# Healthy Cities Ambient Displays

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## ABSTRACT

The Healthy Cities project addresses the lack of publicly-available information about city health. Through interviews and surveys of Berkeley residents, we have found that city health includes a wide variety of economic, environmental, and social indicators. We are building public ambient displays that make city health more visible and encourage change by highlighting the value of individual contributions.

**Keywords:** ambient displays, peripheral displays, city health, sustainability indicators

## INTRODUCTION

City datasets such as air quality, crime rates, energy usage, or recycling amounts can be powerful indicators of city health; however, it is often difficult for city residents to access this information or interpret it. Despite the wealth of information collected about various aspects of city health, residents know little about this information or how they can make a noticeable contribution, leading to feelings of frustration or helplessness. The Healthy Cities project aims to make city health information more publicly visible by displaying easily interpretable health indicators in public places such as transit hubs, shopping districts, or public buildings. We hypothesize that this information will empower residents to improve city health by giving them a better sense of what they can do and by making them feel like their actions are visible.

### Healthy Cities

We have chosen to display city health information in the form of an ambient display, which provides a continuous stream of information in a simple format that can be interpreted at a glance. Because our target locations are places where people will be passing through and will have only peripheral awareness of their surroundings, the easily-readable nature of ambient displays lends itself well to these locations. We have also noted that few ambient displays have been built for the general public, and were interested in exploring this design space.

### Ambient Displays

Ambient displays are devices that peripherally provide a continuous stream of information. Ambient displays show non-critical information in a simple, intuitive, and aesthetic way, reducing the cognitive load of users. Researchers at PARC, M.I.T. Media Lab, Carnegie Mellon University, Georgia Tech., Viktoria Institute, and elsewhere have designed various displays, including a "dangling string" that twitches with network activity [1], a water lamp that casts rippling shadows, pinwheels that provide awareness through sound and air flow [2], a pixellated ambient display [3], a "Digital Family Portrait" that gives peripheral awareness of remote family members [4], and informative art pieces [5].

## METHOD

We began our investigation of city health by conducting in-depth, exploratory interviews of six East Bay residents. Participants were recruited from flyers in grocery stores and posts on Craigslist (an online community forum). We followed up the interviews with a culture probe [6], consisting of four postcards that encouraged our six participants to provide additional details on their day-to-day perceptions of city health.

Responses were categorized into broad topics, which were used to create a follow-up survey. The survey included 33 yes-no and Likert-scale questions and ten written-response questions, asking about the importance of various indicators of city health. Questions were divided into ten groups: neighbors and safety, diversity, environment and conservation, public events, city history, volunteerism, shopping and economics, schools, transportation, and individual health. Surveys were distributed to over 300 people in post offices and farmers' markets in Berkeley, and a link to an online survey was published on Craigslist.

## RESULTS

The interviews and surveys showed us that city health includes myriad indicators such as public school conditions, air quality, effective minimum wage, maintenance of houses and streets, unemployment, individual health, racial diversity, pedestrians, public events, and more. Of these indicators, the ones that are quantitative and are updated often are more suitable for public ambient displays.

### Interviews

The interviews and culture probe postcards gave us a qualitative sense of city health. The participants were two women and four men, with ages ranging from 25-55 years. Three were Caucasian, and the three others were Lebanese, Asian and Latina, respectively. Although our participants had diverse definitions of city health, most or all mentioned certain indicators: the number of locally-based businesses in the community (all 6 participants), the number of parks or amount of green space (5), diversity (5), uniqueness (5), safety and poverty (4), pedestrians (4), and public events (4). These gave us a sense of areas to cover in our survey.

### Surveys

145 residents of Berkeley and nearby Oakland, El Cerrito, and Richmond completed the survey, 95 from in-person recruiting and 50 online. Of these, 90 were female and 52 male, and the ethnic and income distribution was very similar to Berkeley's 2000 census data, suggesting that we succeeded in getting a uniform sample by ethnicity and income, though not by gender.

In our analysis of the survey, we found that thirteen indicators received average ratings 4.0 or above out of 5, in terms of their importance to city health (5 being "very important"). All of these had modes of 5. These indicators are summarized in Table 1.
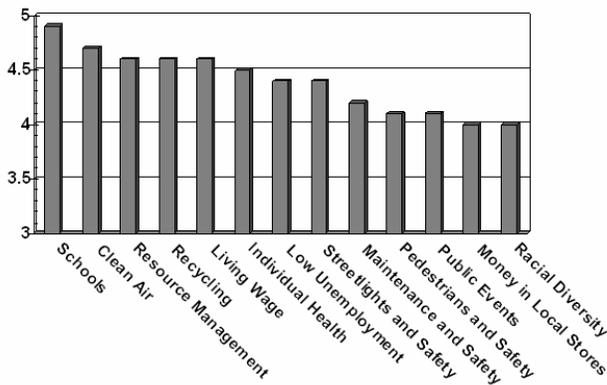


**Table 1. Indicators that received average ratings of at least 4 out of 5 in importance to city health**.

### Displays

While all of these indicators could be used to develop interesting displays, the two indicators we chose to focus on first are electricity usage, as part of resource management, and recycling. Although these were not brought up in our interviews, we chose them because they were important to our survey takers (which had a much larger sample size than our interview pool) and are quantitative, measurable, constrained, and frequently updated, and have accessible data sources. These characteristics are important because the display should be credible and should noticeably change for people who will see it on a daily basis.

Unfortunately, we could not gain access to citywide data for either source, so we have focused on the activity in one recycling bin as a microcosm of city recycling, and light pollution levels at night as an estimate of electricity usage.

We have designed a preliminary recycling display, which will use load cells to sense a can thrown into a particular recycling bin. A visual meter rises when the weight in the bin changes to give users a sense of what their contribution was worth. The interface runs on a Sony Clio, and currently has been made to work in a simulated environment where the addition of a can is simulated with the clicking of a button on the touch-screen.

We have also designed a preliminary electricity display, which uses computer vision to sense the amount of light pollution given off by lights in the city of Berkeley at night. Multiple cameras are used to collect aerial views of the city every few minutes. These images are analyzed for brightness characteristics and aggregated across cameras. The resulting brightness information is overlaid on a map of Berkeley and presented on a screen to users.

### FUTURE WORK

We plan to continue design on our two display prototypes, and possibly design more displays on other city health indicators such as air quality or public events. These displays should be evaluated for their effects on public awareness and action. If successful, Healthy Cities displays could be extended to other cities to raise awareness of city health.

### ACKNOWLEDGMENTS

We would like to thank Joseph McCarthy, Greg Niemeyer, David Gibson, and Timothy Brooke for their feedback and suggestions.

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