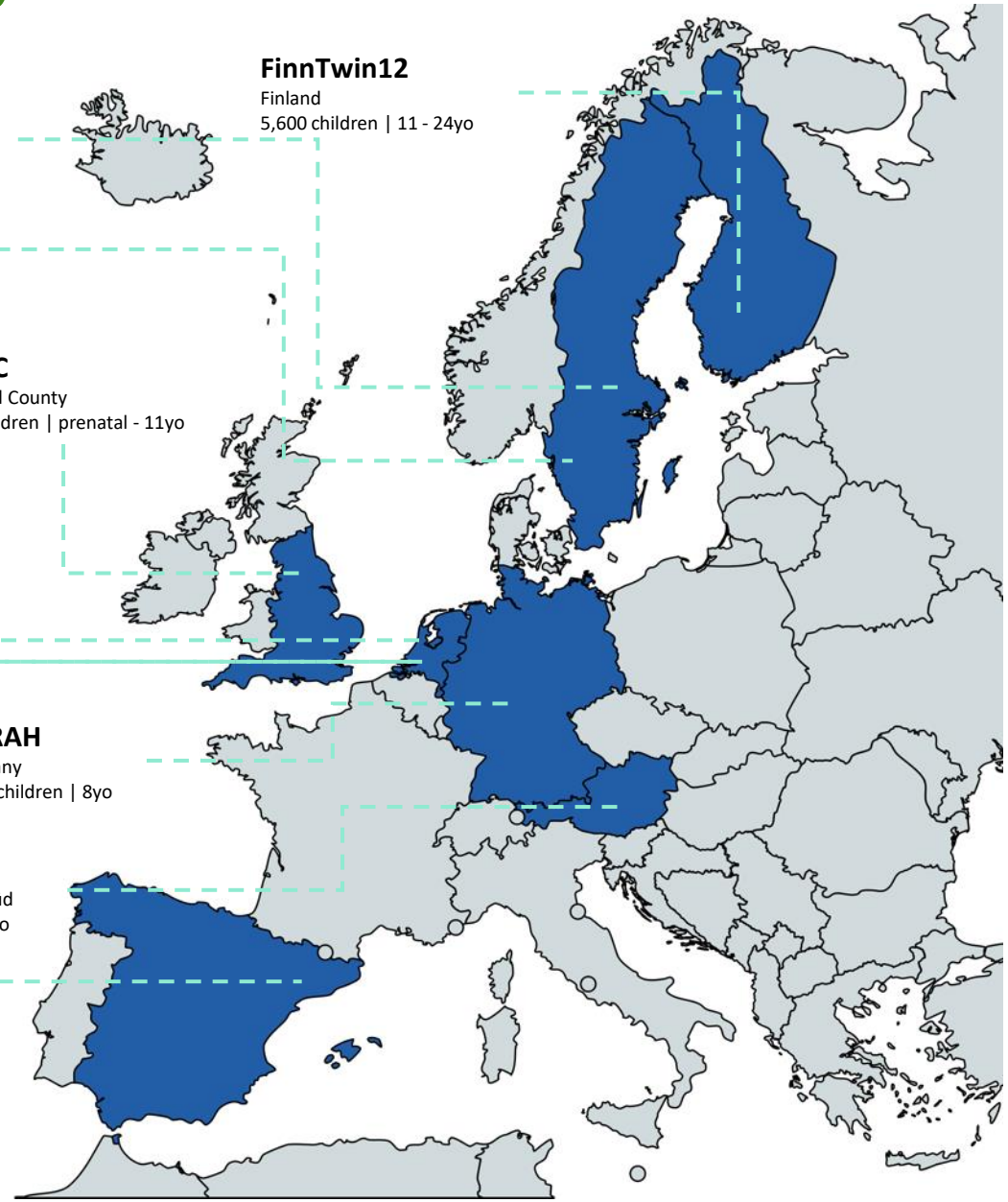
RANCH
Amsterdam | Schiphol
737 children | 9 - 10yo

NORAH
Germany
1,243 children | 8yo

ALPINE
Inntal | Wipptal Nord | Wpptal Süd
1,251 children | (prenatal) 8 - 11yo

BREATHE
Barcelona | St. Cugat
2.878 children | 7 - 11yo

WALNUTS
Barcelona
700 children | 11 - 14yo



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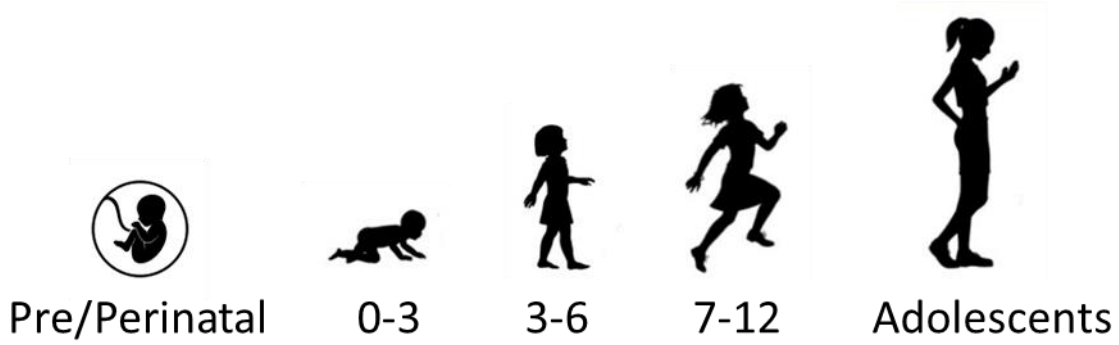
Research questions

The research question are for example WHICH? and HOW?

Which exposures in residential, pre-school and school settings are associated with [outcome]?
How are exposures in residential, pre-school and school settings associated with [outcome]?

Exposures vary with age

The exposure window is relevant



ADHD/Autism

Exposure

Outcome

Cognitive Development

Exposure

Outcome

Internalization/Externalization

Exposure

Outcome

Well-being/lifestyle satisfaction

Exposure

Outcome

Biomarkers

Exposure

Outcome

Analyses results

Across all ages and all outcomes, these variables matter for mental health & cognitive development:

- Number of adults in the household
- Smoking and smoking exposure
- Parental education, income, and occupation
- Green and blue space (access, size and area)
- Road and street indicators
- Air quality and noise exposure
- Urban mix and population density
- Neighbourhood indicators (age structure)

NDVI = Normalized difference vegetation index

ADHD and Autism (Autism Spectrum Disorder)

Prenatal exposure in relation to ADHD and autism revealed that **physical variables were more important** than social domain variables.

Low birth weight is cited as a mediator in these relationships.

	ADHD	Pre/Perinatal	ASD
Social components:	Parental occupation, education, income, population density, and number of adults in a household		Number of households with children in a given area and parental occupation.
Physical components:	Factors like urban density, green space size and distance, pollution levels (NO2), access to parks, and proximity to major roads.		Similar factors, with an additional focus on access to blue spaces (like lakes or rivers), land use diversity, and road/street structure.

Cognitive Development and Selective Attention

Analysis of the social and physical components of the exposome in the early years of life (**pregnancy and 0-3 years)** both showed up as significant.

Selective attention is the cognitive ability to consciously focus mental resources on a specific stimulus or task while ignoring other irrelevant stimuli.

	0-3	3+
Social components:	Family structure (e.g., single-parent households), parental education, and community demographics (age distribution of residents).	Migration background, parental occupation, education level, and playing video games.
Physical components:	Exposure to air pollution (black carbon, PM2.5, ozone), noise from traffic, access to green spaces, and breastfeeding habits.	Access to blue and green spaces, road traffic noise, population density, street layout, air quality (pollution levels), road structures.

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Internalizing and externalizing behaviors

Analyses of exposures in 7-12 year olds in relation to internalising & externalising behaviours, **both social dimension variables** on individual and population level were rated as important, as well **as variables of the built environment** (e.g. urban density and greenspace within the physical dimension)

- **Internalizing behaviors** are manifested through **internalized emotional problems,** such as **anxiety & depression.**
- **Externalizing behaviors** are expressed **outwardly**, with aggression or impulsivity.

7-12

	Internalizing behaviors	Externalizing behaviors
Social components:	Related to household income, parental occupation and education, and community demographics.	Influenced by parental education, household income, family background, and the percentage of families with children in a community.
Physical components:	Influenced by air quality, access to green spaces, and the overall design of the neighborhood (e.g., street layout).	Affected by air pollution (NO2), urban density, road layout, and whether a child's mother smoked.

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Wellbeing, Life Satisfaction, Happiness and Prosocial Behavior

Exposures in 7-12-year-old children related to well-being, life satisfaction, happiness and prosocial behaviour indicate **an association with the physical built environment and road network** as well as **green space**.

7-12

	Life satisfaction & Happiness	Prosocial behavior
Social components:	Influenced by parental education and occupation	Related to parental occupation, the child's native language
Physical components:	Affected by air pollution (NO_2), urban density, road layout, and green spaces	Influenced by air quality, green spaces, road network, land use diversity, and second-hand smoking exposure

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Biomarkers

Adolescents

Factors have been found in the blood that are associated to mental health outcomes.

The results point to connections between ***outdoor environments and protein markers*** *during* ***adolescence****.*

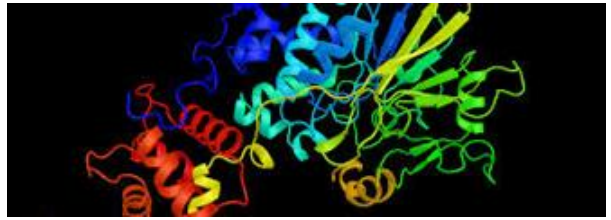
Article | Open access | Published: 24 January 2024

Proteomic insights into mental health status: plasma markers in young adults

Alexey M. Afonin, Aino-Kaisa Piironen, Izaque de Sousa Maciel, Mariia Ivanova, Arto Alatalo, Alyce M. Whipp, Lea Pulkkinen, Richard J. Rose, Irene van Kamp, Jaakko Kaprio & Katja M. Kanninen

Translational Psychiatry **14**, Article number: 55 (2024) | Cite this article

2844 Accesses | **3** Citations | **44** Altmetric | Metrics



A biomarker is a **measurable** indicator in the body that provides **information about a biological or pathological state**, the presence of a disease, or the body's response to a treatment.

It can be a molecule, gene, **protein,** or other substance found in tissue, **blood** (plasma), urine, or other body fluids.

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Main findings

Key results

- Physical activity, social cohesion, sleep, stress and self-regulation are factors that play an important mediating or moderating role in the association between exposure and mental health / cognitive development.
- The association between green space and mental health is influenced by the perceived restorative quality of the living environment and physical activity.
- Analyses revealed that unfavourable social and physical environments seem more prevaltent among children in lower social economic status.
- Accessibility measures should account for population specific needs. For children, access to green spaces depends on reachability and attractivenees factors often overlooked in conventional metrics.

Key results

- Places and activities effect the exposure levels of children at different ages and as such a place-based approach to exposure assessment is needed, in particular to noise.
- Socio-economic neighbourhood characteristics are important for cognitive development and mental health. It is essential to consider equity aspects in policies and interventions, to avoid unintentionally inducing or increaing social inequities in health.
- To design effective interventions, it is essential to consider both physical and social aspects of the environmental exposure.

To conclude...

EXPOSOME approach

- **Exposome:** The physical and social environment interdependently influence human health throughout the lifespan.

- **Working on social factors?** Consider the physical environment and its potential impact on social programs.

- **Working on physical factors?** Don't forget about social factors.

Take inequalities into account when shaping the environment

EXPOSOME approach

- **You cannot address everything;** try to consider as many aspects as possible.
- **Collaborate in interdisciplinary teams:**
  - Exposome research relies on diverse and high-quality data, making teamwork between disciplines essential for understanding environmental influences.
  - Helps to avoid leaving out elements of other disciplines outside your area of expertise.
- Remember, this is a **new approach** and not fully defined and operationalized yet.
- Available exposome data could predict only a limited part of children's mental health and cognitive development

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Let’s reflect:

How do you perceive this new information?

Do you see immediate connections to your work?

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