



The experience of the CitieS-Health project



This project has received funding from the European Union's Horizon 2020 research and innovation programme under grant agreement No 824484

Main aims of the project

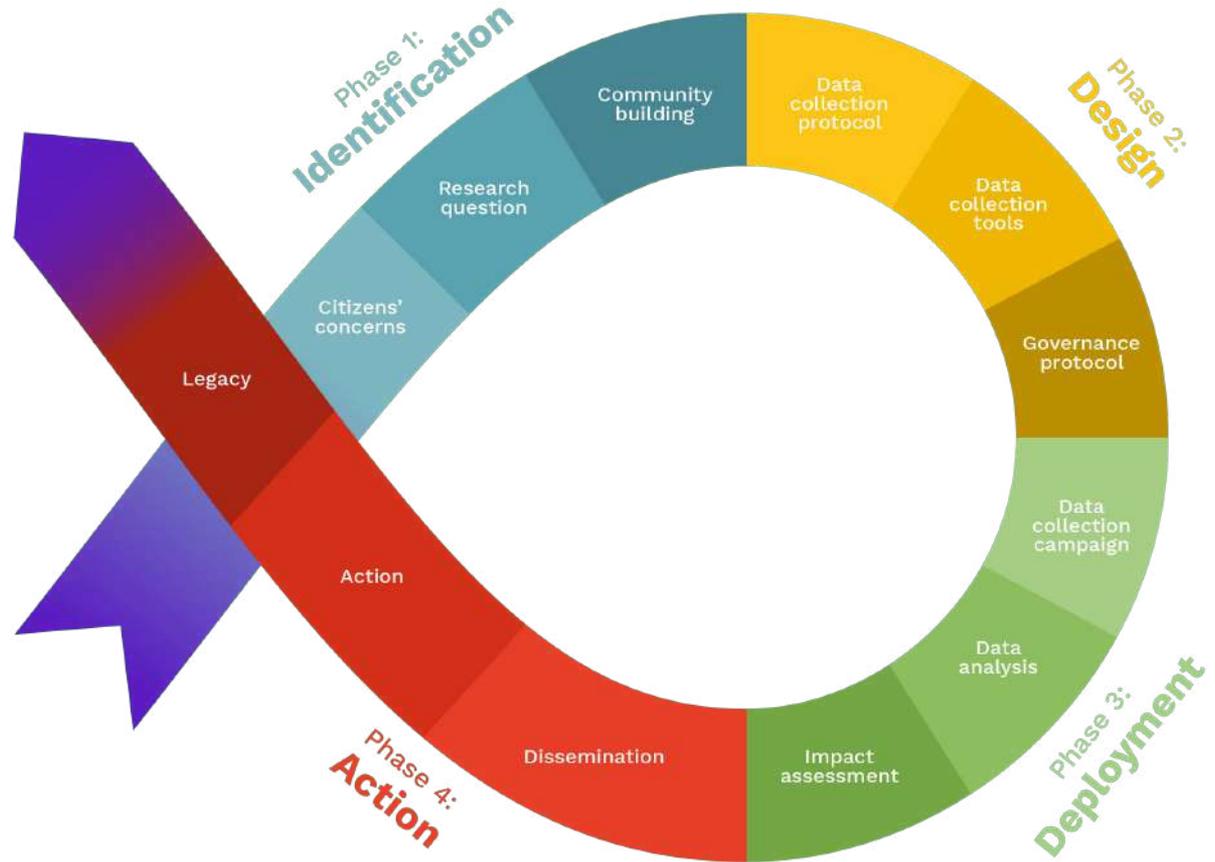
- Co-design citizen science projects linking urban environment and health
- Citizens involved in all phases of research
- Create a toolkit for the development and promotion of similar citizen science projects



Cities-Health Engagement Framework

Following main steps of scientific process, adding a focus on:

- Citizens' concerns
- Co-creation
- Governance
- Action and legacy
- Communication





Pilots



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Citizen Science for Urban Environment and Health

Barcelona

Air pollution and health

Ljubljana

Noise and health

Lucca

Air pollution and health

Kaunas

City design and health

Amsterdam

Wood burning and health



IDEAS
FOR
CHANGE

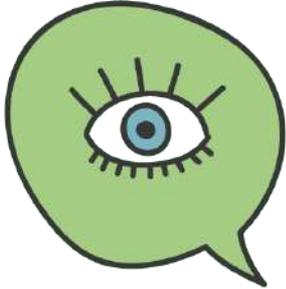
ISGlobal Instituto de
Salud Global
Barcelona



VYTAUTAS
MAGNUS
UNIVERSITY
MCMXXII

ep EPIDEMIOLOGIA
& PREVENZIONE

Pilots Overview



- While operating under the same framework, the five pilots resulted in **very different studies** with respect to:
 - ◆ Final study design
 - ◆ Strategies
 - ◆ Difficulties
- Drivers:
 - ◆ Local context
 - ◆ Citizens' interest
 - ◆ Research question

Barcelona

**Outdoor Air Pollution
and Health**



Phase 1

Identification



Activities conducted

City-wide online survey

Online campaign

~550 respondents



Phase 1

Identification



Activities conducted

Strawberry campaign: pop-up intervention and distribution of 1000 strawberry plants to measure air pollution*.

ACTIVITY IMPACT:

- 1 day, 10 districts, over 1000 people reached
- Receive media attention

* This activity was a joint collaboration with the national citizen science project *Vigilantes del Aire*, from Ibercivis Foundation, IPE-CISC, FECYT



Phase 1

Identification



Activities conducted

Kick-off community meeting:

- Presentation of survey results
- Co-create the research questions

ACTIVITY IMPACT:

40 people participated



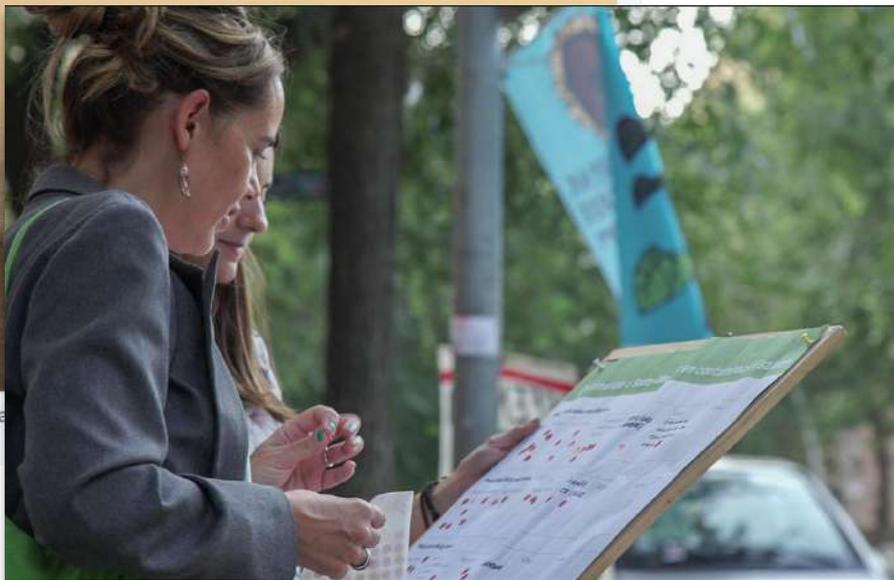
Phase 1

Identification

IDEAS FOR CHANGE retweeted

CityS-Health project @CitySHealthEU · 21 dic. 2019

Ahir es va aprovar la Zona de Baixes Emissions **#ZBE** a Barcelona!
Ajuda'ns a definir la pregunta de recerca sobre **#contaminació** de l'aire i **#salut** a **#Barcelona**. Què vols que investiguem?
Vota aquí bit.ly/2PUI92d - Please, RT! :-)



Activities conducted

Feasibility assessment and refinement of the different suggested research questions

Online public voting of the final research question, among 8 possibilities.

Online campaign + Street-intercept survey to promote the voting

ACTIVITY IMPACT:

608 citizens participated in the vote



Phase 1

Identification

Final research question:

How does air pollution together with noise and green/blue spaces affect mental health?



Phase 2

Design



Activities conducted

Co-creation workshop on study design

- present different types of studies
- gauge citizens' preferences

ACTIVITY IMPACT:

50 people participated

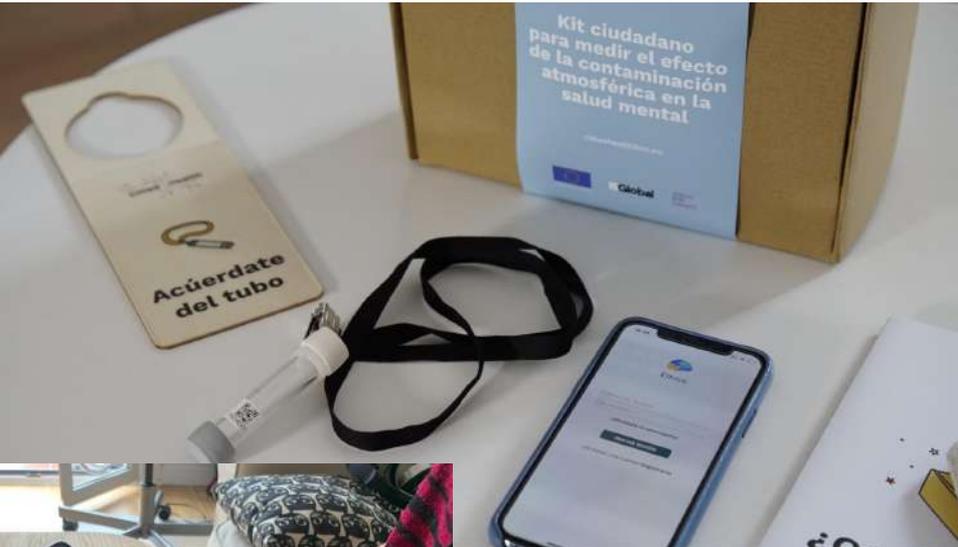
TOOL USED:

Participatory Study Design



Phase 2

Design



Study protocol

During two weeks, every day participants:

- Conduct attention test with an app
- Answer questions mood, stress, wellbeing, sleep
- Share geolocation
- Wear a tube to measure NO₂

Do we observe worse mental health outcomes in days with higher air pollution levels? Is this affected by noise and green space?



Phase 3

Deployment

Home delivery of kit

1

Apúntate para recibir el kit a través de nuestro sitio web.



Apúntate aquí

2

Un bicimensajero te llevará el kit a tu casa.



3

¡Aprende a usar el sensor, empieza el experimento y disfruta!



Mira cómo se instala

4

Al cabo de unas semanas, pasaremos a buscar el tubo para analizarlo.





Phase 4

Action

Individual results report

This report collects the results of your participation in the Cities Health study. The main idea of the study is to see if attention (measured with a cognitive test), feeling of well-being, stress and quality of sleep are affected by the levels of air pollution of the city. It is also interesting to see if noise and time spent in green or blue spaces affect the results.

NO₂ concentrations have been used to measure pollution levels. NO₂ is a gas that is emitted from the burning of fossil fuels. In cities, NO₂ is a good marker of traffic pollution. In Barcelona it is estimated that 70% of NO₂ comes from traffic. Other ways of measuring pollution, such as the level of fine particles, are less specific, since in addition to traffic they can have other origins (for example, Salomon dust, industry plant discharges, etc.). The main reason for selecting the NO₂ for the study is that it is a better marker of traffic pollution.

In this personal report you will find information on:

- Pollution levels (NO₂)
 - NO₂ levels measured by your tube
 - Comparison with the levels of other participants¹
 - NO₂ levels measured in city stations
 - NO₂ levels estimated with your movements²
- Noise levels and proximity to green or blue spaces in your home. Exposure to noise and green or blue spaces estimated with your movements. Your daily steps counted by your phone
- Your attention test results
- Your daily data on mood, stress and sleep quality

To preserve your privacy, this report is anonymous and does not contain personal information that allows your identification.

The reports of all the participants have been created automatically and therefore not include an interpretation of your particular data. If you have doubts, let us know and we will organize a session to interpret the graphs and results.

NO₂ levels

Results of your tube

Period: 10/24/2020 Sun - 10/31/2020 Sun

The average NO₂ levels measured with the tube you carried for a week are:

NO₂ (tube): 16 µg/m³

The tube only offers a single value for the entire period, it does not allow to see different values for each day.

Both the World Health Organization and the European Union set a maximum for the average annual NO₂ levels in cities of 40 µg / m³.

Levels in the city

During the period in which you carried tubes, the NO₂ levels in the city measurement stations from Barcelona were:



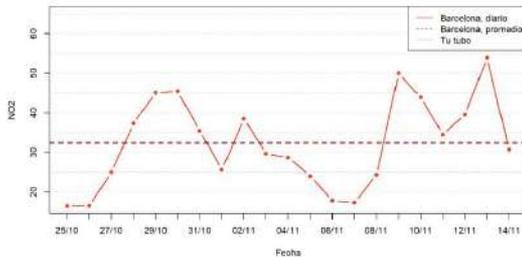
Station	NO ₂ Level (µg/m ³)
Ciutadella 27	27
Poble Nou 38	38
Vall d'Hebron 24	24
Gràcia - St. Gervasi 35	35
Eixample 40	40
Sants 27	27
Pau Rius 22	22
L'Hospitalet 31	31
Badalona 35	35

It should be kept in mind that the stations measure pollution levels at a specific point and at street level. The levels of the tube depend on where you have moved, if you have left Barcelona, the height and orientation of your apartment, the ventilation of the spaces indoors, from other indoor NO₂ sources (boilers, smoke, gas cooker, wood stove, ...), etc.

Individual report results on air pollution and mental health

Each participant received their own personalized results report.

We tested it with a group of community champions before sending it to the rest of the participants to identify what was missing or clarify some concepts.



RESEARCH

Open Access



Co-creating a local environmental epidemiology study: the case of citizen science for investigating air pollution and related health risks in Barcelona, Spain

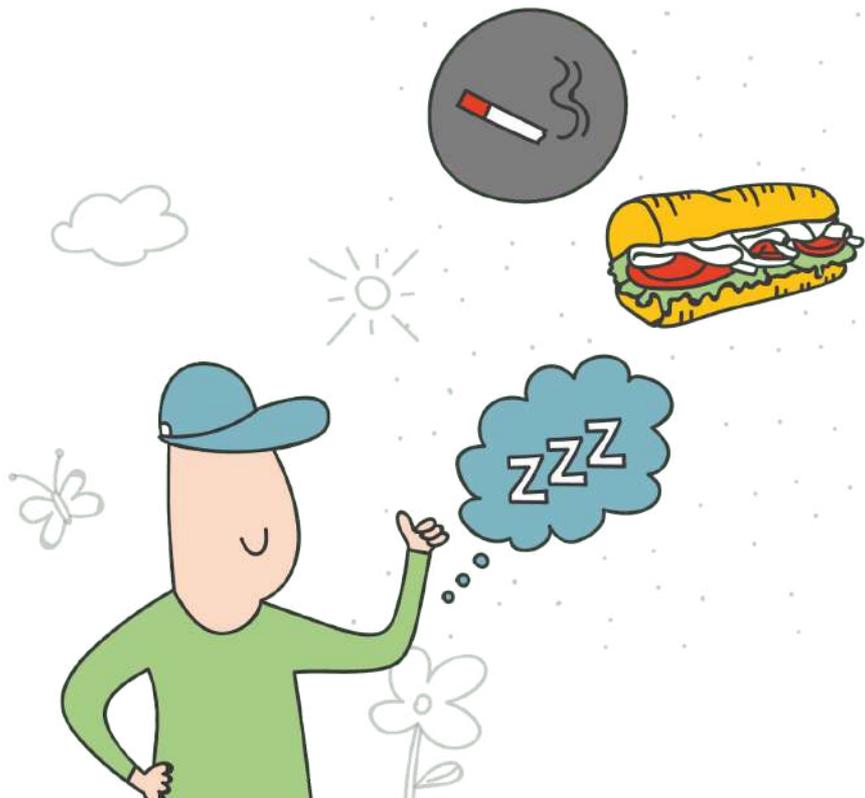
Florence Gignac^{1,2,3}, Valeria Righi⁴, Raül Toran^{1,2,3}, Lucía Paz Errandonea⁴, Rodney Ortiz^{1,2,3}, Mark Nieuwenhuijsen^{1,2,3}, Javier Creus⁴, Xavier Basagaña^{1,2,3*}  and Mara Balestrini⁴

Participants' profile



- ★ Total of **288** participants
- ★ With a mean age of **38 years**
- ★ From **all Barcelona districts**
- ★ The majority of the participants
 - **Women** (70.7%)
 - **University degree** (82.4%)
 - **Non-smokers** or exposed to secondhand smoke (78%)
- ★ During the study period, the majority of our observations (person-day) reported having
 - done **Physical activity**
 - had **Healthy diet**

Participants' profile



- ★ **Not diverse** / representative sample
- ★ **Repeated measurement** study design
- ★ **Each individual serves as their own control** / Compare each individual with themselves on different days
- ★ **Controlled for several factors** such as
 - Day of the week
 - Temperature
 - Psychological status
 - Physical activity
 - Diet
 - Alcohol consumption
 - Time spent in front of the computer

Average levels of nitrogen dioxide (NO₂) during the study period

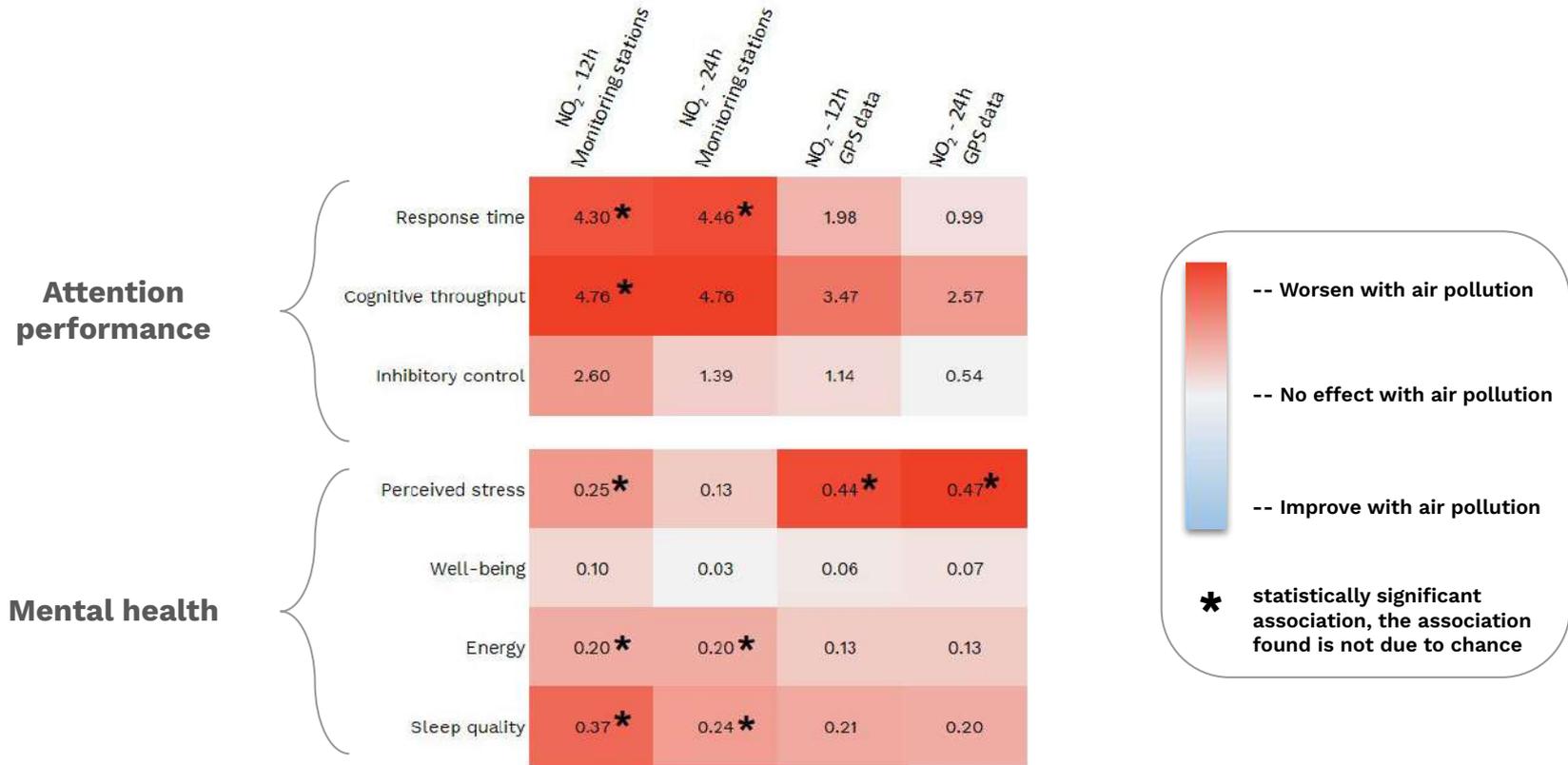
(Sept 2020 to Mar 2021)

NO₂ estimates (µg/m³)	N	Mean (SD)	Min	P25	Median	P75	Max
NO ₂ 12 h – Monitoring stations	3,348	31.0 (13.4)	5.2	21.3	29.5	39.8	85.0
NO ₂ 24 h – Monitoring stations	3,348	30.9 (12.0)	5.8	21.7	30.2	38.4	68.3
NO ₂ 12 h – Using GPS data	3,146	31.2 (14.5)	0.5	20.0	30.1	41.0	91.4
NO ₂ 24 h – Using GPS data	3,151	30.4 (12.4)	0.7	21.3	30.2	37.9	75.1
NO ₂ (168 h ~ 1 wk) – Passive tube	251	26.4 (9.6)	1.8	20.7	25.7	31.0	64.2

New WHO Global Air Quality Guidelines set for NO₂ a 24-hour limit of 25 µg/m³

Key message : Average concentrations of NO₂ found in our study are exceeding the 24-hour limit of 25 µg/m³ recommended by the new WHO Global Air Quality Guidelines

Changes in cognitive and mental health outcomes for each increase of 30 $\mu\text{g}/\text{m}^3$ of NO_2 levels



Changes in cognitive and mental health outcomes for each increase of 30 $\mu\text{g}/\text{m}^3$ of NO_2 levels

Attention performance

	NO_2 - 12h Monitoring stations	NO_2 - 24h Monitoring stations	NO_2 - 12h GPS data	NO_2 - 24h GPS data
Response time	4.30 *	4.46 *	1.98	0.99
Cognitive throughput	4.76 *	4.76	3.47	2.57
Inhibitory control	2.60	1.39	1.14	0.54

Interpretation: The change in response time associated with a 30 $\mu\text{g}/\text{m}^3$ increase in NO_2 (clean day vs polluted day) was equivalent to around **5%** of the observed individual daily variation in response time.

Key message : Attention, measured as response time and cognitive throughput, was associated with short-term exposure to NO_2 and is worse during highly polluted days

Changes in cognitive and mental health outcomes for each increase of 30 $\mu\text{g}/\text{m}^3$ of NO_2 levels

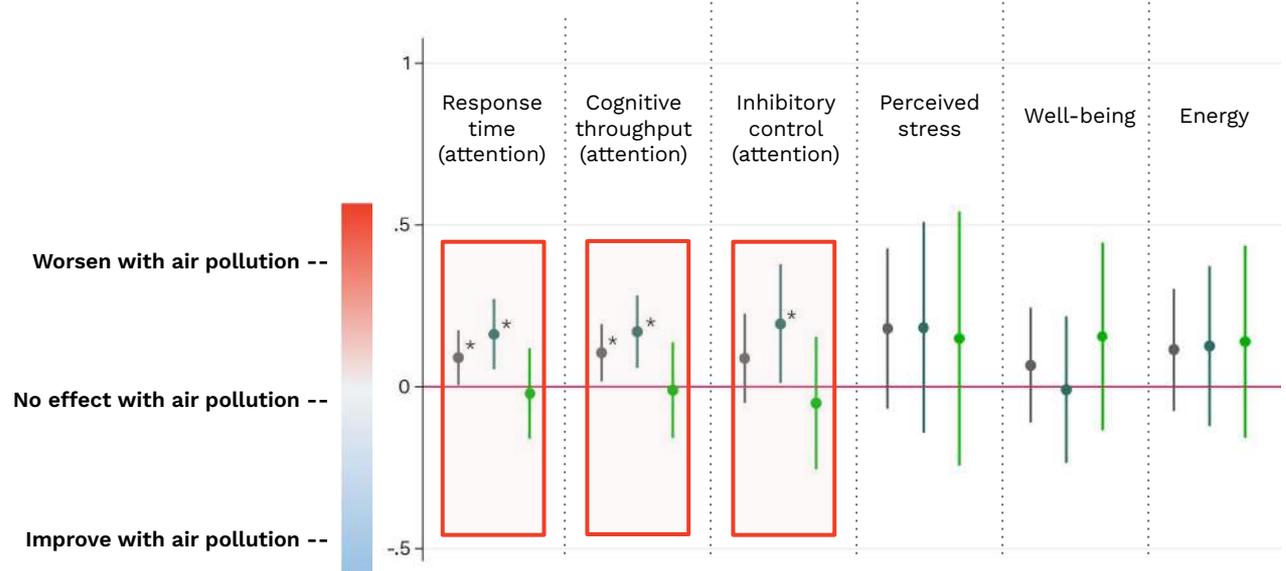
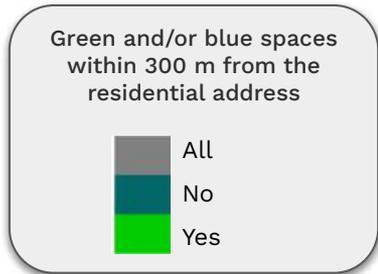
Mental health

	NO_2 - 12h Monitoring stations	NO_2 - 24h Monitoring stations	NO_2 - 12h GPS data	NO_2 - 24h GPS data
Perceived stress	0.25 *	0.13	0.44 *	0.47 *
Well-being	0.10	0.03	0.06	0.07
Energy	0.20 *	0.20 *	0.13	0.13
Sleep quality	0.37 *	0.24 *	0.21	0.20

Interpretation: The difference between a very polluted day and a clean day is of **~0.5 points** (on a scale of 0 to 10) in stress level.

Key message : High perceived stress, low mood rating (energy) and poor sleep quality were associated with short-term exposure to NO_2 .

Results stratified by the presence of natural spaces around the residence



Key message : *There is a possible protective effect of natural spaces against the effect of NO₂ on attention.*



Environment International

Volume 164, June 2022, 107284



Full length article

Short-term NO₂ exposure and cognitive and mental health: A panel study based on a citizen science project in Barcelona, Spain

Florence Gignac^{a, b, c}, Valeria Righi^d, Raül Toran^{a, b, c}, Lucía Paz Errandonea^d, Rodney Ortiz^{a, b, c}, Bas Mijling^e, Aytor Naranjo^f, Mark Nieuwenhuijsen^{a, b, c}, Javier Creus^d, Xavier Basagaña^{a, b, c, g} ✉

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<https://doi.org/10.1016/j.envint.2022.107284>

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Conclusions and implications

- ★ Short-term air pollution exposure is related to small alterations in attention, perceived stress and sleep quality in adults.



These associations support other research findings that suggest air pollution can affect the brain. The size of the observed effects is small but relevant at the population level.



- ★ The presence of natural spaces around the residence may modify the relationship between air pollution and attention performance.



Provide further incentives to design urban areas for the benefits of people's brains.



- ★ The daily average levels of NO₂ observed in this study exceeded those recommended by the WHO.



Adds to the concern about health risk of air pollution in Barcelona and calls for immediate preventive measures



Ljubljana

Noise and health



Phase 1

Identification



Activities conducted

- Face-to-face meeting (demo of tools available)
- Tailored events
- Questionnaires, leaflet



Final research question:

How do the quality of the living environment (with an emphasis on noise) and living habits affect the (mental) health and well-being of individuals?



Phase 2

Design



Mobile apps: questionnaires, cognitive-tests, TAD

Outcome: self-reported levels of stress, mood, sleep quality and activity

SmartWatches & SmartPhone sensors:

Outcome: measured physical activity, heart rate, stress level, noise, activity adjusted dose in time and space

(Low-cost) environmental sensors and health devices:

Outcome: detailed information on exposure and health parameters

Activities conducted

- Data gathering protocols (including user manuals and data collection templates)
- Testing of apps for online data collection, gathering and visualisations (e.g. Ethica data)
- Creation of platform for tracking of sensors and participants, anonymization (Ethica data, NextCloud)

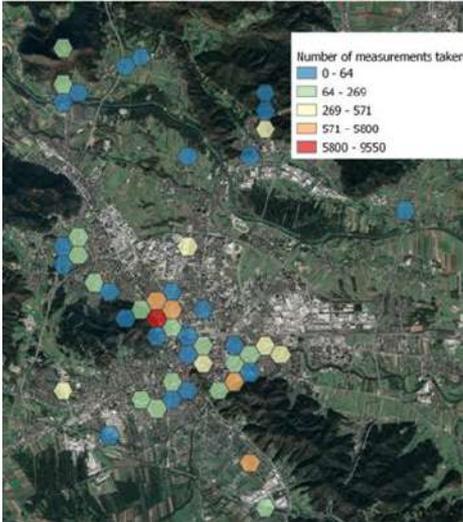
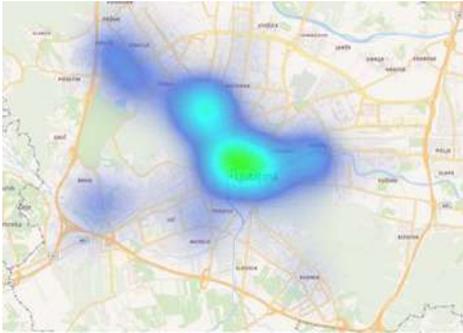
Outcomes of this phase

- Sensors and tools to collect data selected and tested
- Data collection protocol formulated
- Main study/school activities



Phase 3

Deployment



Main study

- 49 participants
- October 2020 – April 2021
- Individual involvement: 7-14 days
- Activities:
 - questionnaires on well-being, sleep, living environment characteristics
 - cognitive tests, noise measurements, PA
- 75 different variables
- 50.000 data points



Phase 3

Deployment

School activities

- 4 research assignments (9 pupils)
- 4 nature days (cca. 200 pupils)
- 2 technical days (cca. 250 pupils)

A

School research assignments



B

Organization of nature day events



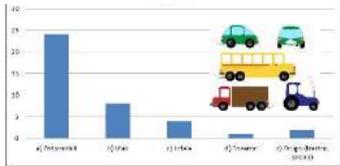
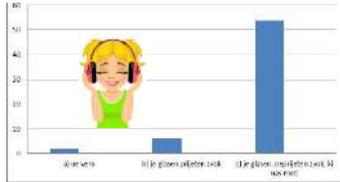
C

Tailored technical-day events:



School curriculum & Technical days

Intro & survey outcomes



Research questions



Article

Citizen Science as Part of the Primary School Curriculum: A Case Study of a Technical Day on the Topic of Noise and Health

David Kocman ^{1,*}, Tjaša Števanec ¹, Rok Novak ^{1,2} and Natalija Kranjec ³

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Received: 28 October 2020; Accepted: 3 December 2020; Published: 7 December 2020



Abstract: In this paper, we summarise lessons learned conducting citizen science (CS) activities within the CityS-Health H2020 project on the topic of noise exposure and health at a primary school in Ljubljana, Slovenia. Activities were organised in the form of a School Tech-Day Event (STDE) as part of the school's curriculum involving second-grade pupils, ages 7–8. The STDE was aligned with the project's methodological framework, which is based on co-creation and co-design principles. To this end, the pupils initially were involved in identifying noise-related issues and translation of selected topics into research questions. Next, together with mentors, they participated in the process of hypothesis formulation and the designing of data collection protocols. Finally, they participated in three focussed noise measurement experiments, as well as data analysis and presentation. We report and critically evaluate the whole chain of activities, focussing on the participant dimension using selected components of the citizen science evaluation framework. The event was very well-received by both pupils and teachers, and their active participation and hands-on experience with scientific processes contributed to their improved scientific literacy. Overall, the demonstrated concept of CS activities has great potential for ongoing inclusion in the school curriculum in its current format, or else adjusted according to specifics from other science and technology fields.

Keywords: citizen science; primary school; school curriculum; noise; health; SDG



ini-symposiu



Assessment & presentation of data





Phase 4

Action

Cities-Health Toolkit: interactive collection of tools

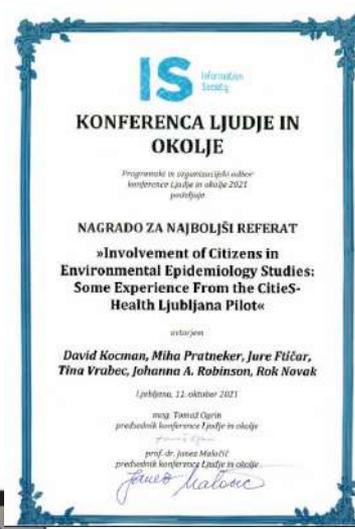
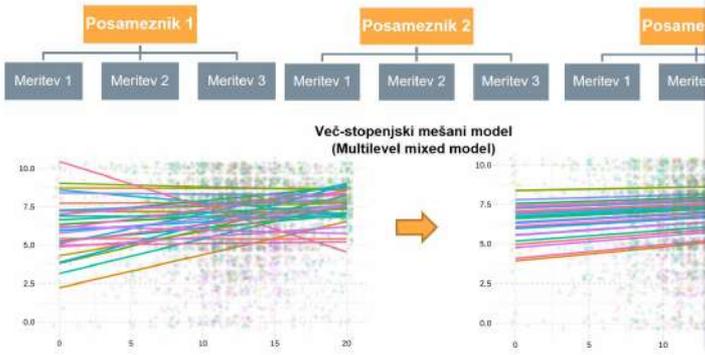
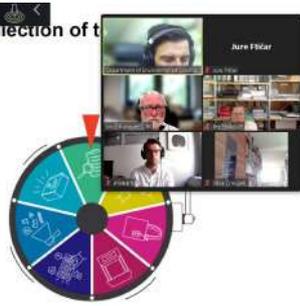
Do you need inspiration?

Spin the roulette and discover new tools to get inspired!

In this toolkit you can find a collection of tools and video tutorials to engage citizens in different stages of a citizen science project. Download the resources needed to carry out the activities and adapt them to your own project goals.

BROWSE ALL TOOLS

citizensciencetoolkit.eu

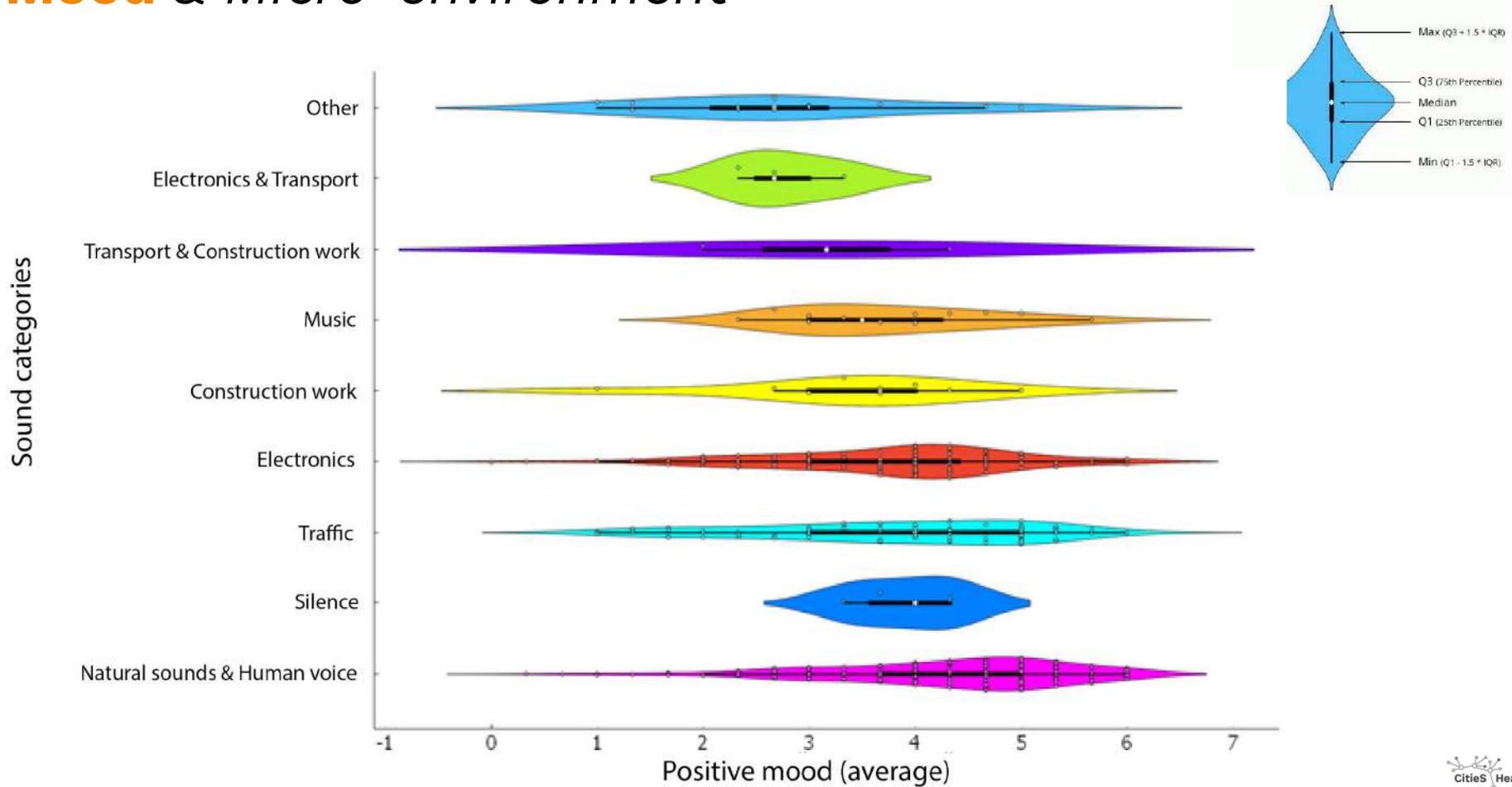


Activities conducted

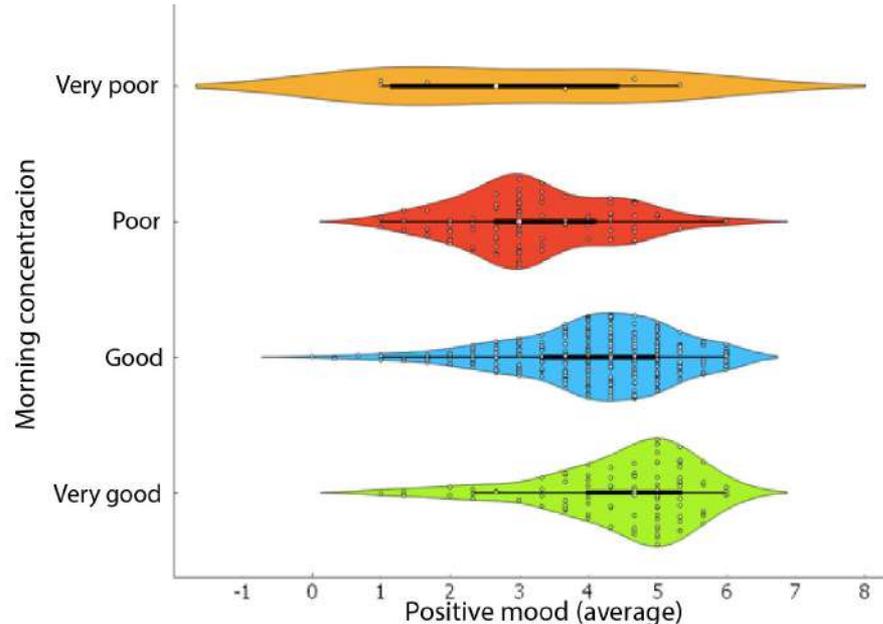
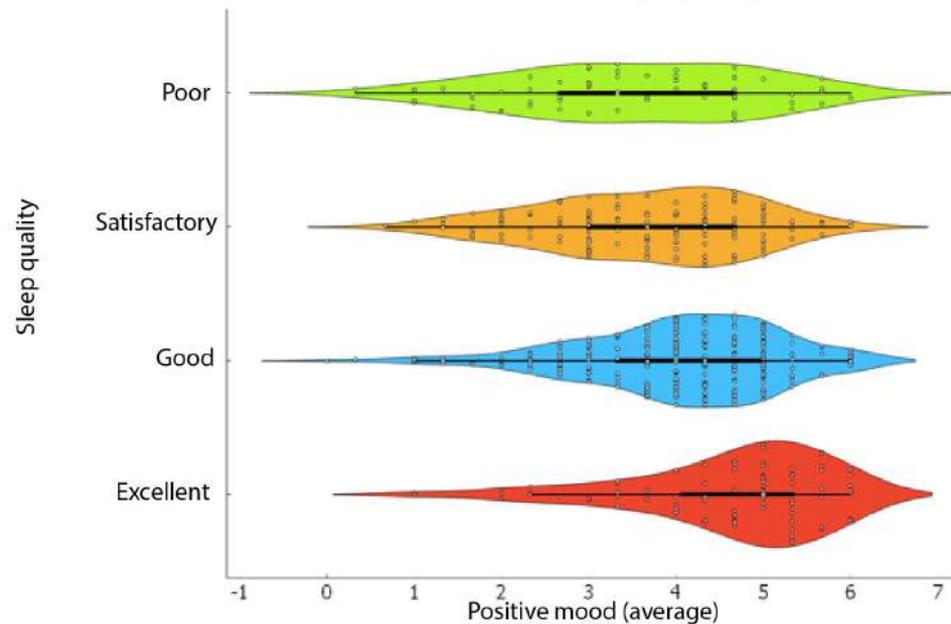
- Dissemination of results at national and international conferences (online)
- Workshops for participants and stakeholders (online)



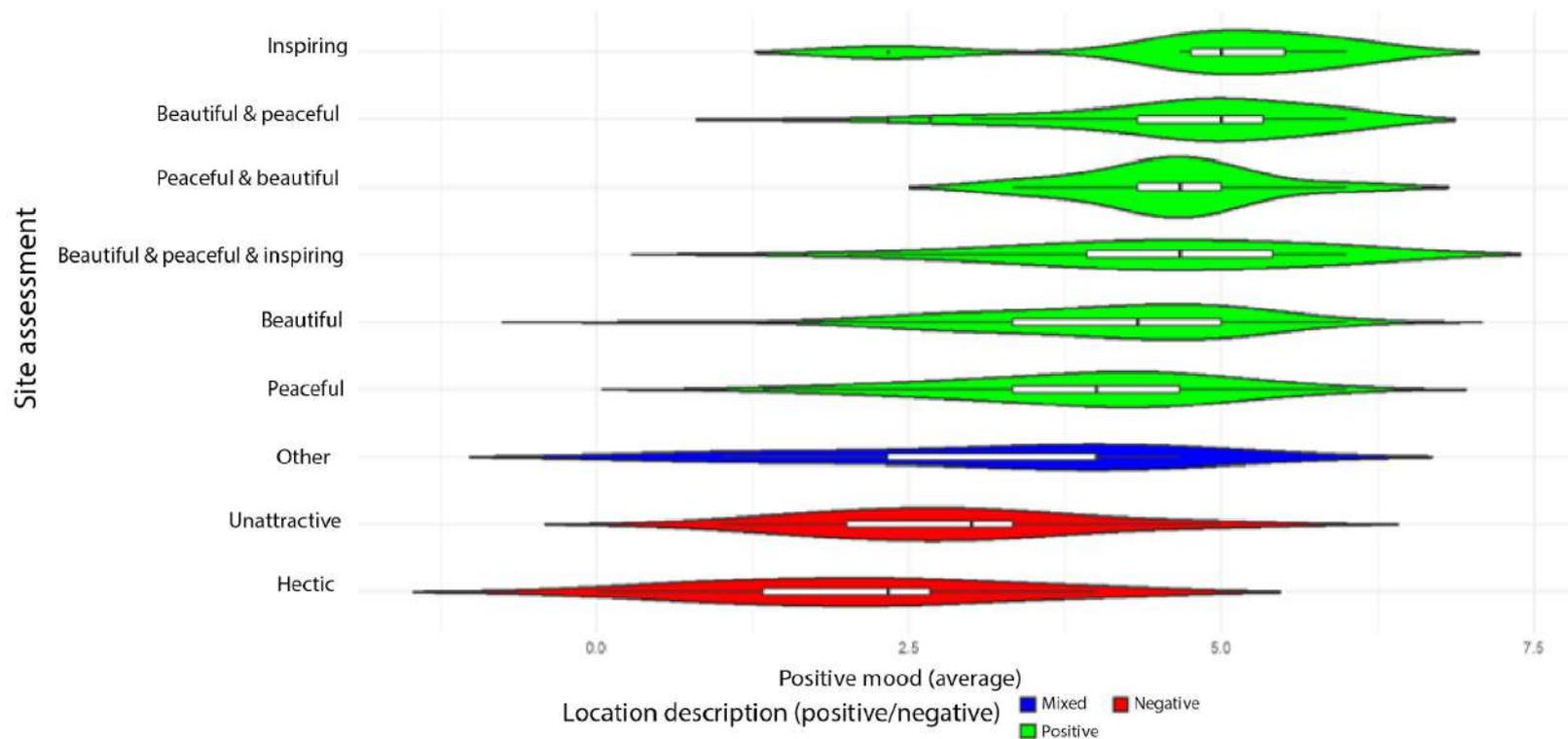
Mood & Micro-environment



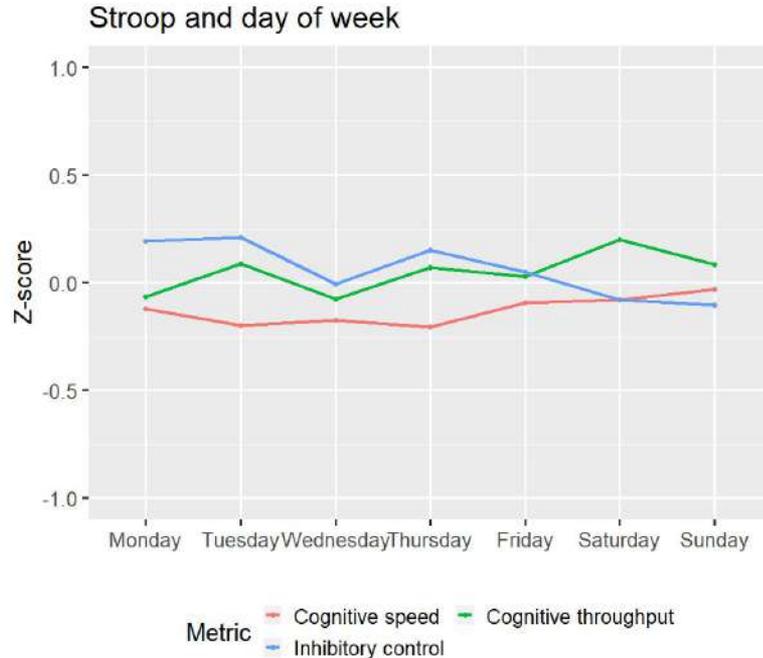
Mood & Sleep quality



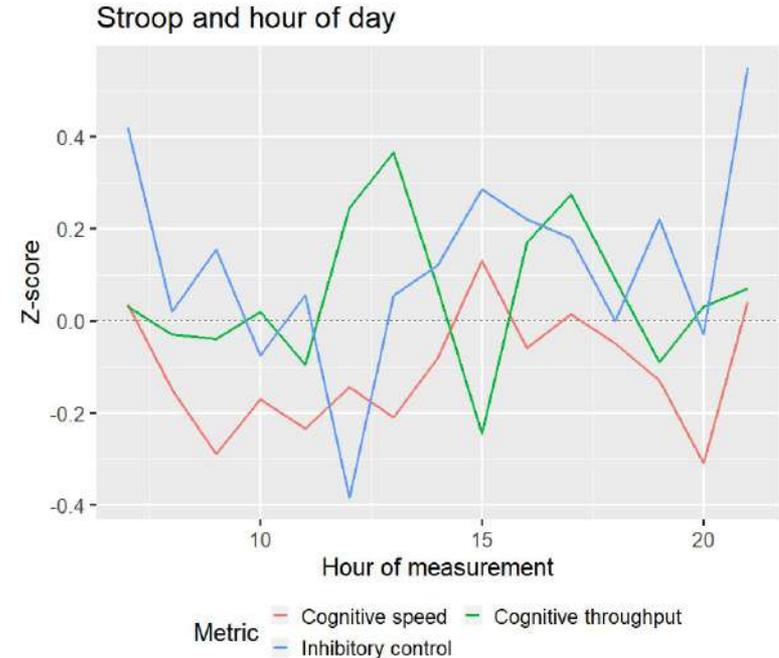
Mood & Subjective perception of micro-environment



Cognitive performance & Day of the week



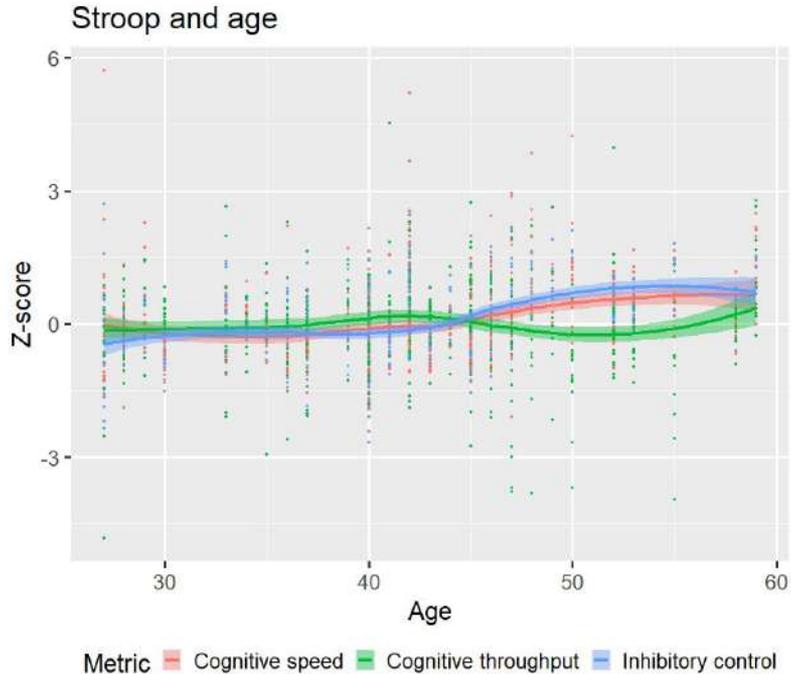
□ **Weekend**



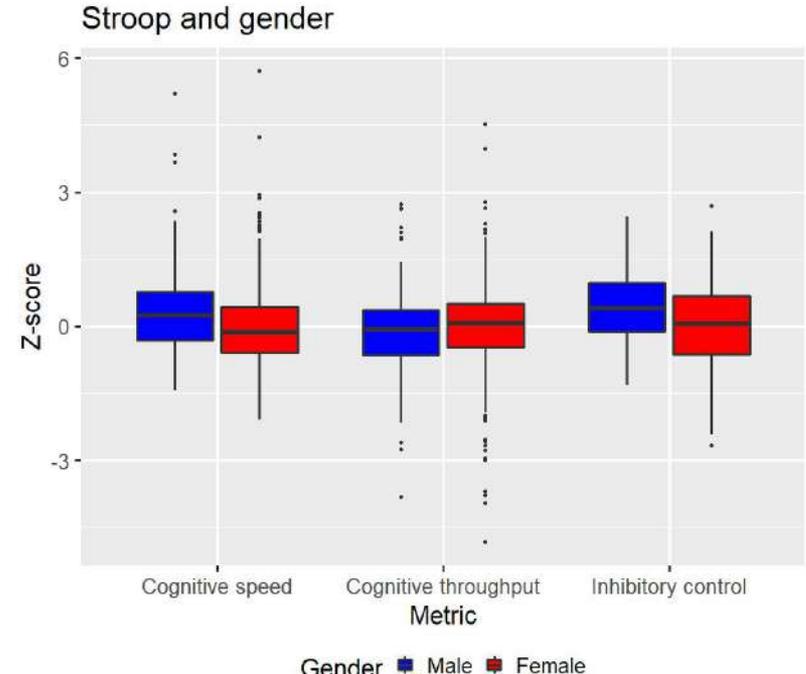
□ **Afternoon**



Cognitive performance & Age/Gender



▭ Ageing



▭ Female

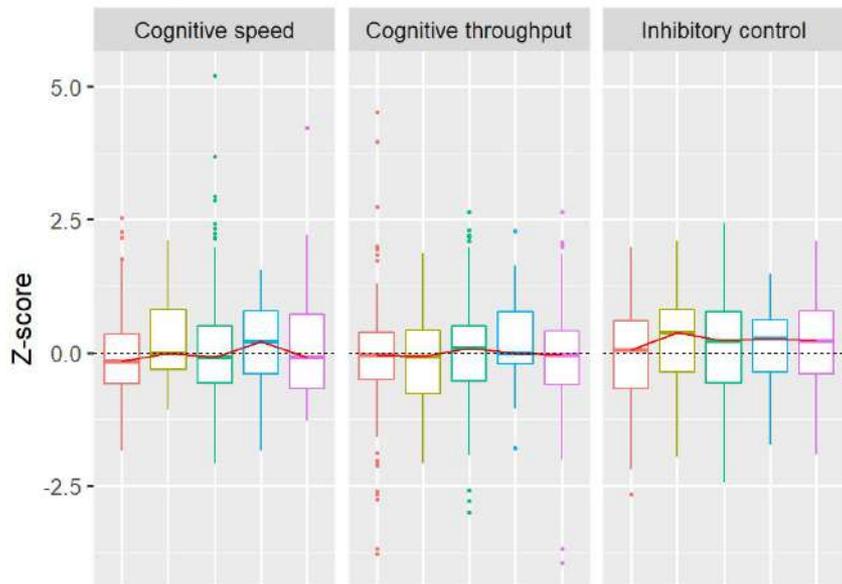


▭ Male



Cognitive performance & Activity/Sleep quality

Stroop and activity

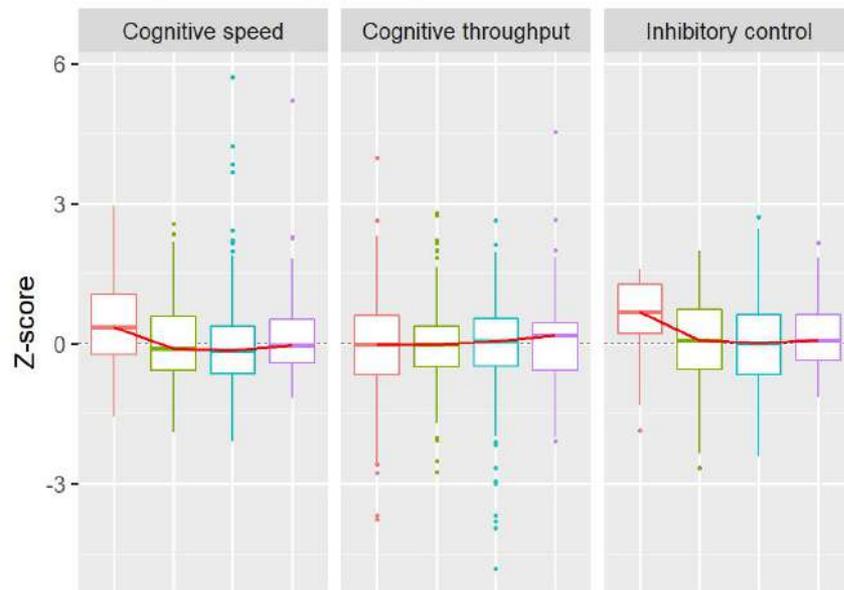


Activity ■ Work/study ■ Other ■ Relaxing
■ Recreation ■ Housework

 Work activity



Stroop and sleep quality



Sleep quality ■ Poor ■ Satisfactory
■ Good ■ Excellent

 Poor sleep quality



Conclusions and implications

- ★ Well-being of individuals is affected by their activity and specifics of the micro-environment.
- ★ Positive feelings are positively correlated with outdoor activities when people spend leisure time, during the weekend, or when they are more rested. In addition, positive correlations were found between noise levels and feelings of energy and happiness.
- ★ Negative mood is associated with work activity and, in the case of poorer sleep quality (worse restedness).
- ★ In general, the results of the momentary measurement of noise level and perception of the acoustic environment did not show statistically significant correlations with the parameters of well-being and cognitive abilities; however, they clearly indicate that the perception of the acoustic environment depends mostly on the subjective perception of the individual.
- ★ The results of the cognitive test revealed that cognitive abilities are mostly influenced by:
 - ★ age (decreasing with age)
 - ★ rest (cognitive abilities throughout the day are better when people sleep better or wake up more rested, respectively),
 - ★ spending time at home for leisure;
 - ★ Gender, with females in general having better cognitive performance than man.

Lucca

Air pollution and Health

Pilot study of Lucca

<https://www.ariadiricerca.it/>



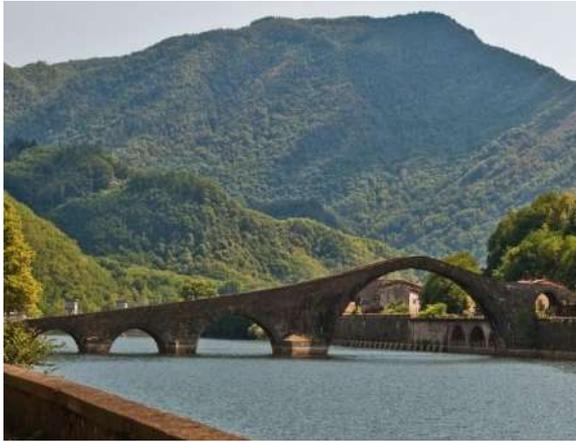
Study area



Partners



Environmental and Human Health in the Serchio Valley



The area was chosen because:

- Area with natural reserves
- Area with high levels of environmental pollutants
- High rates of mortality for chronic illnesses & high prevalence of chronic degenerative diseases





Phase 1

Identification **Open meetings**



16° May 2019



3° December 2019



20° June 2019



1st July 2019

- All phases discussed with citizens
- Public debates on:
 - Presence of heavy metals & other soil and air pollutants
 - How to engage citizens in risk governance
 - Ethical aspects and challenges of participatory research
- Implication of mayors, regional health and environment authorities, 21 associations, and a Citizens' Committee

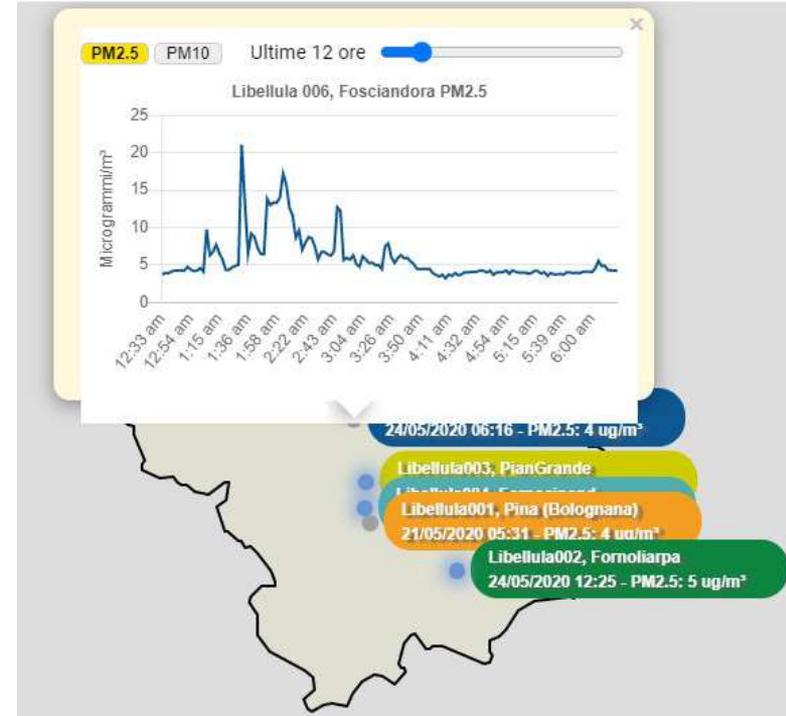


Identification Implementing an environmental self-monitoring network

Citizen science initiative which built a **network of low-cost DIY sensors** to monitor the concentration of respirable and fine particles, **PM 10 and PM 2.5**.

Objectives

- to obtain a **more detailed picture of air pollution**
- to obtain information about localized pollutant sources
- to **raise awareness**.
- make information available to everyone





Phase 1

Identification **Survey on health status and environmental conditions**

Sociological survey to find out what citizens think about the health conditions, the situation of the environment and the relationship between the two in the Valley.



**University Research
Ethics Commission,
University of
Florence**

Outcomes

- 922 participants (1 in 60 inhabitants)
- Air pollution (72%) and soil pollution (56%) major concerns of responders
- 66% knew people who reside in the Serchio Valley and have a kidney disease or disorder.
- 52% believe there is a link between pollution and kidney function





Phase 2

Design

11th December 2019. Event to collaboratively decide which diseases to investigate



It was agreed to focus on **chronic kidney diseases** for the following reasons:

- It is a frequent disease among the Valley's population
- Heavy metals are toxic for the kidneys

Study design

Measure the frequency of kidney disease through urine tests and a blood tests in a sample of inhabitants of the Valley.

Study protocol co-authored by citizens



Phase 2

Design Round table of mayors from the eight municipalities

Round table of mayors from the eight municipalities discussing about potential scenarios in light of the epidemiological study on renal function.

Public implication key to ensure transparency in decision-making processes.

Outcomes

A. Biggeri, B. De Marchi, G. Donzelli, A. Ficorilli, P. Fusco, G. Malavasi, C. Doccioli, C. Campani, V. Amadei, F. Angelini, P. Andreuccetti, M. Giannini, M. Lunardi, D. Saisi, A. Talani. Aria di ricerca in Valle del Serchio: scenari e implicazioni. *Epidemiologia & Prevenzione*. 2021, 45(1-2).
<https://doi.org/10.19191/ep21.1-2.p022.034>. Some citizens and mayors are included among the authors.

Study protocol reviewed by external experts - presented their observations in a public event



Phase 3

Deployment

The outpatient clinic and the recruitment campaign



It required setting up two outpatient clinics to collect and store human biospecimens.

Collective endeavour of researchers, citizens and local health professionals.

Local citizens, health professionals, and biologists recruited and trained to collect samples.

1060 citizens participated in the epidemiological study (donors)

Presentazione del progetto a Borgo a Mozzano
18 febbraio 2022 - Ore 21:00

**ARIA DI RICERCA
IN VALLE DEL SERCHIO**
PRESENTAZIONE DEL PROGETTO DI RICERCA PARTECIPATA

VENERDI 18 FEBBRAIO 2022, ORE 21.00
Salute nella festa - La Casertina della Malata Via Roma, Borgo a Mozzano (Arezzo)

PROFESSOR ANDREOLICETTI - Sindaco Comune di Borgo a Mozzano
GIUSEPPE BRUNO - Governatore Municipalità di Borgo a Mozzano
LORENZO BRIGANDI - Presidente Commissione "Sicurezza, patrimonio civile, volontariato" Comune di Borgo a Mozzano
ANNALESE BUGGERI - Epidemiologa & Psicologa
ROMA BERTOLINI - Responsabile ambulatorio di Borgo

INAUGURAZIONE AMBULATORIO
SABATO 19 FEBBRAIO 2022, ORE 10.30
presso la sede della Municipalità di Borgo a Mozzano, Via S. Francesco, 1

LE ASSOCIAZIONI E I CITTADINI SONO INVITATI A PARTECIPARE

IN COLLABORAZIONE CON I COMUNI DI:

IN COLLABORAZIONE CON I COMUNI DI:

Aperto l'ambulatorio per la rac...
Guarda più... Condividi

Guarda su YouTube

Vuoi partecipare attivamente al progetto?
Contattaci per sapere come fare:
scrivi a info@ariadincerca.it oppure clicca sul bottone:

[Contattaci](#)



Phase 4

Action

Historical reconstruction of the relationship between industry and society in the valley



Historical research

Oral interviews to 23 subjects.

Epidemiologic study

Context

- Environmental exposure to low levels of cadmium is associated to impaired renal function.
- A raised frequency of mortality and hospital admission for urinary diseases are documented in the Serchio Valley.
- A putative pollution source (copper foundry) active for more than one century, is located in the Serchio Valley.

Objective

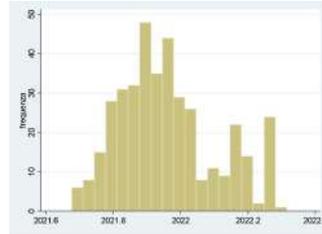
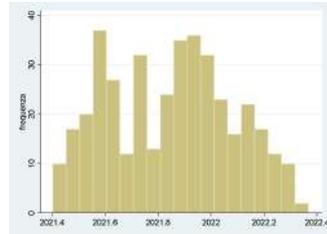
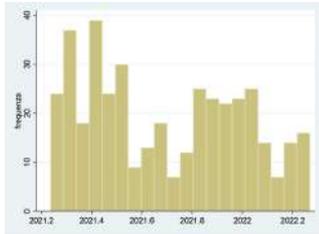
- The study aims to measure glomerular filtration rate by serum creatinine concentration in a sample of residents in the Serchio Valley.

Materials and Methods

- The study is cross-sectional. A stratified (age, gender, municipality of residence) random sample was drawn from the demographic files.
- After collecting their informed consent, an interview on life styles, occupational history and diet was administered by telephone. Clinical measurements and urine and blood sample were obtained at a following stage.
- Biologic specimens were stored and conferred to a biobank.
- Statistical analysis provides summaries of glomerular filtration rate (GFR) and potential association with subject characteristics. According to international protocols we used two different formulae (MDRD and CKD_EPI) to transform serum creatinine to GFR measurements.

Results: study sample

Age class (years)	Men	Women	Total
18-39	37/156	63/156	100/312
40-49	27/106	45/106	72/212
50-59	62/106	61/106	123/212
60-69	30/106	40/106	70/212
70+	22/56	13/56	35/112
Total	178/530	222/530	400/1060



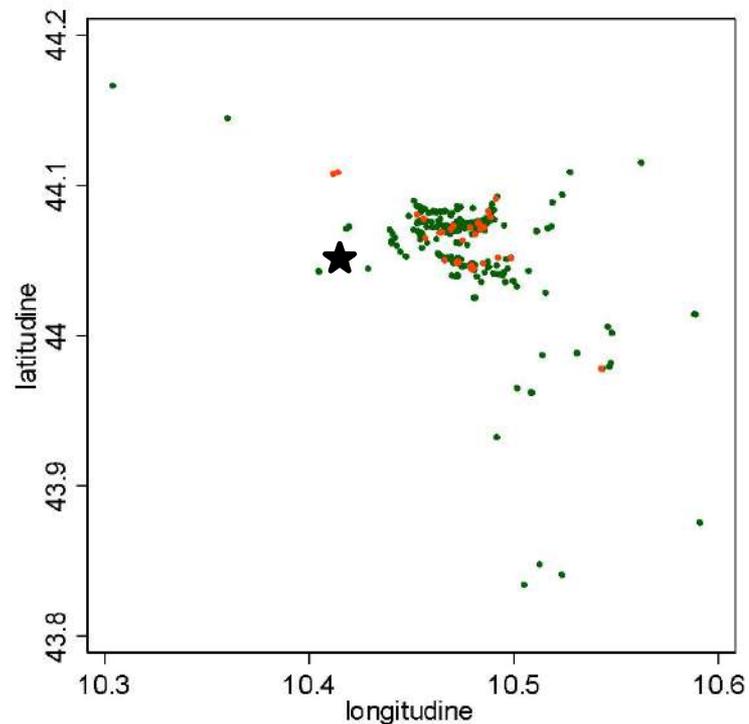
recruitment 03/2021 interview 04/2021 biobanking 08/2021

Results: summary statistics

Glomerular filtration rate (ml/min) (CKD_EPI)			
Age classes	Reference values	Study sample	
		Mean	Interquartile range
20-39	110	103	94-113
40-49	99	88	80-97
50-59	93	83	75-92
60-69	85	77	70-87
70+	75	61	53-70

Results: association estimates

	Glomerular filtration rate (ml/min; %) (CKD_EPI)	
	Difference	90% Confidence Interval
Diabetes	16 (8%)	6;26 (3-13%)
Hypertension	20 (10%)	14;24 (7-12%)
Work history	10 (5%)	0;17 (0-8.5%)
Distance<2km	5 (2.5%)	0.5;10 (0-5%)



Conclusions

- In the sample of 400 residents in the Serchio Valley, the glomerular filtration rate (ml/min) had an average value of 86 (interquartile range 75 - 97). In studies of populations living in areas with environmental exposure to heavy metals, average values varied between 88 and 120.
- Diabetes, Hypertension, working in the copper foundry or residence in the vicinity of the plant turned out as the most associated factors with decreased kidney function.
- As a result of the project, the issue of renal health is now a reality in the social context of the area and for the local administrators and the institutions.

Kaunas

City design and health

Kaunas pilot



Aims

- Know how the urban design and physical activity affect citizens' health and well-being.
- Outline the **citizens' concerns** and place them at the center of citizen science research
- Enhance participants' understanding of environmental and behavioral issues that affect personal and community health.





Phase 1

Identification



Activities conducted

- **Reach to communities** through mass media information, radio lecture, announcements in local website
- Open Pilot study kick-off meeting to identify health & environmental citizens' concerns, potential research questions.
- **Build the study community** - engage participants and stakeholders.
- Translate participants' concerns into potential **research questions**.



Phase 1

Identification



Outcomes of this phase

- Participants **environmental concerns** were: traffic related air pollution, truck noise, car-parking problems, deficiency in yard green zones, unfitted pathways for motional disabled persons.
- **Health concerns:** sleep disorders, hypertension, cardiac problems, obesity, diabetes, back pain.
- **Final research question:**

Why do citizens in my district suffer from hypertension more often than in the other ones?



Phase 2

Design



Activities conducted

- Meeting to build Pilot study research protocol.
- Campaign to discuss the data collection protocol, tools and governances protocol.
- ◆ Tested sensors and tools to collect data. Sensors-watches to track the physical activity, walking distance, the number of calories burn, heart rate and sleep quality.
- Harmonize documents for the Bioethics Committee approval.





Phase 3

Deployment



Activities conducted

- Face-to-face interview (580 citizens):
 - ◆ Socio-demographic characteristics
 - ◆ Environmental residential characteristics
 - ◆ Perceptions
 - ◆ Physical activity
 - ◆ Health
- Geographic Information Systems to evaluate neighborhood quality at the district level.
- Elaborated questionnaire for evaluating the pilot



Phase 3

Deployment

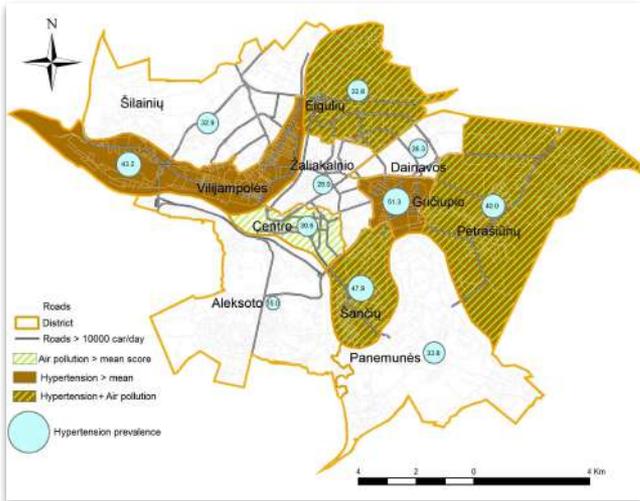


Fig. 1. Spatial distribution of the perception of air pollution and the prevalence of hypertension

Outcomes of this phase

- We could plot district-level information on map to explore spatial patterns:
 - ◆ citizens perceptions on air pollution
 - ◆ traffic flows
 - ◆ percentage of hypertension
- No obvious associations at district level.
- In the next step, use collected individual-level data to assess associations.



Phase 4

Action



Article
Measuring the Outcomes of a Participatory Research Study: Findings from an Environmental Epidemiological Study in Kaunas City

Regina Gražulevičienė^{1*}, Sandra Andrušaitytė^{1*} and Karolina Kaparavičienė¹



Article
Neighborhood Social and Built Environment and Disparities in the Risk of Hypertension: A Cross-Sectional Study

Regina Gražulevičienė^{1*}, Sandra Andrušaitytė^{1*}, Tomas Gražulevičius¹ and Aušra Dedele¹

Department of Environmental Science, Vytautas Magnus University, R. Štoviškio 16, 44049 Kaunas, Lithuania; * Correspondence: regina.grazuleviciene@vdu.lt (R.G.); sandra.andrusaityte@vdu.lt (S.A.)



Article
Urban Environment and Health: A Cross-Sectional Study of the Influence of Environmental Quality on Blood Pressure

Regina Gražulevičienė^{1*}, Sandra Andrušaitytė^{1*}, Aušra Dedele¹, Karolina Kaparavičienė¹, Vibeke Kaparavičienė¹ and Inga Borskaitė¹



Article
Environmental Quality Perceptions and Health: A Cross-Sectional Study of Citizens of Kaunas, Lithuania

Regina Gražulevičienė^{1*}, Sandra Andrušaitytė^{1*}, Aušra Dedele^{1*}, Tomas Gražulevičius¹, Lenas Vaitas¹, Vibeke Kaparavičienė¹ and Inga Borskaitė¹



28th International Scientific-Practice Conference
HUMAN AND NATURE SAFETY 2022
4–6 May, 2022

CERTIFICATE

This is to certify that

Sandra Andrušaitytė, Regina Gražulevičienė, Aurimas Rapalavičius, Audrius Dedele

attended 28th International Scientific-Practice Conference

HUMAN AND NATURE SAFETY 2022

and presented a report

The Results of International Cities Health Environmental Epidemiological Study in Kaunas City

Chancellor of Vytautas Magnus University
Agriculture Academy

prof. dr. Astrida Miceikienė

Vice-Chairman of the Conference

dr. Gediminas Vasiliauskas

CITIZENS EDUCATION THROUGH PARTICIPATORY RESEARCH LEARNING: A KAUNAS PILOT STUDY

R. Gražulevičienė, S. Andrušaitytė, A. Dedele
Vytautas Magnus University (LITHUANIA)



Article
Environmental Quality Perceptions and Health: A Cross-Sectional Study of Citizens of Kaunas, Lithuania

Regina Gražulevičienė^{1*}, Sandra Andrušaitytė^{1*}, Aušra Dedele^{1*}, Tomas Gražulevičius¹, Lenas Vaitas¹, Vibeke Kaparavičienė¹ and Inga Borskaitė¹

Activities conducted

- The study results were published in 5 international journals
- Created the research protocol: the study association between the urban environmental and health
- Evaluation findings of local participants
- Workshops for participants and stakeholders (hybrid)

Type of tool: Research
Phase: Co-design
RESEARCH PROTOCOL
Defining the overall study beforehand

People involved:
+1000

Duration:
12-24 months

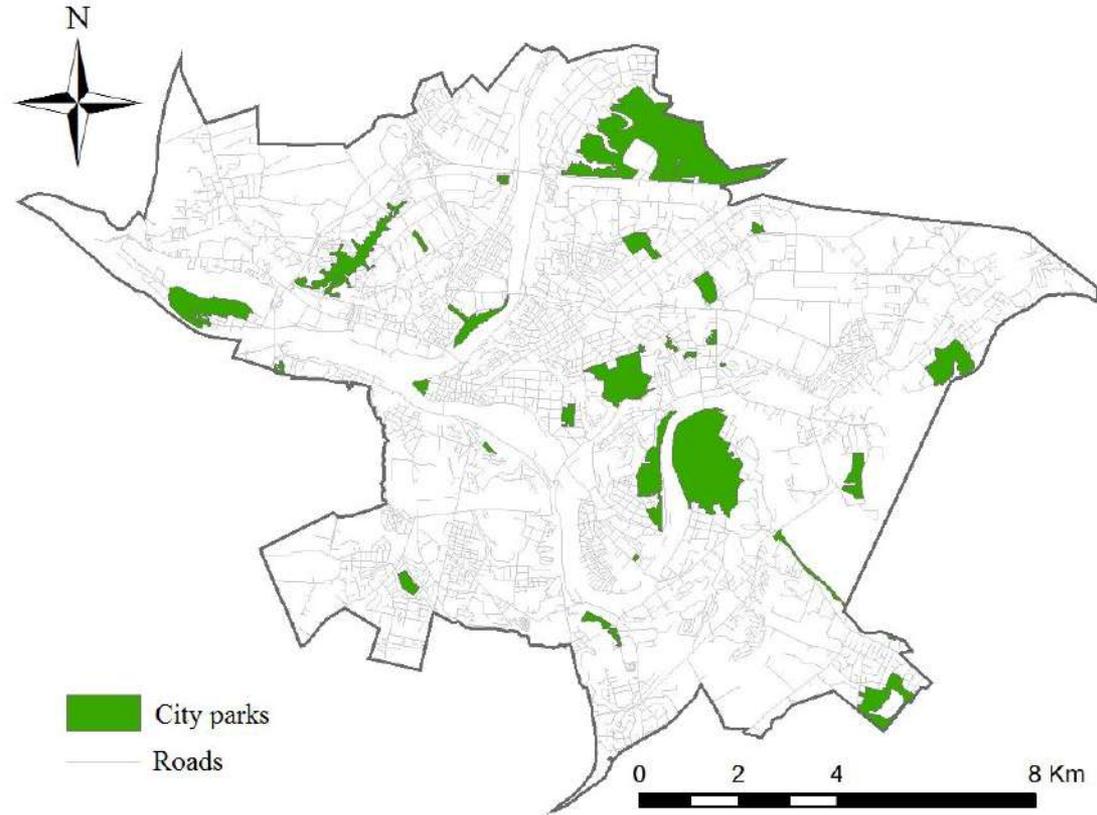
Author:
VDU

Epidemiologic study

- We conducted a cross-sectional study.
- Study sample was 1086 18–74-year-old participants-volunteers residing in 11 districts of Kaunas city.
- Estimated environmental exposure by using GIS, traffic flow, and noise, modeled NO₂, PM_{2.5}, PM₁₀, and greenness NDVI for the participants' home addresses, and determined participants' perceptions of environmental quality.
- Linked information with personal sociodemographic data and health data.
- Used multivariate logistic regression to assess the associations between environmental exposures and health issues in men and women.

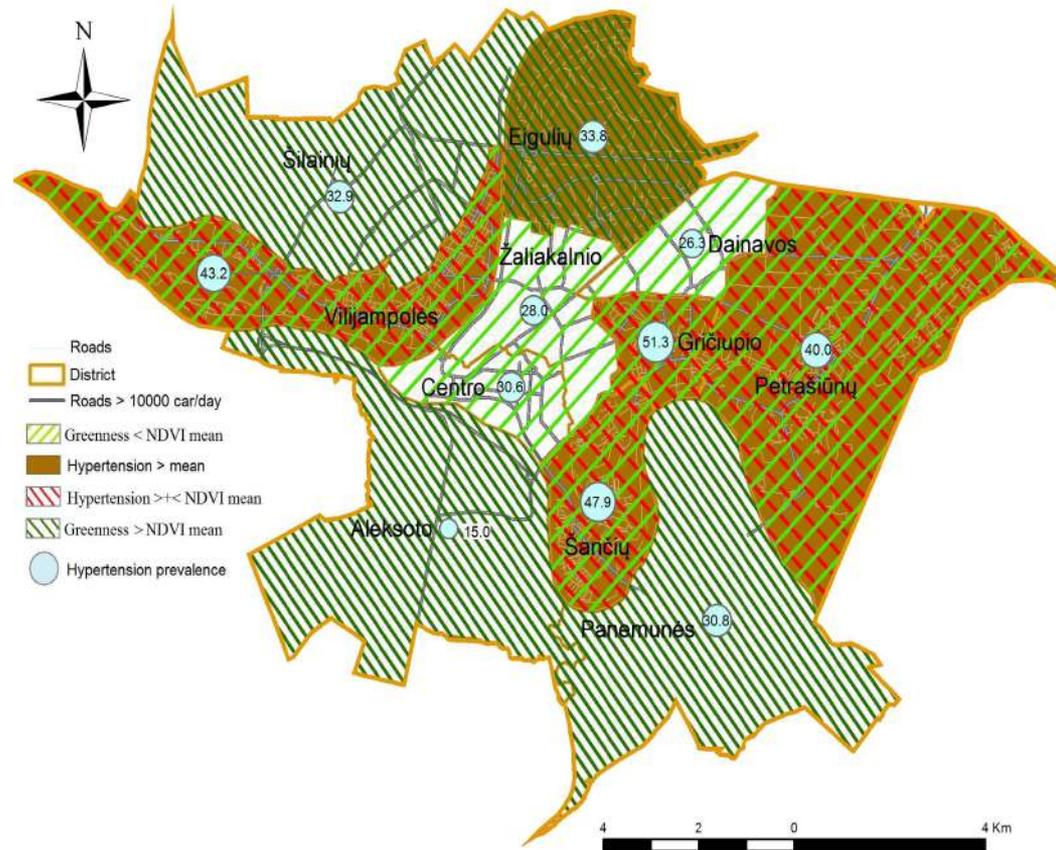
Results

- More than 1000 citizens participated in Kaunas pilot study
- 54% of the respondents were women.
- about 33% of the participants were 18–44 years of age, 62% were 45–64 years of age, and 5.3% were aged 65 years or older.
- As many as 53.1% of all the participants had university degrees



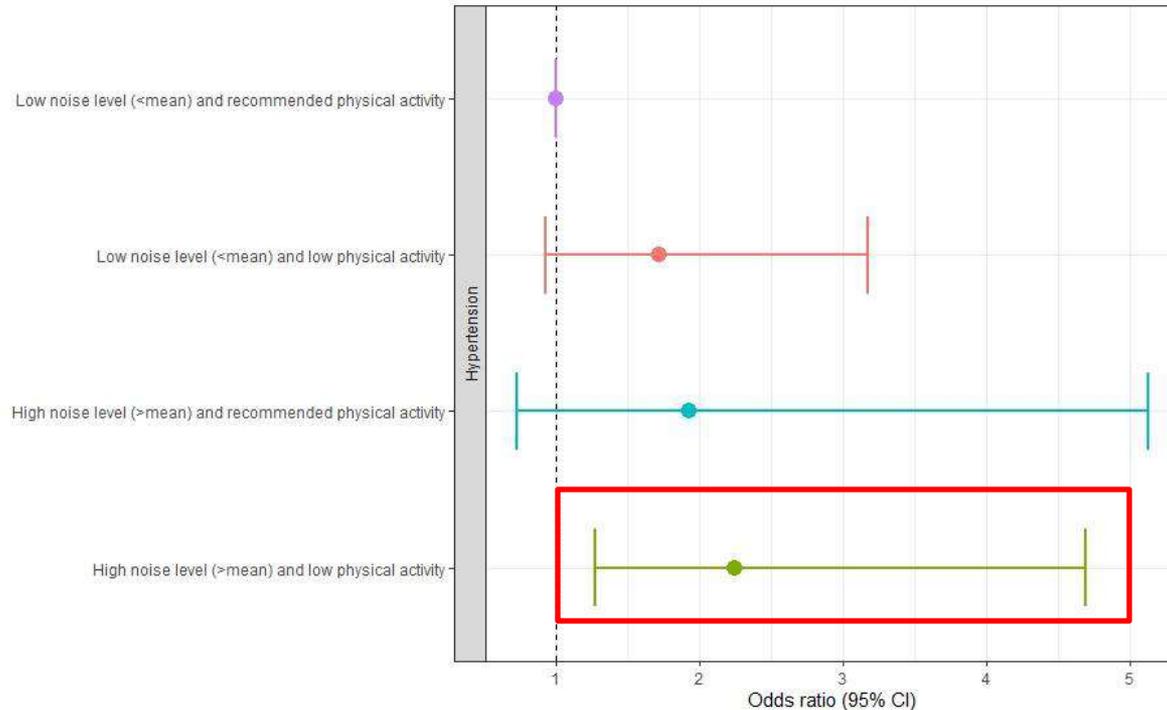
Results: exposure and health

- 28.5% of the participants had been exposed to heavy traffic emissions (above 10,000 cars/day).
- The prevalence of hypertension in the districts ranged from 15.0% to 51.3%.
- The environmental issues associated with hypertension and obesity were poor possibilities to reach green spaces and relaxation areas by walking and low physical activity.



Results

Poorer quality of the built and social environment significantly increased odds ratios for stress, hypertension and low physical activity when age, sex, education status, family status, and smoking were accounted for.



Results

Low SES persons residing in areas with low exposure to green spaces had a significantly higher risk of hypertension when sex, age, family status, smoking, and income were accounted.

Surrounding greenness (NDVI) & education		Odds ratio	95% CI
High greenness level	High education	1	1
	Lower education	1.92	0.95-3.85
Low greenness level	High education	1.65	0.88-3.08
	Lower education	1.83	1.01-3.36

Outcome: message for politicians

- Findings of the epidemiological study suggest that physical activity in green spaces has a positive impact on health.
- Perceived high quality of the neighborhood was found to be associated with better self-rated health, higher acquired knowledge, and higher physical activity levels.
- Urban planning in promoting healthy behavior, among them by creating opportunities for walking to reach the city's green spaces or parks may improve the citizens' health.
- Informal adult environmental education through participatory action research is an important measure to empower citizens to identify environmental problems and define local targets.

Kaunas pilot study main scientific publications

1. Gražulevičienė, R.; Andrušaitytė, S.; Dėdelė, A.; Gražulevičius, T.; Valius, L.; Kapustinskienė, V.; Bendokienė, I. Environmental quality perceptions and health: a cross-sectional study of citizens of Kaunas, Lithuania // International journal of environmental research and public health. Basel: MDPI, 2020, vol. 17, iss. 12, 2020, p. 1-14, ISSN 1660-4601. [doi:10.3390/ijerph17124420](https://doi.org/10.3390/ijerph17124420)
2. Gražulevičienė, R.; Andrušaitytė, S.; Gražulevičius, T.; Dėdelė, A. Neighborhood social and built environment and disparities in the risk of hypertension: a cross-sectional study // International journal of environmental research and public health. Basel: MDPI, 2020, vol. 17, iss. 20, 2020, p. 1-16, ISSN 1660-4601. [doi:10.3390/ijerph17207696](https://doi.org/10.3390/ijerph17207696)
3. Gražulevičienė, R.; Andrušaitytė, S.; Dėdelė, A.; Gražulevičius, T.; Valius, L.; Rapalavičius, A.; Kapustinskienė, V.; Bendokienė, I. Urban environment and health: a cross-sectional study of the influence of environmental quality and physical activity on blood pressure // International journal of environmental research and public health. Basel: MDPI, 2021, vol. 18, iss. 11, 2021, p. 1-15, ISSN 1660-4601. [doi:10.3390/ijerph18116126](https://doi.org/10.3390/ijerph18116126)
4. Gražulevičienė, R.; Andrušaitytė, S.; Rapalavičius, A. Measuring the outcomes of a participatory research study: findings from an environmental epidemiological study in Kaunas city // Sustainability. Basel: MDPI AG, 2021, vol. 13, iss. 16, 2021, p. 1-15, ISSN 2071-1050. [doi:10.3390/su13169368](https://doi.org/10.3390/su13169368)
5. Gražulevičienė, R.; Andrušaitytė, S.; Rapalavičius, A.; Dėdelė, A. Environmentally related gender health risks: findings from citizen science cross-sectional study // BMC Public health, 2022, t. 22, nr. 1, p. 1 - 14, ISSN 1471-2458. [doi:10.1186/s12889-022-13824-3](https://doi.org/10.1186/s12889-022-13824-3).
6. <https://citizensciencetoolkit.eu/>

More information:

<http://citieshealth.vdu.lt/>



Amsterdam

Woodburning and Health

Pilot introduction

Woodburning and Health

- The Netherlands has around 800 thousand active woodstoves and fireplaces.
- Which contribute around 30-39% of the total PM2.5 emissions.
- Woodsmoke is a regular nuisance for roughly 10% of the Dutch population.
- This percentage rises to as high as 64% within the Dutch lung patient population.



Utrecht, Netherlands

Biomass burning and health

Get involved!

[Contact](#)



Phase 1

Identification



Universiteit Utrecht

Zoek in deze site

Het Project Nieuws Contact

Onderzoek samen met burgers
naar luchtverontreiniging en
houtverbranding.

Oproep voor onderzoeksvragen



Rijksinstituut voor Volksgezondheid
en Milieu
Ministerie van Volksgezondheid,
Welzijn en Sport



Strijd mee
voor gezonde lucht
en gezonde longen



GGD
Amsterdam
Public Health Service

Activities conducted

1. Literature and media research into civic concerns
2. Meetings with key organized stakeholders: RIVM, Lung Foundation, Municipal health Service Amsterdam
3. Online “call for research questions” campaign
4. Kick off physical co-creation meetings with citizens in IJburg (a relatively new neighborhood in Amsterdam)
5. Start COVID-19: Moved to online TEAMS meetings and included citizens from all over the Netherlands interested in researching woodburning and health.



Phase 1

Identification



Outcomes of this phase

1. **Identified a clear rift in the community between citizens who burn wood and those that find woodsmoke a nuisance.**
2. Identification of community concerns in IJburg and online participants from across the country.
 - a. Identification of health concern overlap in digital and physical civic communities
3. Formulation of main health related research question
 - a. **What are the short term effects of woodsmoke on respiratory health?**
4. Formulation of additional exposure related research questions.
5. Established a community of interested citizens



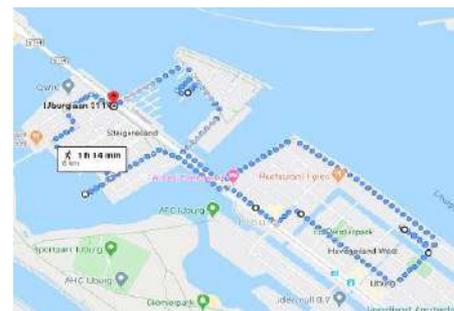
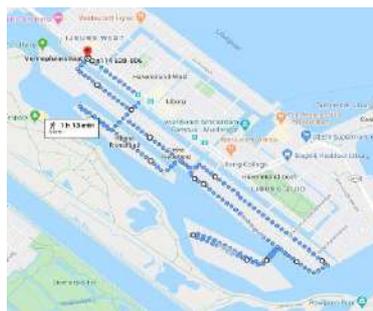
Phase 2

Design



Activities conducted

1. Creation of preliminary design options for questions identified
2. Co-creation meetings with citizen scientists regarding
 - a. Study protocol
 - b. Governance
 - c. Data collection tools
3. Medical ethical clearance for panel study





Phase 2

Design



Outcomes of this phase

- Co-created data collection protocol for all pilot questions
- List of devices needed to collect exposure data
- Pilot governance agreement with citizens
- Medical ethical clearance for panel study





Phase 3

Deployment



Activities conducted

1. Conducted mobile measurements in IJburg (10 walks)
2. Conducted stationary measurements in the homes of people who burn wood and experience nuisance from woodsmoke (12 homes)
3. Conducted a panel study (46 participants)
4. Had data analysis meetings with citizens
5. Had interpretation of results meetings with citizens
6. Circulated CityS-Health impact questionnaire

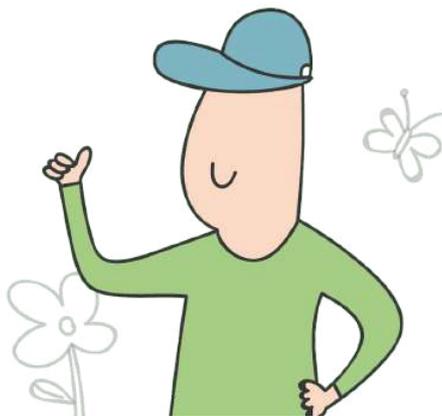
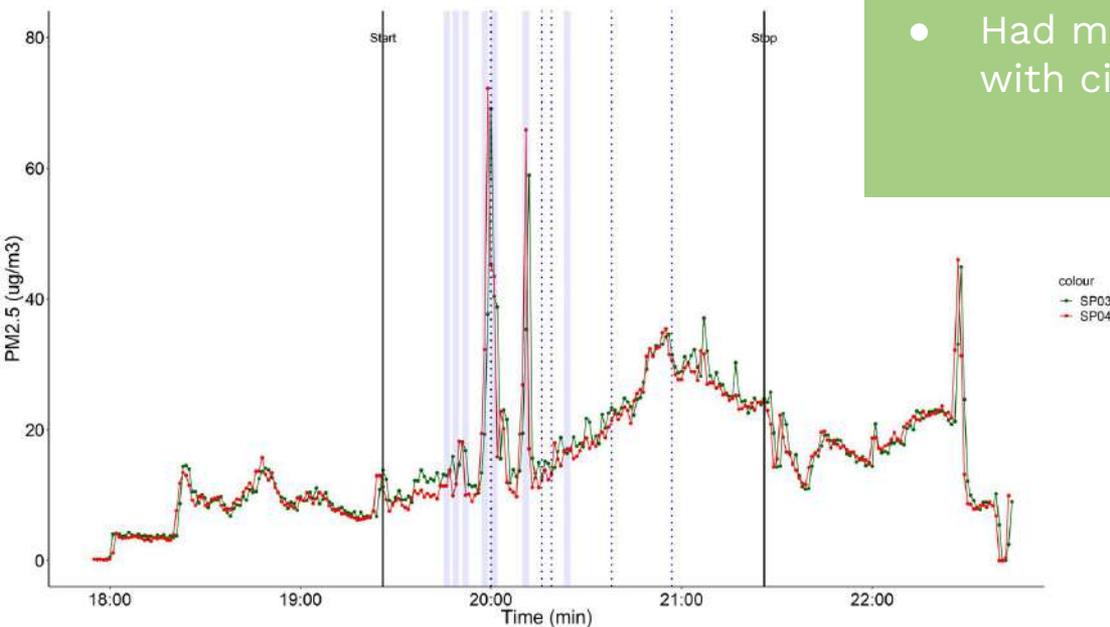


Phase 3

Deployment

Outcomes of this phase

- Collected data for all of the formulated research questions
- Analyzed study data with help from citizens
- Had meaningful and interactive discussions with citizens regarding the results of studies





Phase 4

Action

Gezondheidseffect van houtrook bewezen

Publicatiedatum 30-03-2022 | 15:27



Tweede kamer brief en bijlagen:

[Kamerstukken / Tweede kamer](#)

Persbericht RIVM:

[Gezondheidseffect van houtrook bewezen / RIVM](#)

Samenwerking houtrookonderzoek:

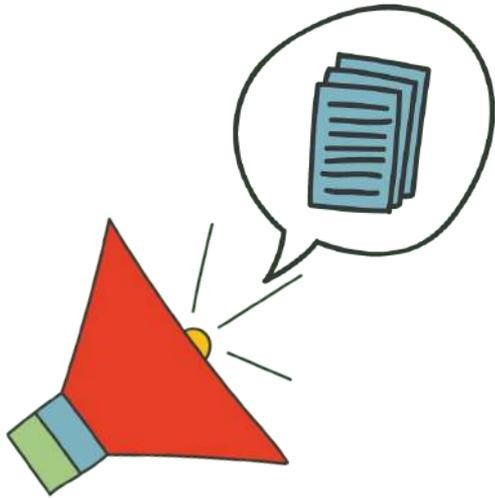
[Samenwerking Houtrookonderzoek / RIVM](#)

Activities conducted

- Dissemination of panel study results by researchers via a policy summary
- Dissemination of results by citizens via:
 - Twitter
 - Organized citizen websites
 - Public policy debates
- Future dissemination of results still ongoing:
 - Scientific articles
 - Short clip
 - Popular article



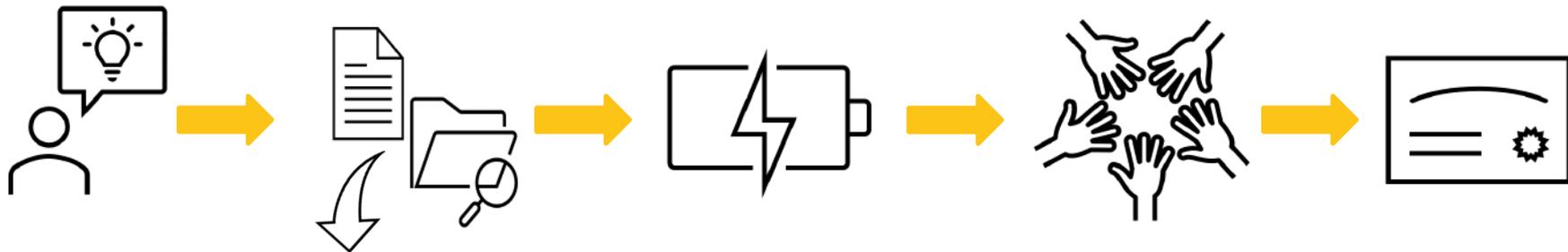
Action



Activities outcomes

- Pilot results were disseminated to various topic relevant platforms
- Citizens were able to use the results produced by the pilot in public and political debates regarding the effects of woodsmoke on respiratory health.
- Pilot results are part of policy debates concerning woodsmoke and respiratory health.

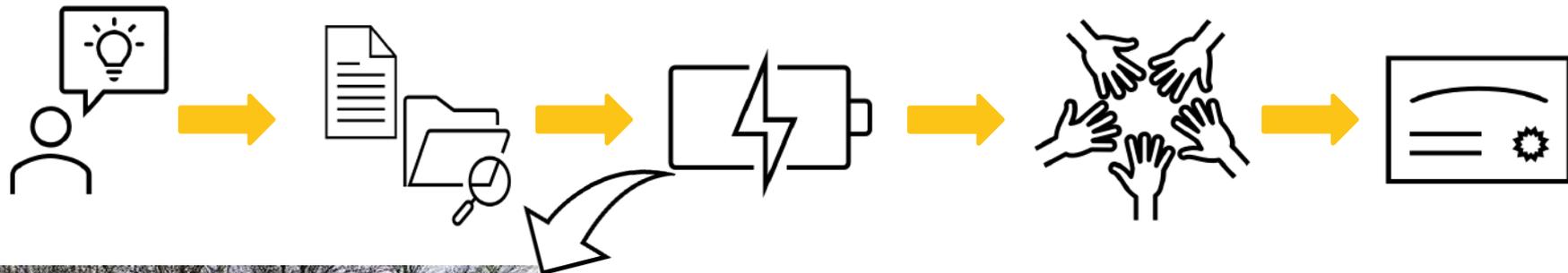
Epidemiologic study



Protocol

- Panel study design (repeated individual observations)
- Daily dairies, 2 spirometry measurements per day, 3 saliva samples on one day per week
- Central monitoring sites (participants must live within 2km radius from central site)
- Over 3 months (February- May 2021)
- 4 Locations (IJburg, Bergen, De Meern, Zutphen)

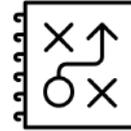
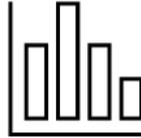
Epidemiologic study



Data collection tools

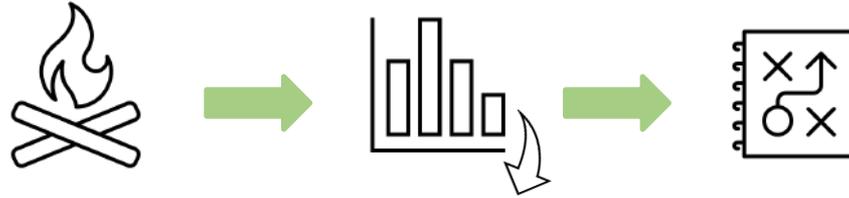
- Leckel/Derenda for filter based Levoglucosan
- Sidepack AM520 for particulate matter (PM_{2.5})
- DiscMini for Ultrafine particles (UFP)
- Aethalometer MA200 for black and brown carbon (BC/BrC)
- Daily diary observation for woodsmoke smell to indicate

Results



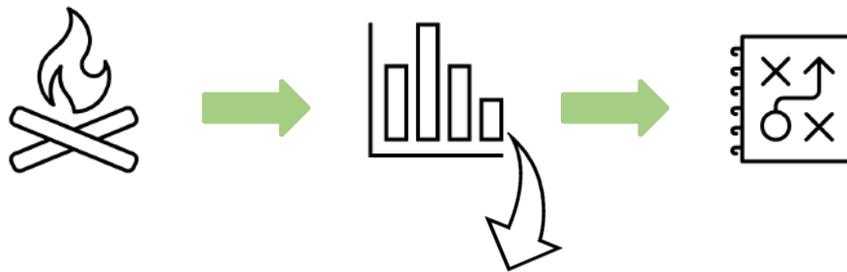
Characteristic	
N	46
Age, years (mean (SD))	60.9 (9.6)
Female (%)	25 (54.3)
Ex-smoker (%)	28 (60.9)
Study locations	
Bergen (%)	8 (17.4)
De Meern (%)	7 (15.2)
IJburg (%)	10 (21.7)
Zutphen (%)	21 (45.7)
COPD/asthma	11
Healthy	35

Results



Pollutant	N_Obs		Shortness of breath (rest)				Extra_medication			
	N	N	N_cases	OR	LCI	UCI	N_cases	OR	LCI	UCI
Levoglucosan	2797	46	70	1.12	0.97	1.30	46	1.19	1.07	1.33
Levo_lag1	2801	46	68	1.15	1.01	1.32	48	1.02	0.78	1.35
Levo_lag_2d	2637	46	63	1.20	1.04	1.39	45	1.21	1.03	1.43
Levo_lag_5d	2651	46	67	1.15	0.65	2.03	43	1.58	1.00	2.51
Smell_lag0	3055	46	76	1.22	0.44	3.38	50	1.43	0.55	3.73
Smell_lag1	2680	46	68	0.96	0.55	1.70	48	1.09	0.53	2.24

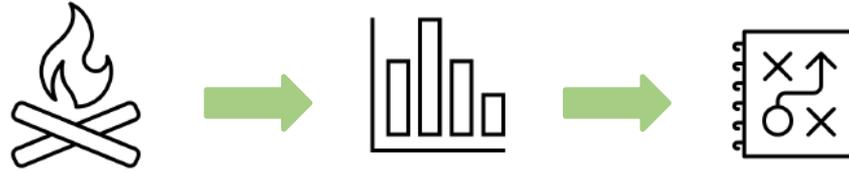
Results



Lung function outcomes

- No clear association between lung function measurements and woodsmoke exposure.
- This conclusion was made based off of the varying directions of associations (both positive and negative)

Results

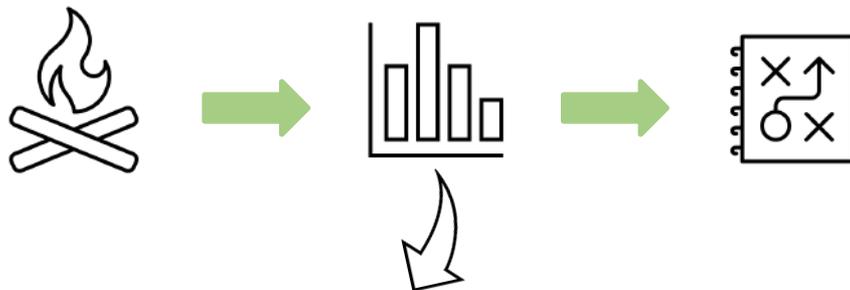


	Levoglucosan
PM_DeMeern	0.46
PM_Zutphen	0.52
PM_IJburg	0.44
PM_Mons	0.43

Was the effect seen caused by PM2.5

- Associations with PM2.5 were less clear
- Associations with Levoglucosan were not caused due to a correlation of Levoglucosan with another source
- PM2.5 was included in the analysis as a confounder after which associations with Levoglucosan remained

Conclusions



Conclusions from data analysis

- Days with more woodsmoke within a neighborhood led to people experiencing more shortness of breath at rest, and more medication use.
- Weak indication that increased neighborhood exposure to woodsmoke leads to more nasal complaints.
- No consistent associations found with lung function measurements or the stress marker cortisol.
- The findings of the study show that woodsmoke exposure at a neighborhood level can lead to health effects in the Netherlands.

Toolkit



citizensciencetoolkit.eu

The toolkit scope and key features

Scope: inspire and enable

The toolkit aims to:

1. support practitioners in **planning and designing** a CS intervention that tackle citizens' concerns (focus on environmental pollution and health)
2. inspire other citizen science practitioners with **creative ideas on how to engage citizens**
3. enable **replication by providing useful resources**

The screenshot shows the top navigation bar with the CityS Health Toolkit logo on the left and links for 'About', 'Phases', 'Tools', 'Contact us', and '+ Add your tool' on the right. Below the navigation is a large banner image of people with their hands raised, overlaid with the text 'Putting citizens' concerns at the heart of citizen science' and 'Science can help communities tackle problems that affect them'. The main content area features the heading 'Four phases to take your Citizen Science project to the next level!' followed by a list of four phases: 1. Identification (Start with an issue that citizens care about), 2. Co-design (Co-design the research study and give decisions to citizens), 3. Deployment (Deploy data collection and human relations), and 4. Action (Plan the action to drive changes). To the right of the list is a circular diagram with a play button in the center, representing the four phases. At the bottom of the page, there is a section titled 'Do you need inspiration?' with the text 'Spin the roulette and discover new tools to get inspired!' and a 'Browse all tools' button. To the right of this section is a roulette wheel graphic with various icons representing different tools.

Do you need inspiration?

Spin the roulette and discover new tools to get inspired!

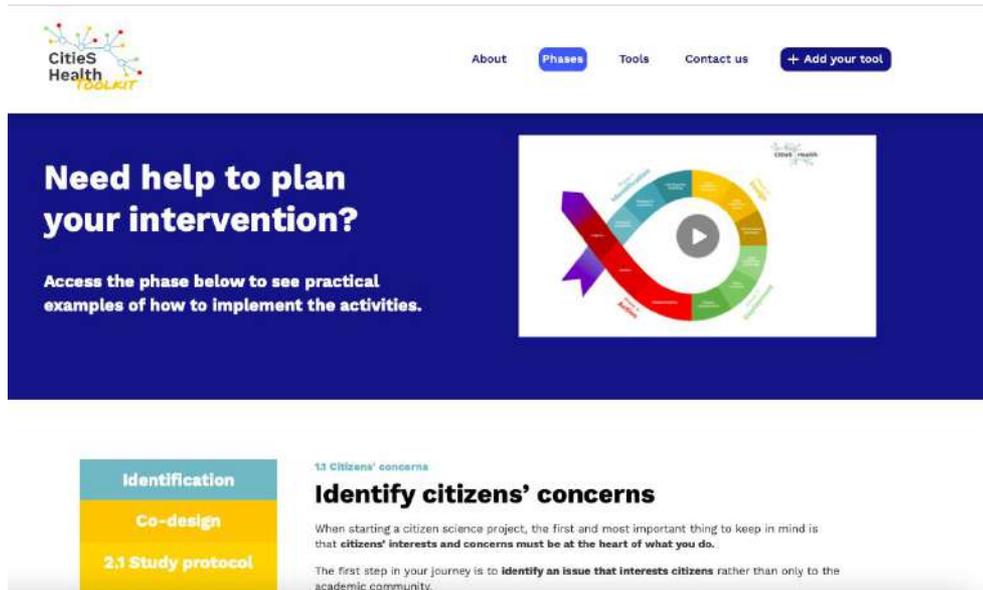
In this toolkit you can find a collection of tools and video tutorials to engage citizens in different stages of a citizen science project. Download the resources needed to carry out the activities and adapt them to your own project goals.

[BROWSE ALL TOOLS](#)



Tools for different phases of a citizen science project

The toolkit allows you to choose your point of departure. The tools are grouped according to different phases of the CiteS-Health Engagement framework.



The screenshot shows the top navigation bar with 'About', 'Phases', 'Tools', 'Contact us', and '+ Add your tool'. Below the navigation is a large blue banner with the text 'Need help to plan your intervention?' and 'Access the phase below to see practical examples of how to implement the activities.' To the right of the banner is a circular diagram representing the engagement framework. Below the banner, there are two columns of tool cards. The first column is titled 'Identification' and contains a card for 'Co-design' with '2.1 Study protocol'. The second column is titled '13 Citizens' concerns' and contains a card for 'Identify citizens' concerns' with a description: 'When starting a citizen science project, the first and most important thing to keep in mind is that citizens' interests and concerns must be at the heart of what you do.' and 'The first step in your journey is to identify an issue that interests citizens rather than only to the academic community.'

Need help to plan your intervention?

Access the phase below to see practical examples of how to implement the activities.

Identification

Co-design

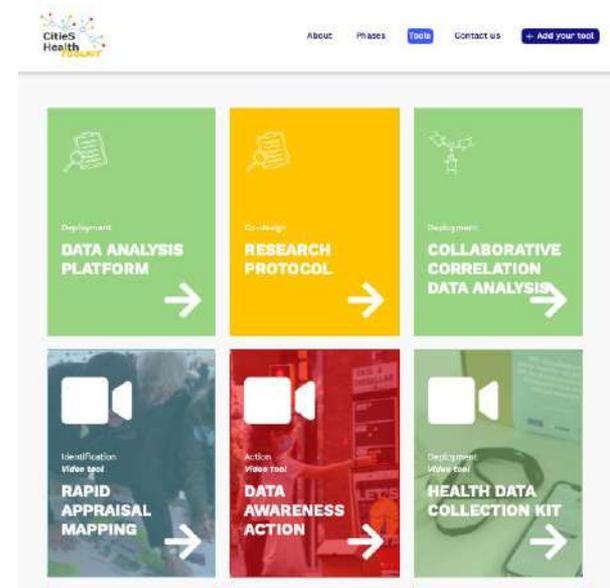
2.1 Study protocol

13 Citizens' concerns

Identify citizens' concerns

When starting a citizen science project, the first and most important thing to keep in mind is that **citizens' interests and concerns must be at the heart of what you do.**

The first step in your journey is to **identify an issue that interests citizens** rather than only to the academic community.



The screenshot shows the top navigation bar with 'About', 'Phases', 'Tools', 'Contact us', and '+ Add your tool'. Below the navigation is a grid of six tool cards. Each card has an icon, a phase name, a title, and a right-pointing arrow. The cards are: 1. Deployment: DATA ANALYSIS PLATFORM; 2. Co-design: RESEARCH PROTOCOL; 3. Deployment: COLLABORATIVE CORRELATION DATA ANALYSIS; 4. Identification Video tool: RAPID APPRAISAL MAPPING; 5. Action Video tool: DATA AWARENESS ACTION; 6. Deployment Video tool: HEALTH DATA COLLECTION KIT.

DATA ANALYSIS PLATFORM

RESEARCH PROTOCOL

COLLABORATIVE CORRELATION DATA ANALYSIS

RAPID APPRAISAL MAPPING

DATA AWARENESS ACTION

HEALTH DATA COLLECTION KIT

Key features

- Tools designed and tested to engage citizens in some stages of a research study.
- Toolbox with templates and documents to adapt and adopt in your project.
- The tool in action explaining the method implemented.
- Personalized engagement consultancy sessions to start creating your own engagement strategy

tieS health

About Phases Tools Contact us + Add your

Type of tool: Workshop
Phase: Co-design

EXPERIMENT DESIGN CANVAS

Co-design key aspects of the

People involved:
~40 people

Duration:
1.5 hour

THE CHALLENGE

In a research study, many decisions are to be taken at different stages, research topic, the type of data to be collected and how, and what to do with key decisions. Often these decisions remain in the hands of researchers or prior knowledge and experience. However, in a citizen science project where the learner of the process, involving citizens in the decision-making

For what issues citizens want to be before decisions are taken

THE TOOL

The decision making canvas is a tool that helps researchers to guide conversations with citizens around decision-making processes in science. The tool allows you to identify: (1) At what stages of a research study do citizens want to be consulted to make decisions, (2) what decisions do they want to make and, (3) how we can involve them to make these decisions. The tool is meant to be used during a co-creation workshop, which can be carried out in different stages of a research study, preferably starting at the onset of the project.

[Download the toolbox](#)

We share with you some resources that can be useful to carry out this activity.

Decision Making Canvas - ready to print
Decision Making Canvas (pdfable)

Discover the tool in action!

Let's talk about governance!

CitieS-Health Barcelona Pilot

What

An online workshop was organized to start discussing with citizens participating in the CitieS-Health Barcelona pilot about how they wanted to get engaged and what roles they wanted to take during the data collection campaigns, the analysis phase and the dissemination of study results. The Decision-Making Canvas was used to guide the conversation.

Why

To identify what decisions participants wanted to make in the study to increase transparency in the research process.

Challenges & Lessons learnt

Challenges



- Engagement of citizens (and maintaining it over long periods) is complicated.
- Time constraints probably the main preventing factor for participation
- Difficult for scientists to find the right balance: how much should they influence on citizens' ideas (use of previous knowledge, projecting their own biases - citizens asking back: what would you do?).

Recommendations



- Doing citizen science takes time.
- Different methods needed to reach out to citizens (to obtain a good response, in terms of number and diversity of citizens).
- Partnerships with organized stakeholders are vital for civic recruitment
- Find a good balance between the time citizens can devote to the project and the amount of work and tasks they can possibly contribute.
- Communication between citizen scientists and research institutions is key and needs to be done on a regular basis
- Citizens should be included in the identification phase of research projects to ensure socially relevant research.
- Researchers need to be prepared to manage citizens expectations.



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