



#### Personal Air Pollution Monitoring Technologies

#### User Practices and Preferences

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#### Air pollution is rising globally.

#### Air pollution is rising globally. Air pollution is a major risk to our health.

Air quality monitoring now has become a mainstream concern.

SYSTEM CHANGE



Indoor air quality monitors have already garnered some popularity among mainstream consumers.



How do people currently monitor air pollution around them?

How would they prefer to monitor personal air pollution exposure?

# Study Objectives



#### Understand

Current air pollution monitoring practices



Requirements for personal air pollution monitoring

#### Methods

Sequential explanatory mixed-methods design.



## Survey







27 multiple-choice questions

Between April and November 2019 Adults living/working in a metro area 53.8% male and 43.3% female

Mostly between 18 to 44 years old (88.8%), Caucasian (44.1%), and employed (63.7%)

Demographic s

$$n = 314$$

Nearly half with annual household income was less than \$50,000 (46.6%)

Only a quarter reported to be in a technical industry (25%).

Respondents were largely from the greater Chicago area.

Most respondents lived in a residential area (73%), worked in a downtown or residential area (62%), and went to work by car

### Attitudes

#### % of respondents

#### Environmental pollution is an important global problem

High levels of air pollution can adversely affect my health

Breathing in polluted air for many years may cause cardiovascular diseases

Breathing in polluted air for many years may cause cognitive impairments





60 2
Strongly Somewhat
agree

### Attitudes

% of respondents

Environmental pollution is an important global problem

High levels of air pollution can adversely affect my health

Breathing in polluted air for many years may cause cardiovascular diseases

Breathing in polluted air for many years may cause cognitive impairments



85 10





### Monitoring Practices



## Monitoring Practices



## Monitoring Practices



#### % of respondents



#### I would like to know how much polluted air I breathe in over time (e.g., during last year)

I would like to know how much polluted air I breathe in sometimes (e.g., during last evening's commute)

> I am willing to wear a device to measure the polluted air I breathe in

I am willing to put a device at home to measure the polluted air my family and I breathe in

% of respondents



I would like to know how much polluted air I breathe in over time (e.g., during last year)

#### I would like to know how much polluted air I breathe in sometimes (e.g., during last evening's commute)

I am willing to wear a device to measure the polluted air I breathe in

I am willing to put a device at home to measure the polluted air my family and I breathe in

#### % of respondents

Somewhat disagree



Strongly disagree

I would like to know how much polluted air I breathe in over time (e.g., during last year)

I would like to know how much polluted air I breathe in sometimes (e.g., during last evening's commute)

> I am willing to wear a device to measure the polluted air I breathe in

#### I am willing to put a device at home to measure the polluted air my family and I breathe in

#### % of respondents

26 33 100 Neither agree Strongly agree Somewhat agree nor disagree Somewhat disagree Strongly disagree

I would like to know how much polluted air I breathe in over time (e.g., during last year)

I would like to know how much polluted air I breathe in sometimes (e.g., during last evening's commute)

#### I am willing to wear a device to measure the polluted air I breathe in

I am willing to put a device at home to measure the polluted air my family and I breathe in

#### Form Factor Preferences

How likely are you to wear or carry a device on/around/near your \_\_\_\_\_

56 bag 18 wrist shoes waist neck 100 Highly Likely Least Likely

% of respondents

### Form Factor Preferences

How likely are you to wear or carry a device on/around/near your \_\_\_\_\_



# Summary

- People want to monitor their personal exposure to air pollution.
- But most people do not currently measure air pollution levels around them.
- More people were willing to have a portable at-home air quality monitoring device than wearing one.
- For a wearable, people preferred to clip it on a bag or wear it on the wrist.

# Interviews

# Technology Probe



#### Interview







People vulnerable to air pollution

Explored the technology probe

Audio recorded and thematically analyzed

# Demographics

Participant	Age	Gender	Characteristics
1	35	Male	lives in/near a heavy industrial area
2	72	Female	older adult, cardiovascular condition
3	27	Female	chronic respiratory condition, lives near a heavy industrial area
4	55	Female	chronic respiratory disease
5	70	Male	older adult
6	69	Female	older adult
7	49	Male	chronic respiratory condition

### Smaller, Lighter, Modular



I'd think just with you. And then if you've it on your home, you could just mount it, if it needs to be charged, and that's your home system –P1

> [...] almost similar to the air fresheners they have in the car and as you are driving wherever you go –P1



## To Monitor or Not



Well I guess I'd avoid if it was indicating that it was high levels ... I'd try to avoid it –P2

> Would I like to [monitor air quality]? Well ... the problem is if you monitor it what can you do about it. To me it's almost better not to know –P6



# Longitudinal Data



Yeah, I think year long would be good. Just because I'd like to know if the pollutions are actually irritating me more and when –P3

> I might consider at some point where can I move to where there is less pollution. If I can compare like living here in the city to maybe –P4



# Lifestyle Changes



how can I better it like presenting this stuff to your bosses and you coworkers to say this is how bad the air is here, what can we do to clean it –P1

> I don't know what I can really do about it [pollution] as far as what's outside –P4



# Advocacy Goals



if your neighbors all had something similar you could petition to your alderman to do something about the air quality or if there's a city bureau. I mean if you have data that's why you go up there, you don't use opinions –P6

# Design Requirements









Mobility, lightness, and modularity

Good accuracy

Easy access to longitudinal data

Providing tangible actions to reduce air pollution exposure

### Study Limitations



#### Convenience sample



Greater Chicago area does not have very high pollution levels



## Summary

- Few people currently own or use an air pollution monitoring device.
- Most people would like to know their personal air pollution exposure.
- Most people perceive air pollution as a public health issue, not a personal issue.
- Lack of tangible steps available to an individual to reduce personal air pollution exposure can significantly hinder adoption and use of personal air pollution monitoring tools.

#### Nina Sakhnini | nsakhn2@uic.edu Thank you.

