# Interpersonal Informatics: A Case Study of In-Home Air Quality

JIMMY MOORE, University of Utah, USA
PASCAL GOFFIN, University of Utah, USA
MIRIAH MEYER, University of Utah, USA
JASON WIESE, University of Utah, USA

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## 1 INTRODUCTION

The oft-cited goal of quantified self (and much of personal informatics) is self-knowledge through numbers [1]. Yet, the same tools that people can use to grow their self-knowledge can also be used to grow knowledge about others. In six long-term deployments (20-47 weeks) of indoor air quality sensors to families with at least one asthmatic family member [2], we saw multiple examples where data collected was used to build knowledge about other family members. Participants used the air quality data to learn about how their own behaviors affected the air quality, but also the behaviors of their family members.

Using this data, participants could see structure in the data that indicated routines of the family members in the house. They also saw the repercussions of specific activities (e.g. burning food on the stove). In some cases, participants used this data to hold other family members accountable for their behavior and its negative impacts on air quality.

## 2 DON'T BLAME ME, BLAME THE DATA

Participants used the data to back up conversations with their family members. In one example, P2 has an 11-year old autistic child who struggles to accept limitations imposed by his asthma:

> **P2**: We tend to have my son stay in if [the outdoor air quality is bad], which he gets frustrated about because he's like, I'm not having any trouble breathing! I'm fine! How come I can't go out to recess?

He has trouble understanding why P2 limits his actions, especially because his normal evaluation mechanism – whether or not he is exhibiting symptoms – leads him to the conclusion that everything is fine. P2, however, used the visualization to help her son understand the reasoning behind her decisions:

> **P2:** We have been showing him the information on the graphs, and it has helped him accept the decisions on whether to let him spend time, how much time, outside. It has been a big help!

By showing her son the visualization, P2 was able to help him accept that he should not go outside and play when the outdoor air quality was bad. The collected data thus facilitates the conversation and makes it go smoother.

## 3 HIDDEN CONTEXT IN SENSING

Indoor air quality data might seem fairly boring on its face, but with a little bit of context and a couple of annotations, it becomes more legible [4]. For example, when asked whether they noticed any patterns when reviewing air quality data (see Figure 1), one participant mentioned:


Fig. 1. P2 daily routine captured by air quality monitors

> **P2**:...things like seeing exactly what time we get up in the morning and let the dogs out of the kennels. Same thing every morning. They come out and get rowdy. Putting them back in the kennels. We're out in the morning, same time at night. You can see those kinds of patterns.

Participants had initially understood the air quality monitors to measure the air quality of their homes, but after living with the system they realized what it could sense and show as a function of air quality.

## 4 THE DATA SAYS IT'S YOUR FAULT I'M SICK

However, using the collected air quality data to infer human activity and facilitate a conversation was not always a positive interaction. One participant, an asthmatic adult with teenaged children living at home, noted that his daughter's cooking aggravates his asthma:

> **P5:** My daughter — love her dearly — but when she cooks sometimes meat and things that are fatty I noticed that the vapor and stuff just goes in through the house

When the air quality monitors capture spikes in air quality, P5 wanted to connect those spikes to the behavior of his family members, and use it to hold them accountable.

> **P5's spouse:** He'll text me "What are you doing???" I'm just cleaning! Or cooking... it's not me that turns it on [makes spikes] when I cook... somebody else — who shall remain nameless — likes to cook really high and fast.. it's not me. He'll text "what's going on, how come there's a [spike]?"

P5 uses the data to facilitate very different kinds of interactions, trying to attribute bad air quality to his family's behaviors so that he can confront them.

## 5 INTERPERSONAL INFORMATICS

This case study of interpersonal interactions from the air quality monitors that we deployed highlights both opportunities and challenges when using personal informatics data in social environments (in this case families). The sensors enabled participants to be aware of their own behaviors with respect to air quality and to manage and sometimes change them, and to consider the family as the unit of analysis for using leveraging this personal informatics data [3]. However, this data also ended up being used as a rogue form of home surveillance, a decision that not all inhabitants of the home were necessarily happy with [5]. As personal informatics technology becomes more pervasive, it is likely to be increasingly used to facilitate social interactions based on the data.

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