



ERC Work Program 2025 Webinar

Geographic environments, daily activities and stress:

A study on the space-time fragmentation
of exposure patterns

July 23rd, 2024

Camille Perchoux Ph.D.

Bio

Antibes, France
Sciences



1987
Cannes,
France
Me

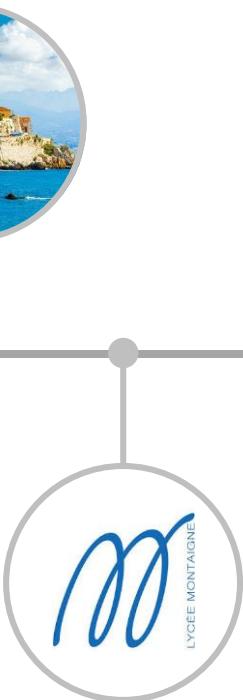
Antibes, France
Sciences



1987
Cannes,
France

Me

09/2005
Bordeaux,
France
CPGE – Litterature



Antibes, France
Sciences



09/2006
Aix- Marseille,
France
B.Sc. Urban planning



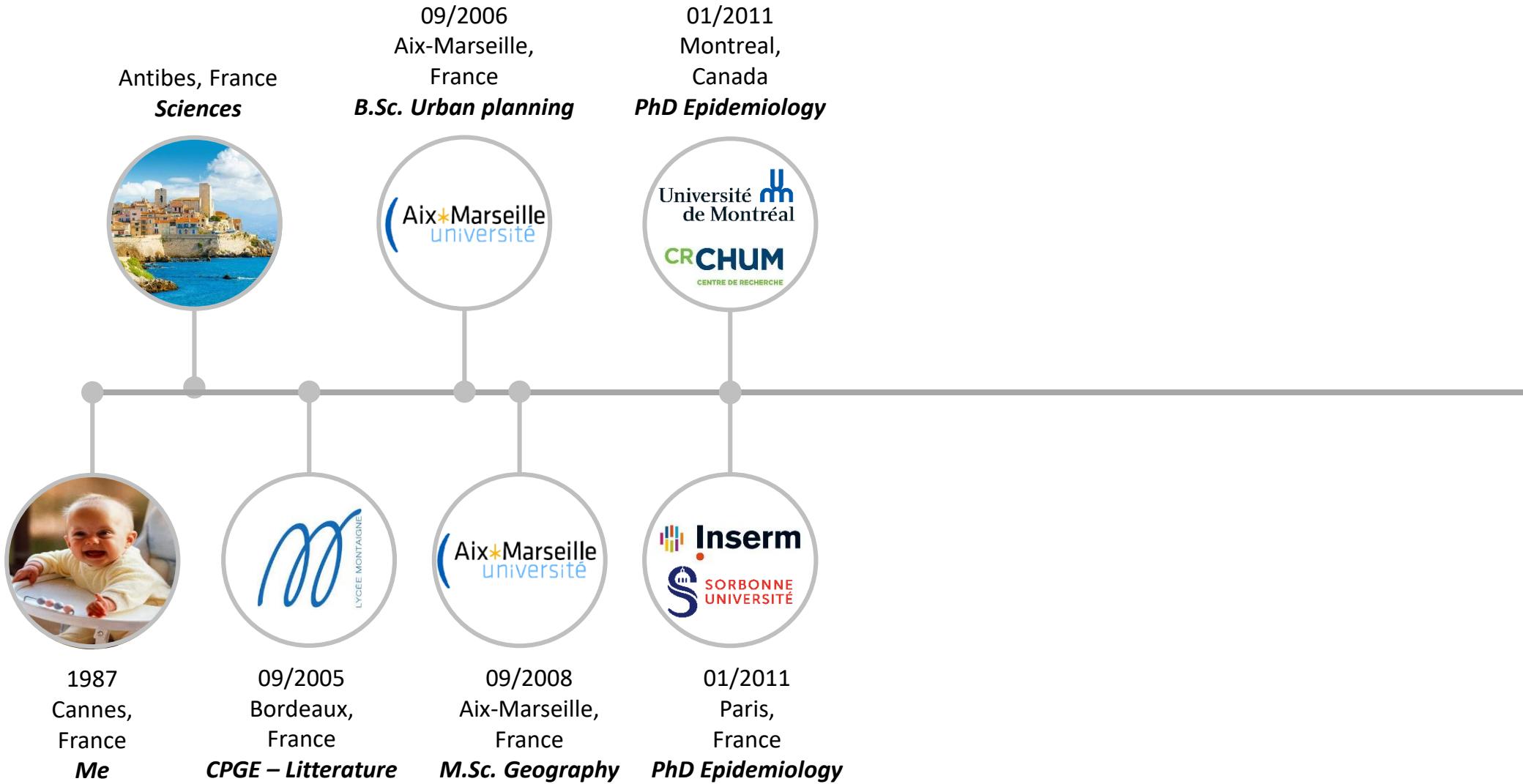
1987
Cannes,
France
Me

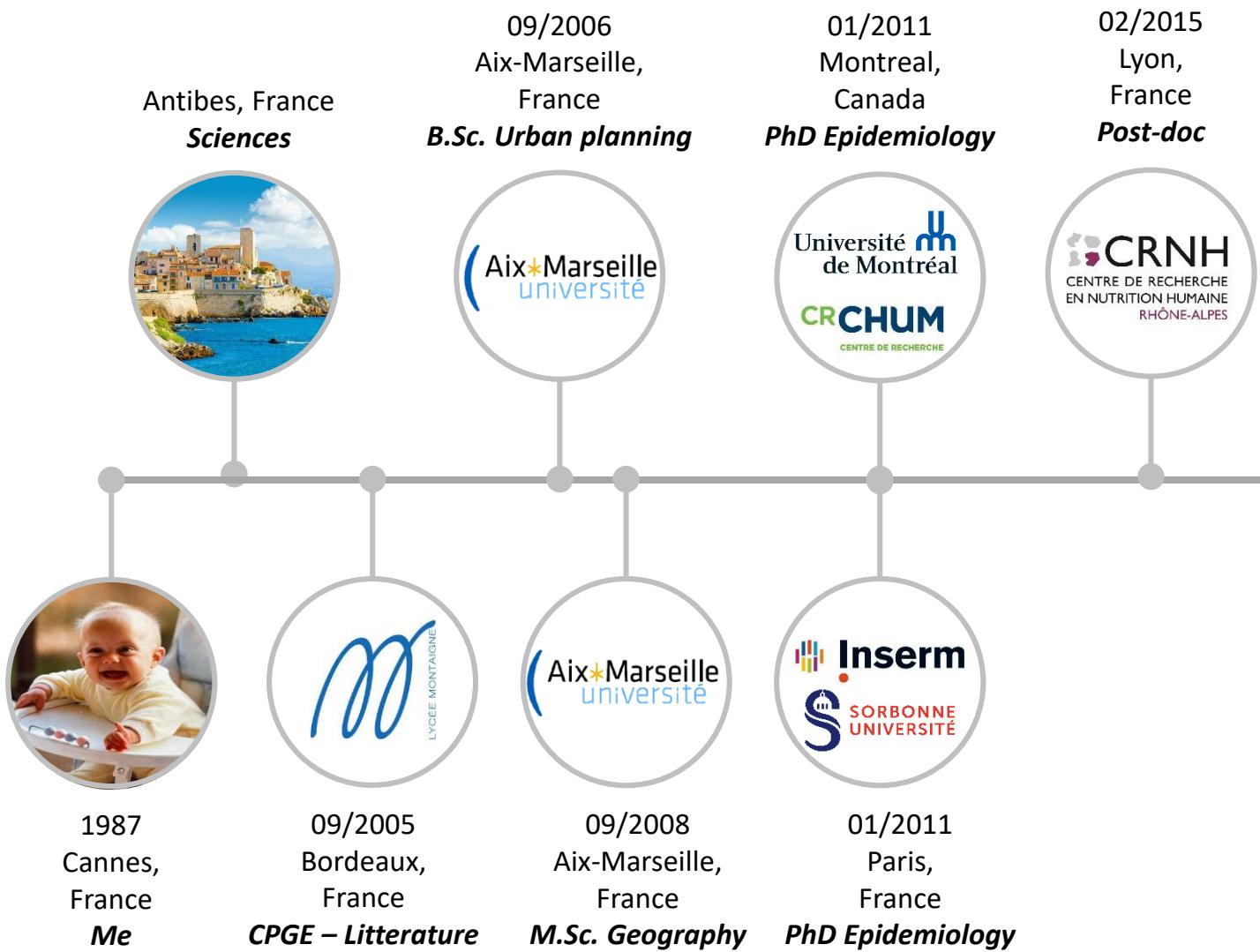


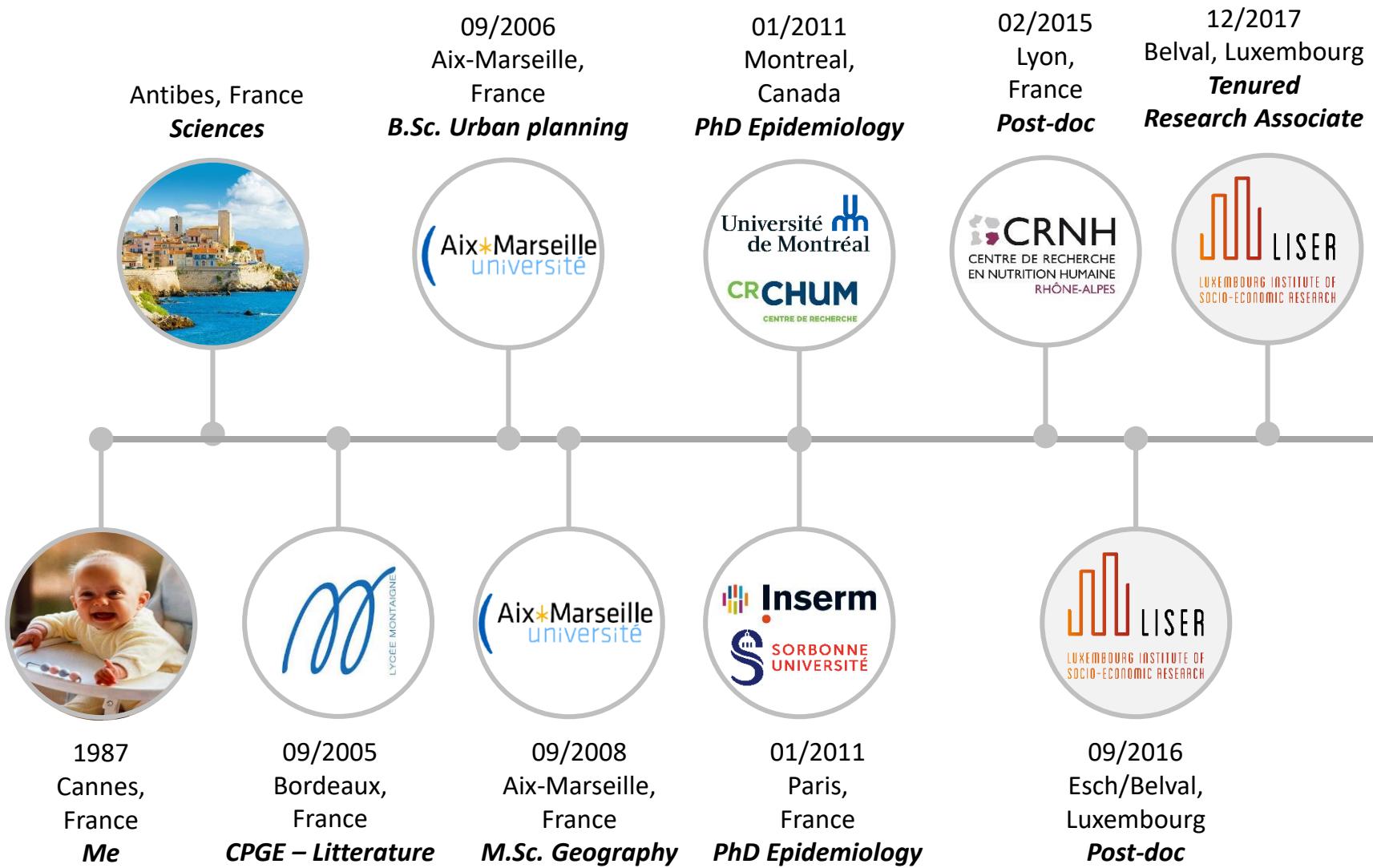
09/2005
Bordeaux,
France
CPGE – Litterature

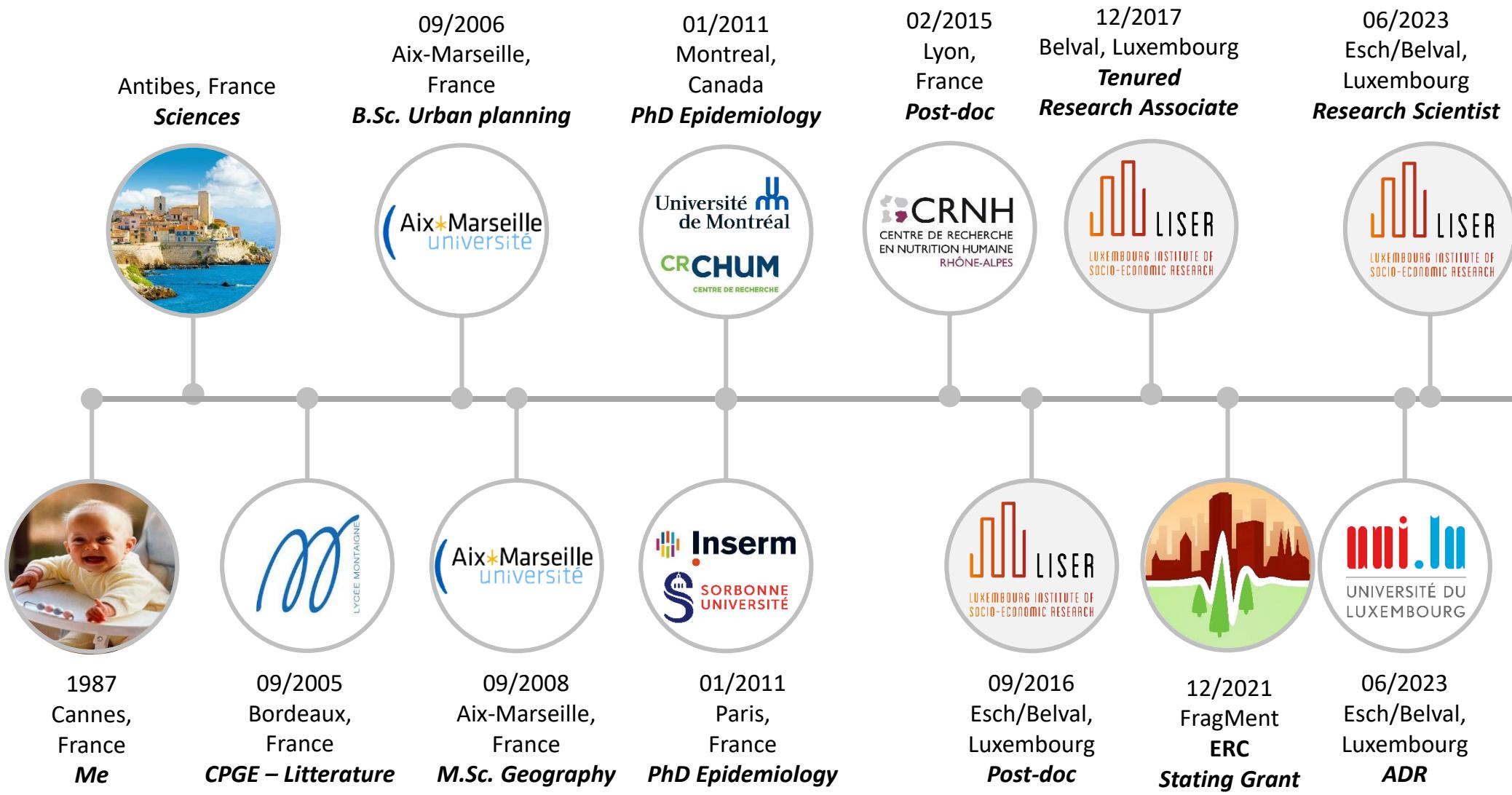
09/2008
Aix-Marseille,
France
M.Sc. Geography

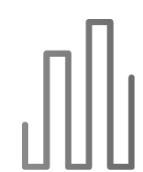






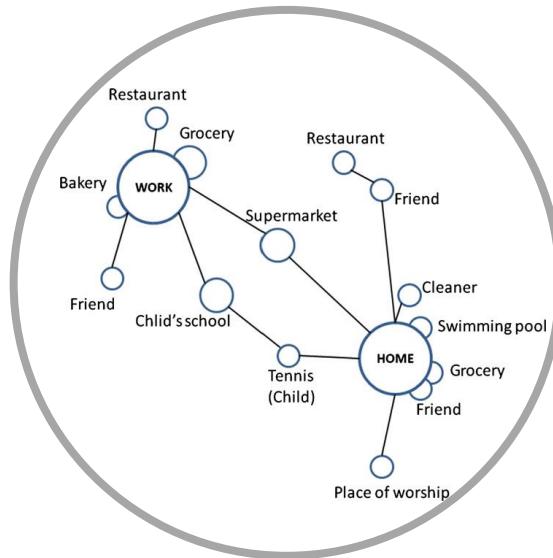




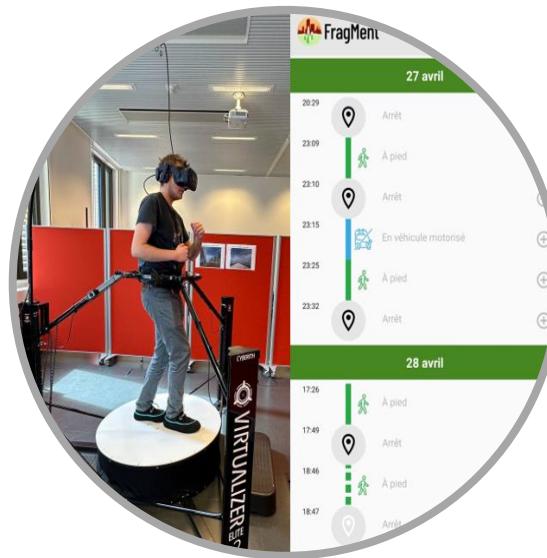


My research - Methodologies

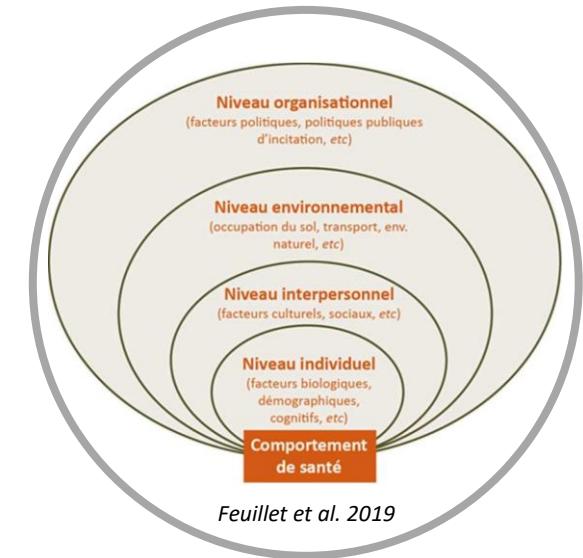
Understanding how urban environments and places influence population health



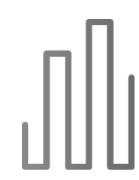
Environmental exposure assessment
accounting for daily mobilities



New developments in
Exposure & Risk assessment



A socio-ecological approach
of health determinants



My research – Research themes

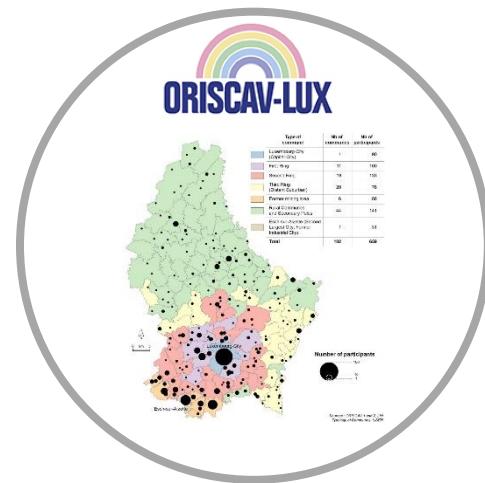


Mobility and activity patterns



Environmental determinants of physical activity and sedentary behaviors

*Image : Roe & McCay 2021



Time-varying neighborhood effects on cardio-metabolic health
FNR CORE MET'HOOD 2020-2023



Geographic environments, daily activities and Stress
ERC StG FragMent
2021-2027

Social inequalities in health

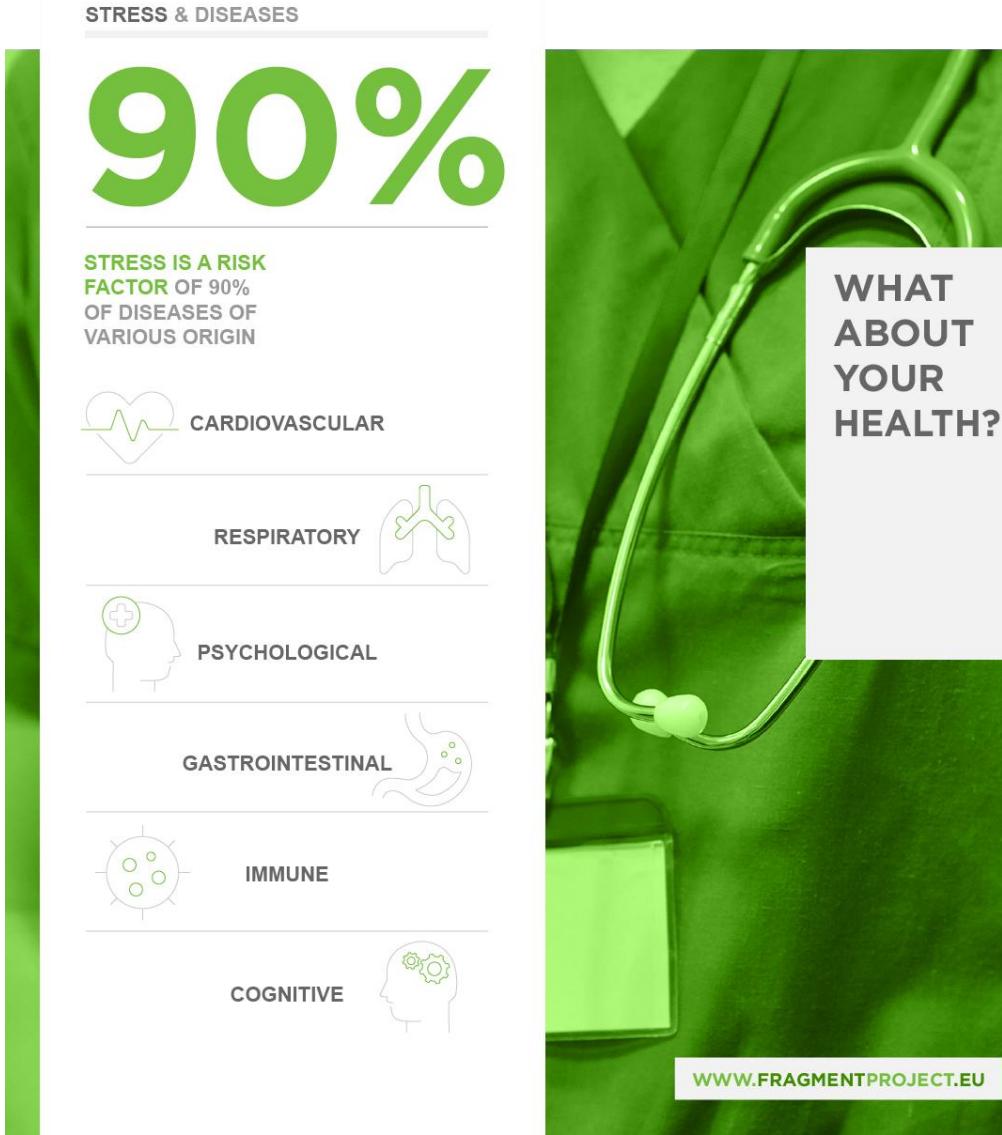


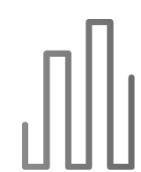
Geographic environments, daily activities and stress:

*A study on the space-time fragmentation
of exposure patterns*



Why stress ?





Stress throughout the day

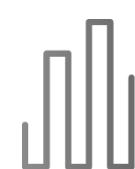
IMAGINE



8:00 am

1:00 pm

6:00 pm



Stress throughout the day

IMAGINE



8:00 am

1:00 pm

6:00 pm

WHAT IF...

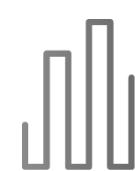


8:00 am

9:00 am

6:00 pm

Urban stressors



Stress throughout the day

IMAGINE



8:00 am

1:00 pm

6:00 pm

WHAT IF...



8:00 am

9:00 am

6:00 pm

OR IF...



8:00 am

8:45 am

11:00 am

3:00 pm

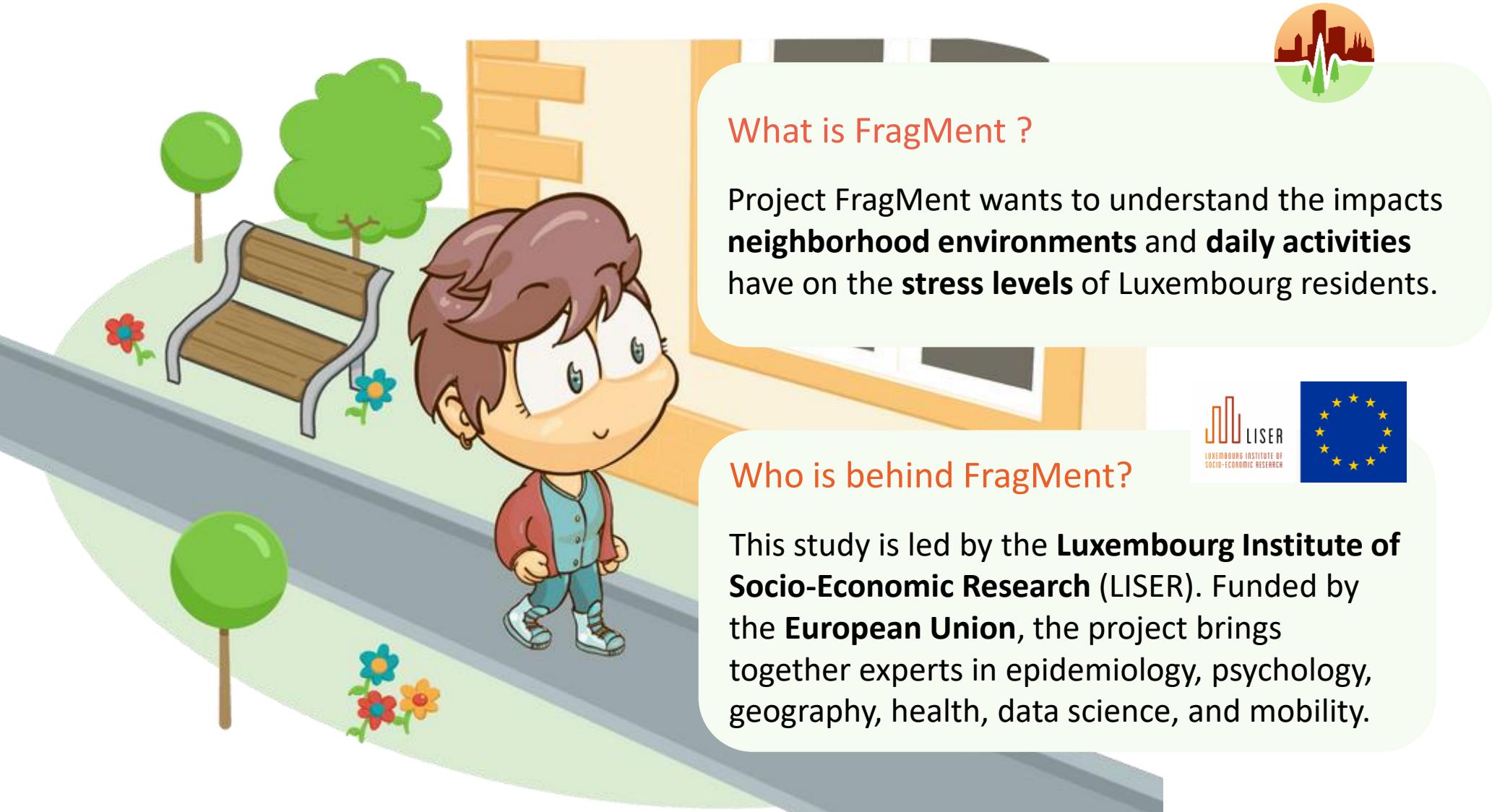
5:00 pm

6:00 pm

Urban stressors



The FragMent project



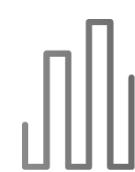
What is FragMent ?

Project FragMent wants to understand the impacts **neighborhood environments** and **daily activities** have on the **stress levels** of Luxembourg residents.

Who is behind FragMent?

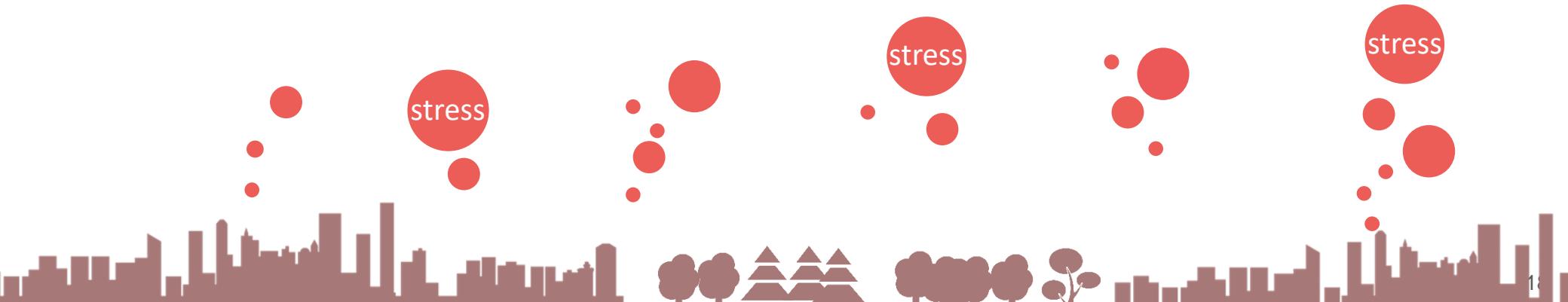
This study is led by the **Luxembourg Institute of Socio-Economic Research (LISER)**. Funded by the **European Union**, the project brings together experts in epidemiology, psychology, geography, health, data science, and mobility.

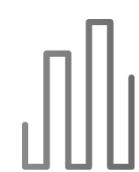




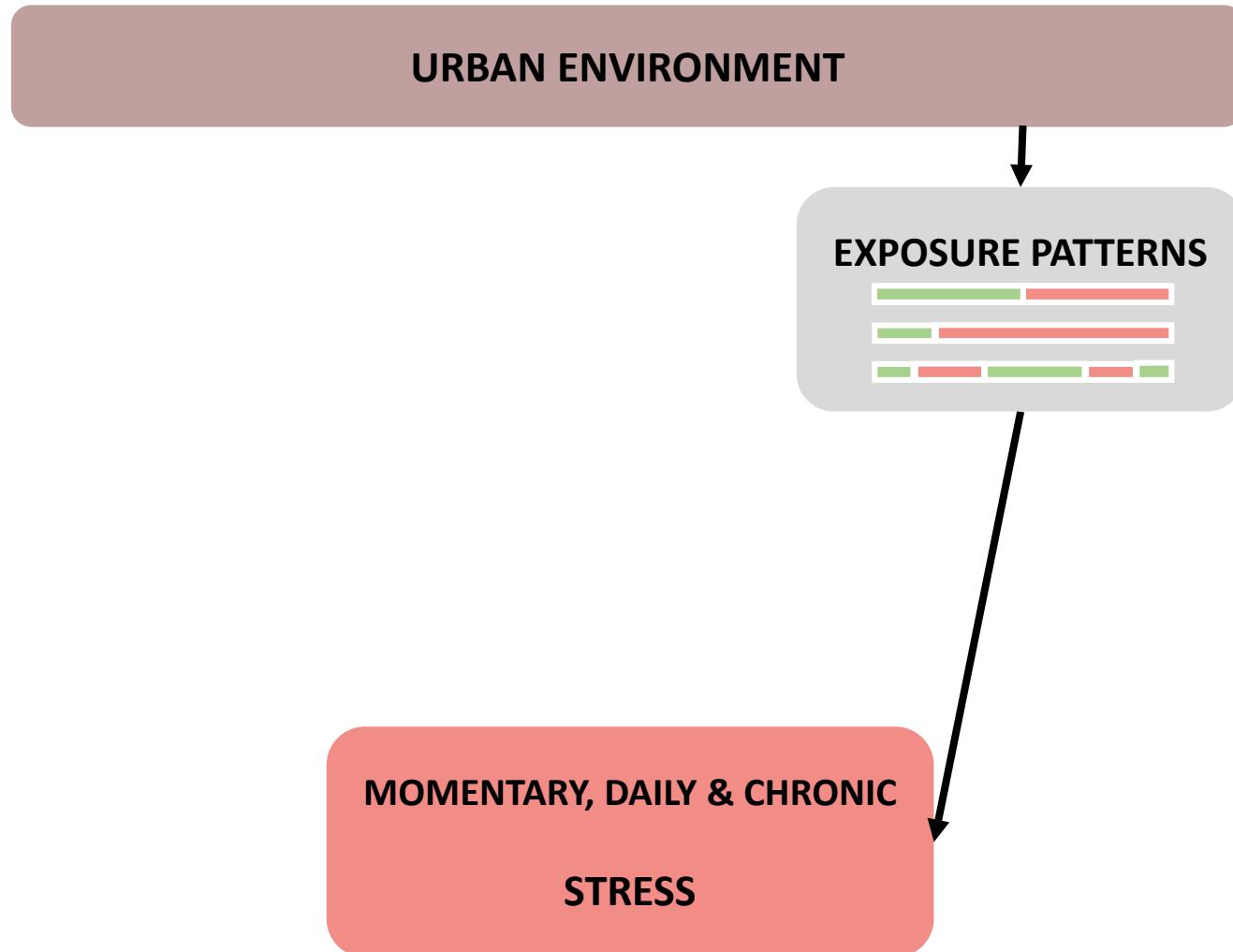
Aim of FragMent

Evaluate the extent to which the
spatial and temporal fragmentation of exposures
to **environments** in daily life influences **stress**,
and **social inequalities in stress**

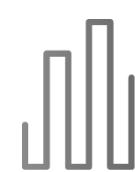




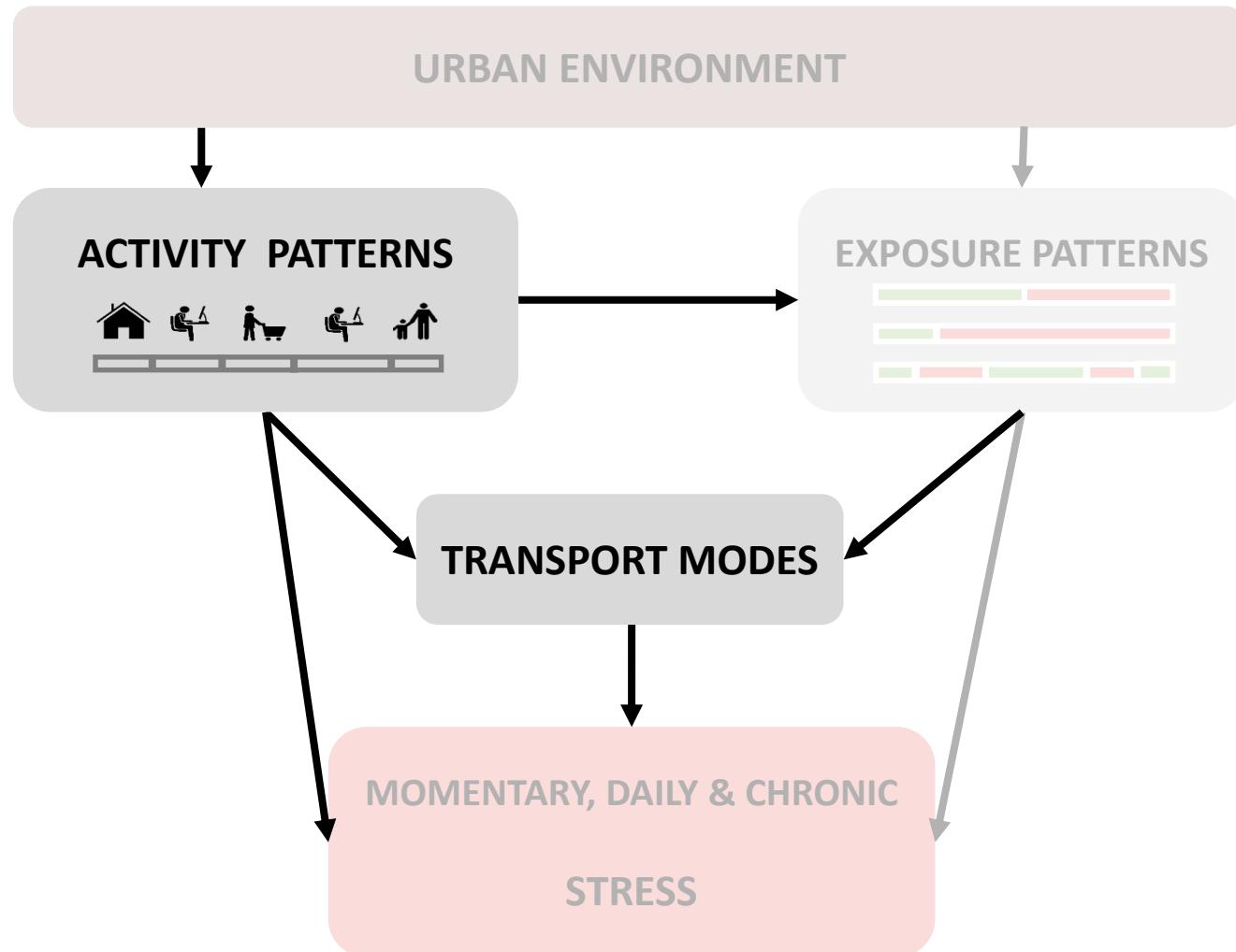
Objectives and hypotheses



Objectives 1 & 2

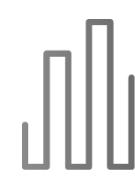


Objectives and hypotheses

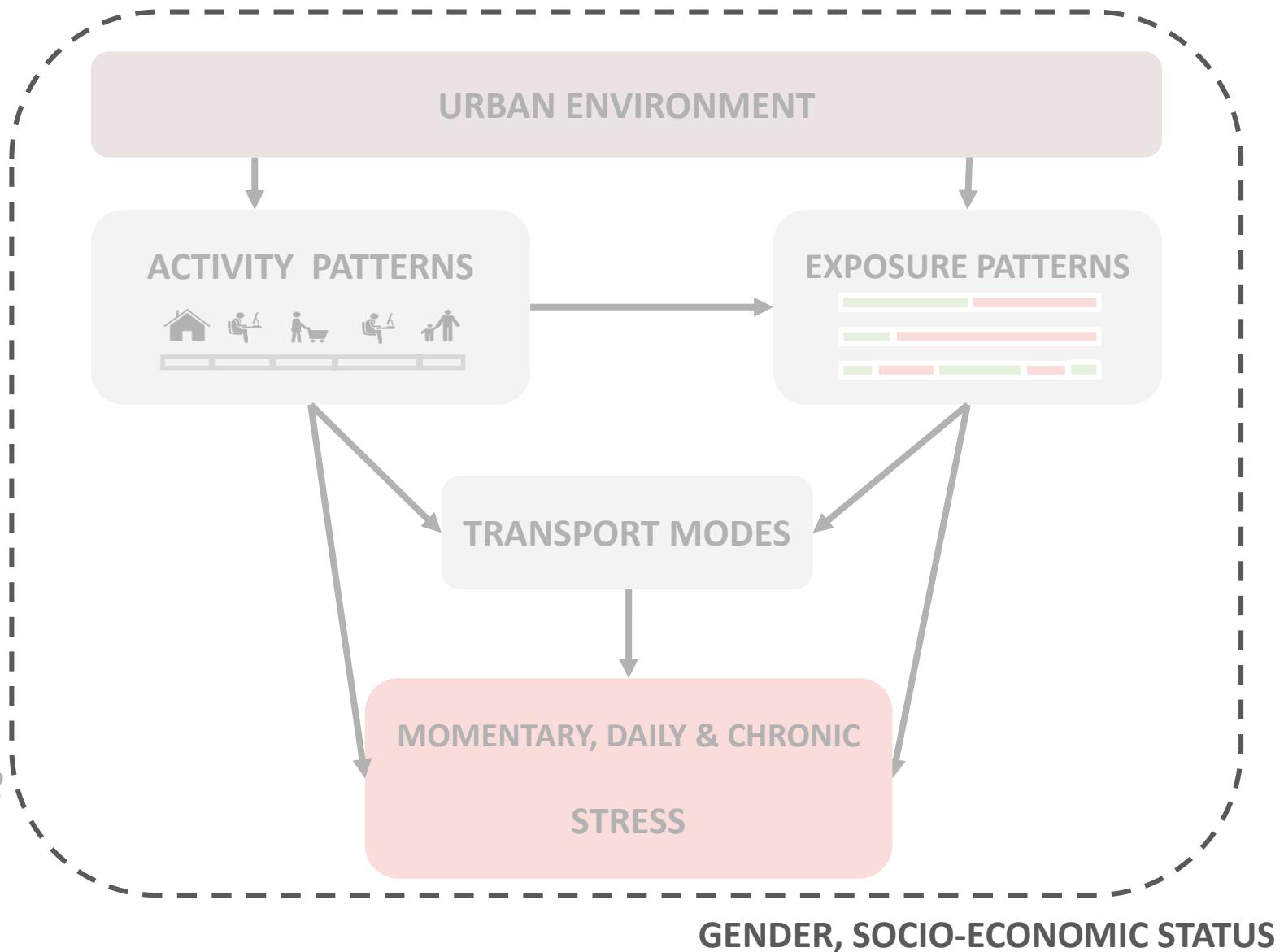


Objectives 1 & 2

Objective 3



Objectives and hypotheses





Three complementary methods



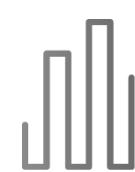
**Participatory & qualitative
Research !**



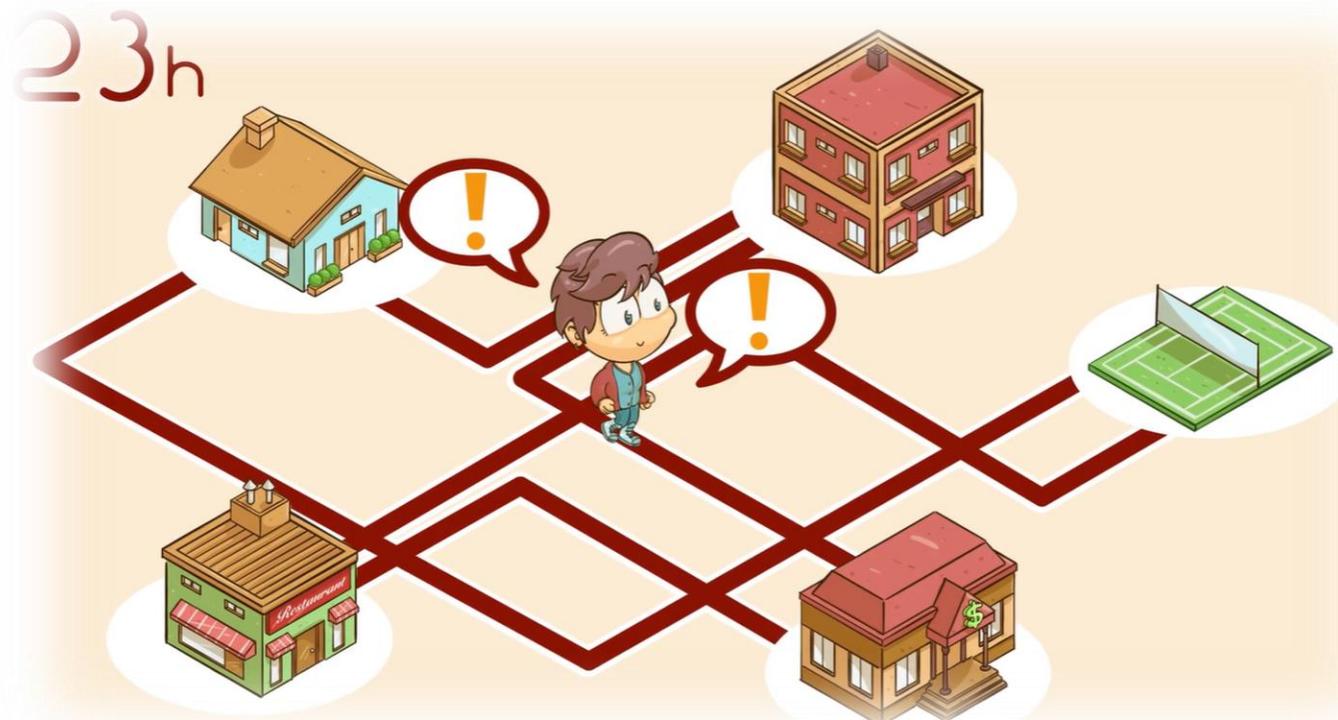
**A national survey:
Your voice matters more
than you think !**



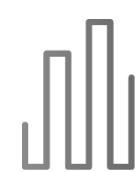
Virtual lab experiments !



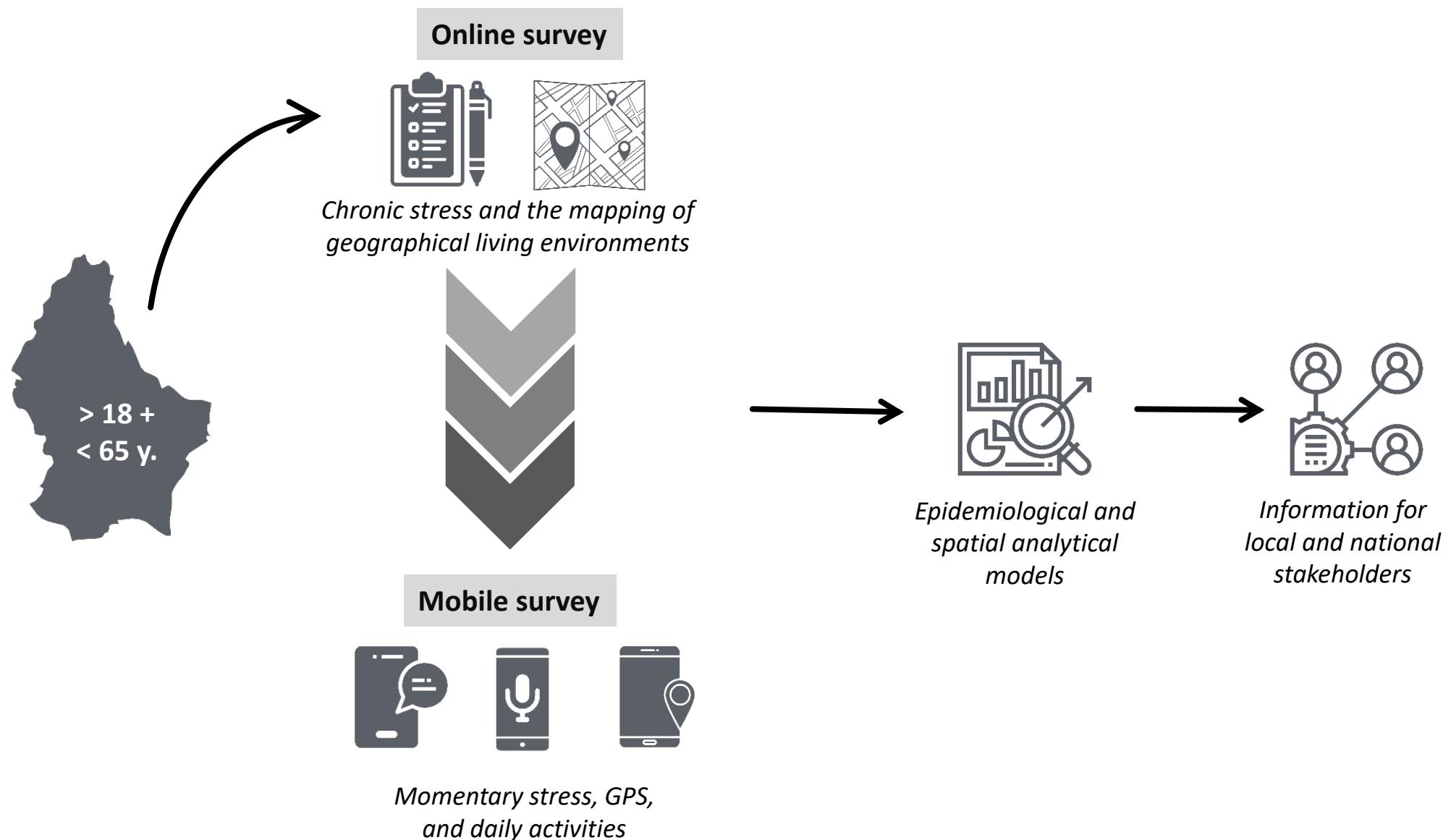
The FragMent survey



Use interactive map-based questionnaires and an app to help understand the causes of stress in our everyday environments.



The FragMent survey



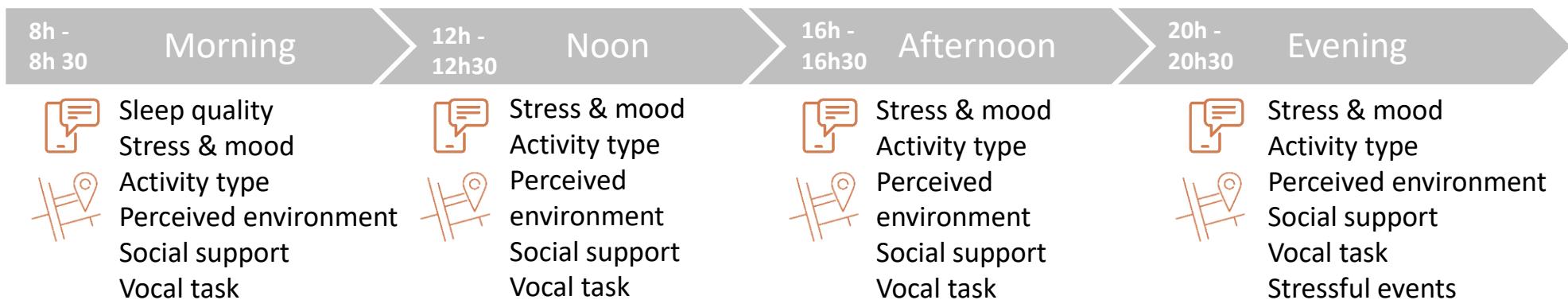


Geographical ecological momentary assessment

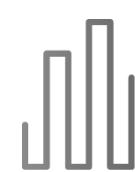


Repeated sampling throughout the day of participants' experiences and behaviors, in situ and in real time.

(Shiffman et al., 2008)



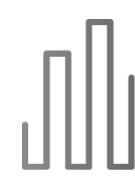
- **WHERE & WHEN** stress is experienced (+ GPS)
- **WHAT**: What domain of activity ?
- **WITH WHOM** : with whom are you interaction ?
- **WHY**: What perceived environmental factors matter ?



FragMent mobile survey: examples of core questions

Measuring perceived stress in daily life environments





FragMent mobile survey: mobility data

A precise characterization of mobility patterns and transport modes

15:53 30%

Données GPS

Activé

Latitude	49.503948697820306°
Longitude	5.946654444560409°
Heure	2024-04-23 10:53:23
Altitude	407.0m
Précision	23.0m
Direction	Ouest Nord-Ouest (286.5°)
Vitesse	1.8m/s
Nb de satellites	0/0
Activité	f (96%)
Hdop	3.4
Vdop	2.2
Pdop	4.2

Propulsé par Eco Emo Tracker

18:38 30%

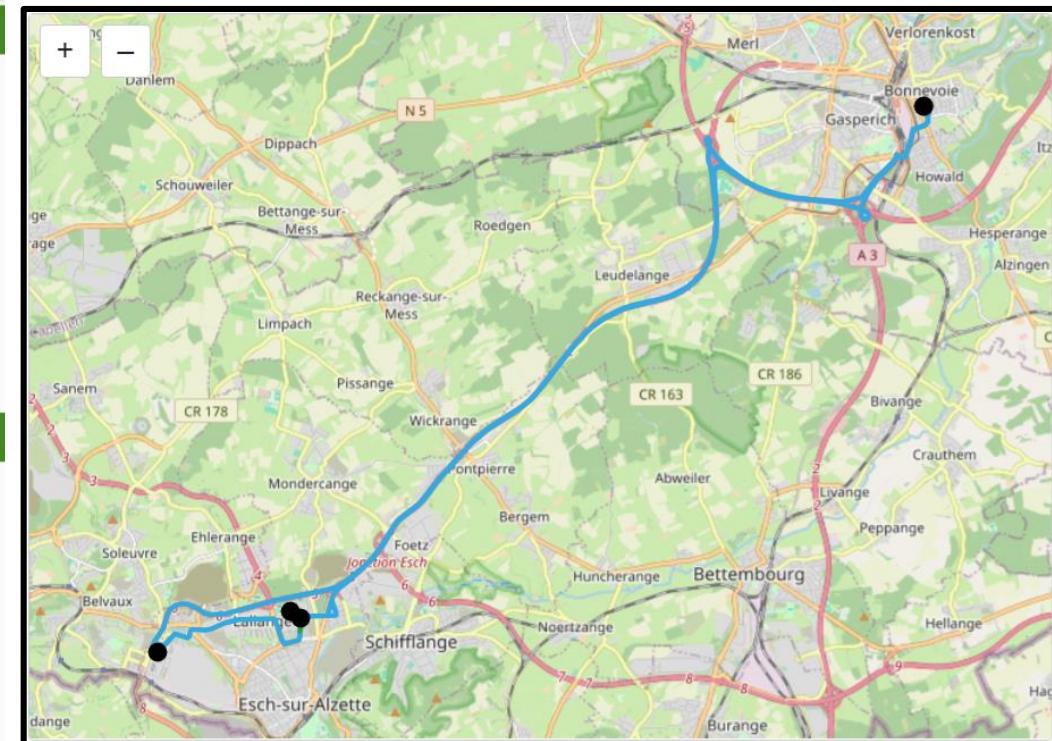
27 avril

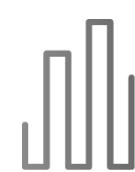
20:29 Arrêt
23:09 À pied
23:10 Arrêt
23:15 En véhicule motorisé
23:25 À pied
23:32 Arrêt

28 avril

17:26 À pied
17:49 Arrêt
18:46 À pied
18:47 Arrêt

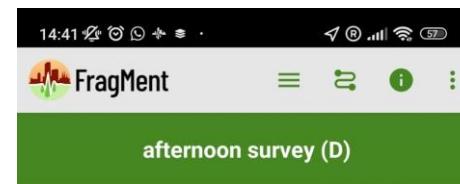
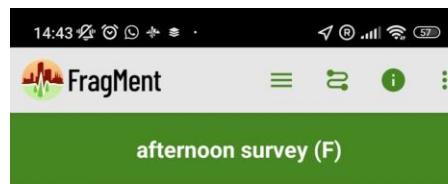
Propulsé par Eco Emo Tracker

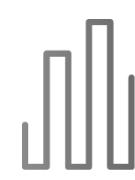




FragMent mobile survey: vocal tasks

A measurement of physiological stress via the voice !





Virtual reality experiments to study stress

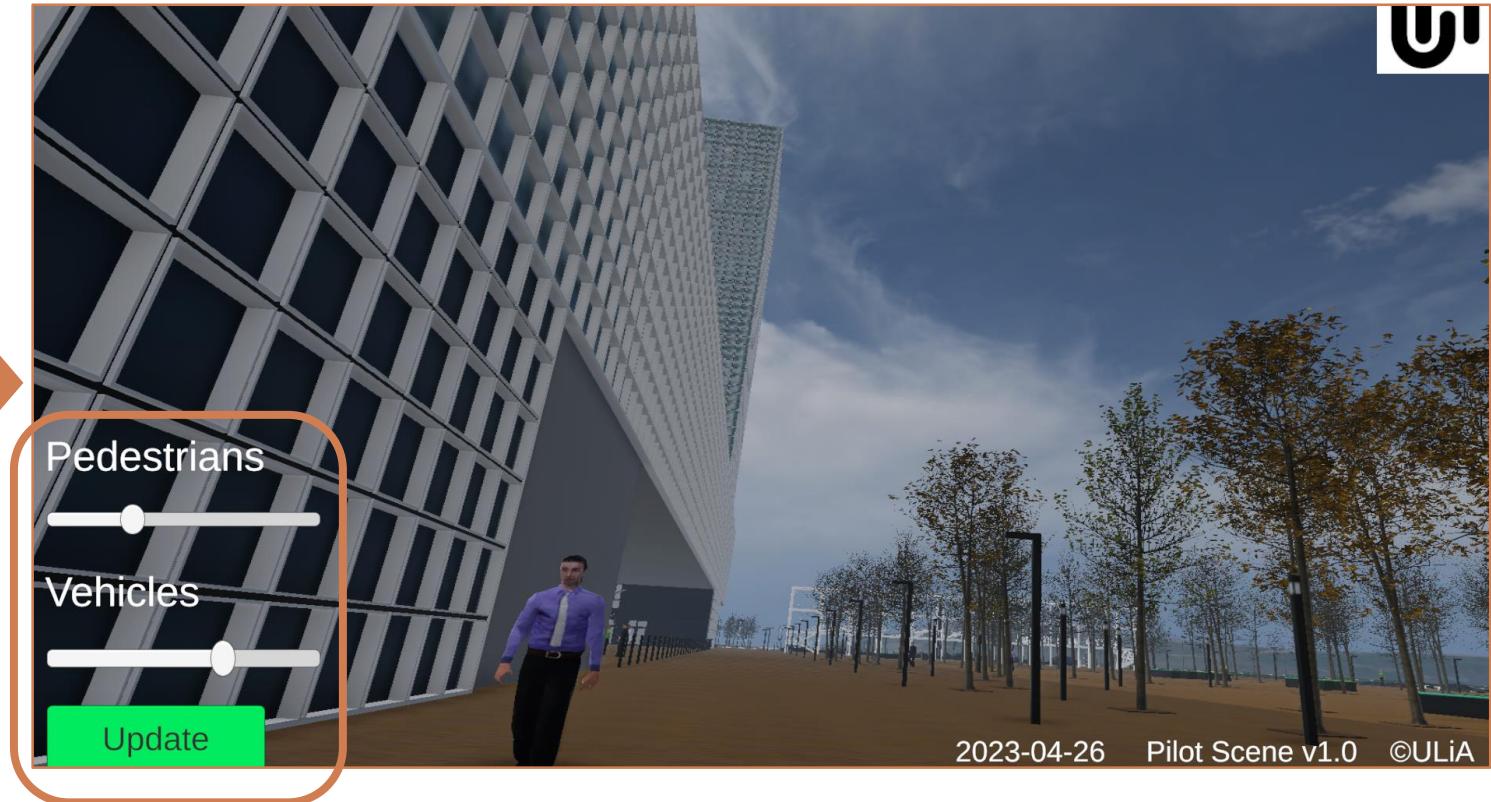




Why controlled virtual experimentation?



Virtual reality experimentation makes it possible to **systematically manipulate** and **test controlled virtual environments**, while maintaining a **high level of realism** to ensure strong **ecological validity.** (Birenboim, 2021)



Manipulate and evaluate the attributable part to each factor



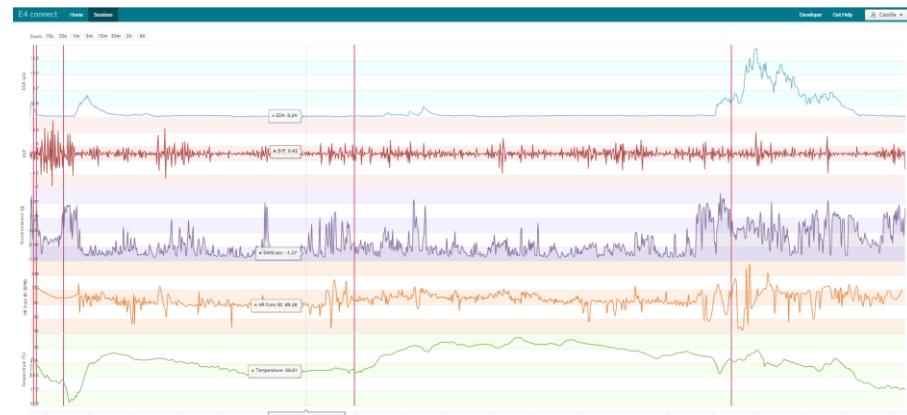
Stress measurements in VR

Real-time
physiological data
(HR, ST, EDA)



Empathica E4

Other biosensors to be tested (EEG)



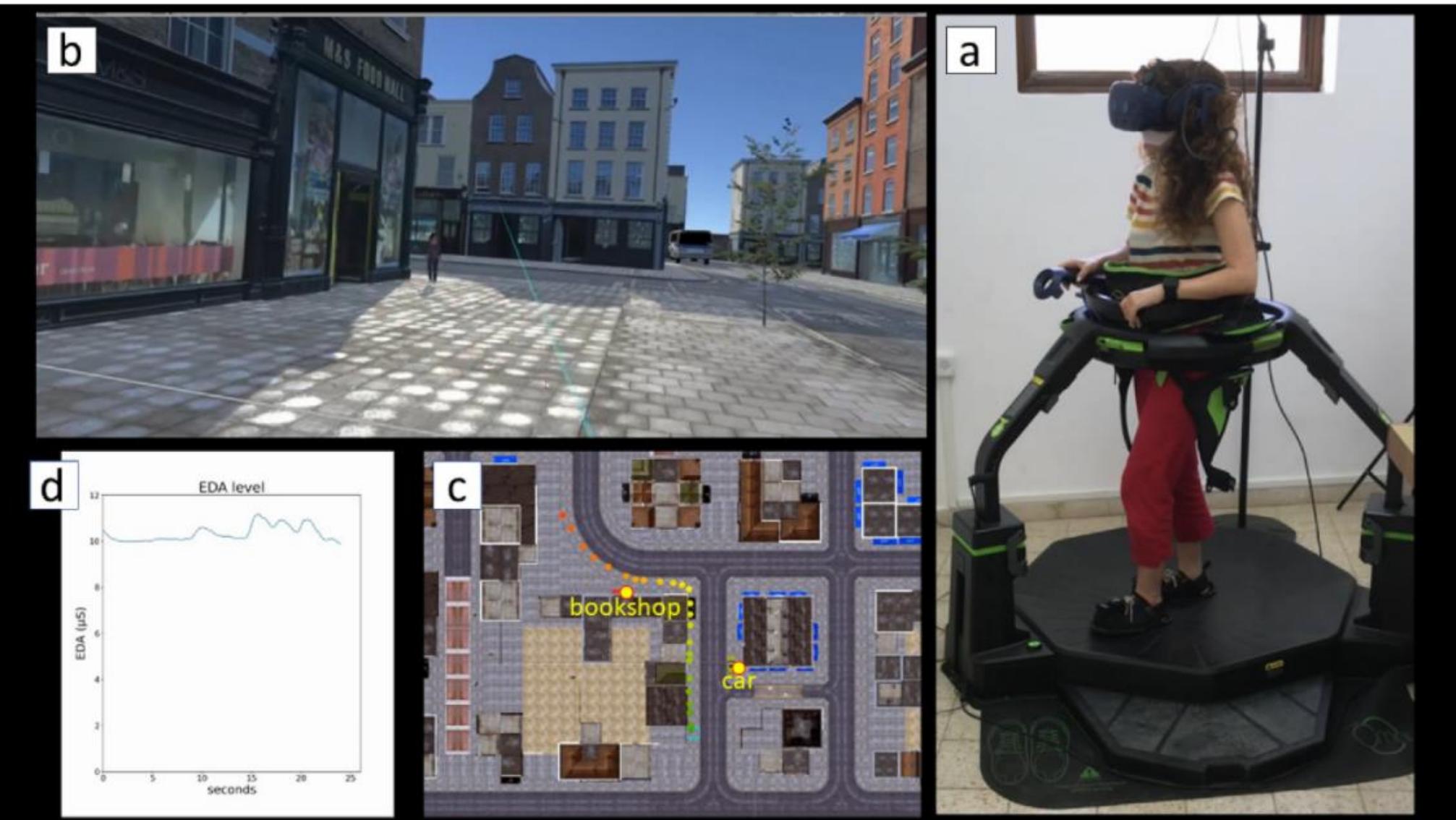
Psychological
stress



How stressed are you?

1 ("Not at all stressed out")
to
4 ("Very stressed out") scale

Experimental setting: combining IVEs with biosensors



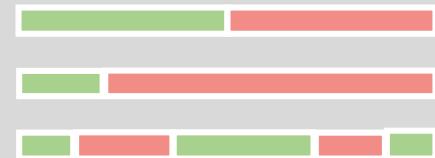
Source: Birenboim, A., Ben-Nun Bloom, P., Levit, H., & Omer, I. (2021). The study of walking, walkability and wellbeing in immersive virtual environments. *International journal of environmental research and public health*, 18(2), 364.



Expected results

A new analytical framework for neighborhood effects on health

Acknowledgement of
the « meaning of time »



Better assessment of
social inequalities in stress



Robust evidence on environmental stressors in daily life

Advances in risk
assessment



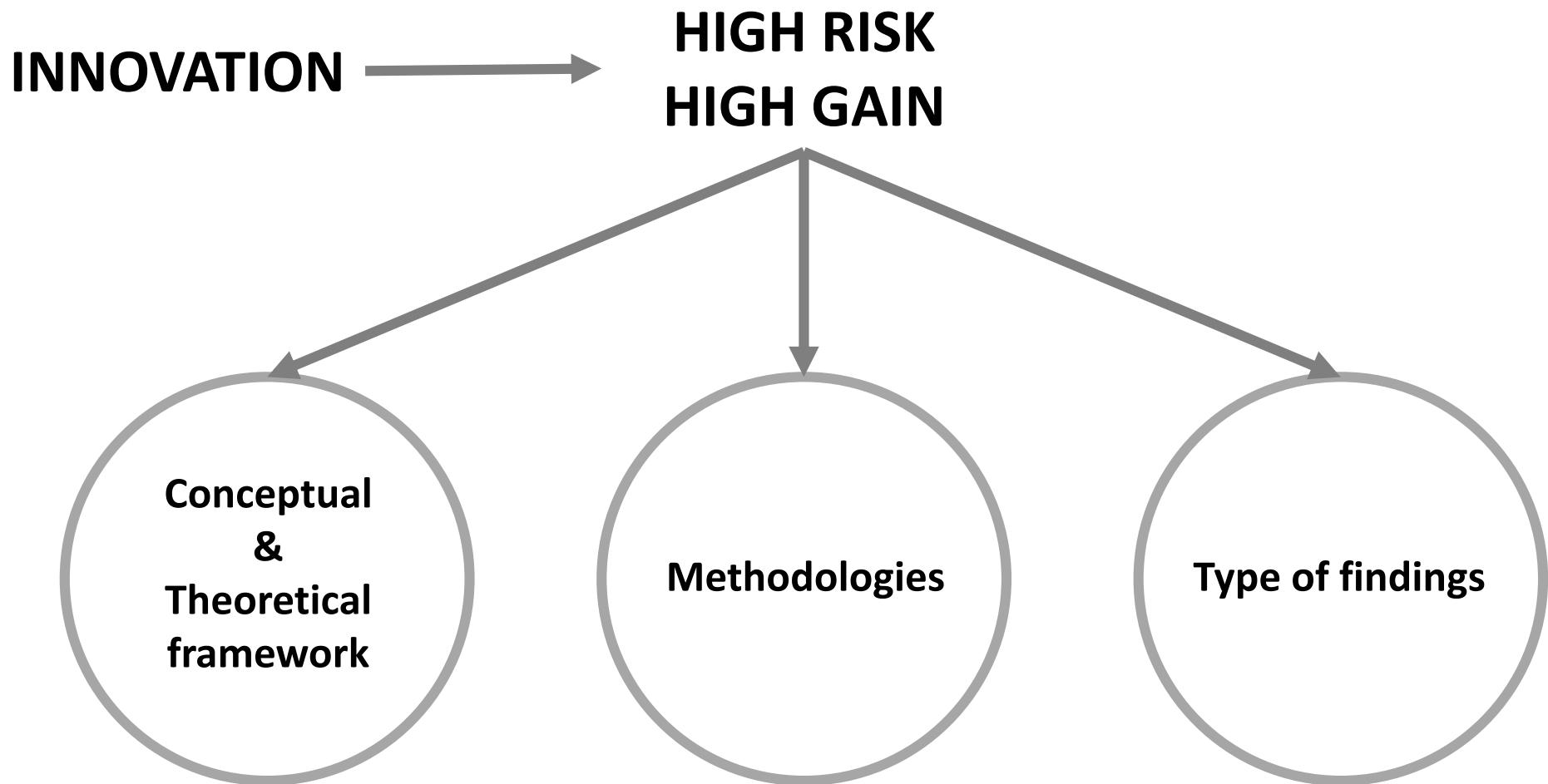
New knowledge on
environmental stressors



Preparing your ERC proposal: general considerations, timeline, and more...



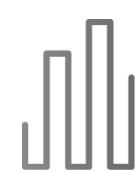
Innovation is key





FragMent innovation points

- **A new conceptual framework...**
 - bridge geography & epidemiology
 - disentangle the « notion of time » in place and health research
 - better understanding of social inequilities in neighborhood effects on stress
- **Use of VR technologies...**
 - while walking in virtual environments
 - in combination with biosensors
 - a newly « validated » experimental setting
- **Use of vocal biomarkers in real-life environments**
 - First study to use vocal biomarkers linked to environmental stressors
 - First study to use vocal biomarkers with a GEMA study design
 - Longitudinal study with vocal biomarkers of stress (15 days)
- **New knowledge from different methodologies on environmental stressors**



You DO NOT NEED to master everything

My background & core expertise

- Geography and public health epidemiology
- Accounting for daily mobility in neighborhood and health research
- Methods: map-based questionnaires, GPS, GIS, spatial and epidemiological models

BEFORE THE ERC

What I had never investigated

- Stress
- Focus groups methodology
- Virtual reality
- Experimental research
- Vocal biomarkers
- Data collection campaign



You DO NOT NEED to master everything

My background & core expertise

- Geography and public health epidemiology
- Accounting for daily mobility in neighborhood and health research
- Methods: map-based questionnaires, GPS, GIS, spatial and epidemiological models

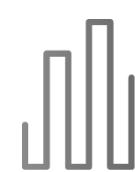
BEFORE THE ERC

What I had never investigated

- Stress
- Focus groups methodology
- Virtual reality
- Experimental research
- Vocal biomarkers
- Data collection campaign

What I had already investigated

- Numerous health outcomes
- Space-time exposure measurements
- Transport and daily mobility tools & analyses
- Social inequalities in health
- Longitudinal & cross-sectional study designs
- Intersectorial/participatory workshops



You should capitalize on complementary expertises



*And show tracks of past/ongoing collaborations
to increase the feasibility of your project !*



LUXEMBOURG
INSTITUTE
OF HEALTH



Inserm



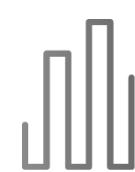
University of
Zurich^{UZH}



WAGENINGEN
UNIVERSITY & RESEARCH



האוניברסיטה העברית בירושלים
THE HEBREW UNIVERSITY OF JERUSALEM



Integrating colleagues with complementary expertise

**PhD
Co-supervision**

Visitings

Steering committee

...



Preparing well in advance

January 2020: Initial discussions on the general idea (i.e., fragmentation in health)

- Read every abstract of ERC funded projects

Spring 2020: Creation of a LISER support committee (meeting every month)

- Conceptual framework
- Short writing exercises (objectives, rational, etc.)
- General discussions on innovation from different disciplines

Autumn 2020: Mentoring by an external researcher (ERC grantee)

Winter 2020: First draft B2

- Listen to every video on the ERC website
- Create checkboxes and verify this is in your document
- B2 reviewed by Luxinnovation, mentor, head of department, colleagues

Spring 2021: B2 Final draft 3-4 weeks before the submission – start of B1

2

**mock Interviews
with interdisciplinary panels**

15

**mock Interviews
with colleagues**

**40-page
document referencing all
questions & answers**



FragMent

Follow us on social media



Site Web



FragMent Project



Projet_fragment



FragMent Project
@FragMent_ERC