

Small Hammers and Silver Bullets: Low-Income Families, Dietary Behavioral Change and Ubicomp

Julie Maitland

People-Centered Technologies Group
NRC-IIT, Fredericton, NB, Canada
julie.maitland@nrc-cnrc.gc.ca

Katie A. Siek

Department of Computer Science
University of Colorado at Boulder, CO, USA
ksiek@cs.colorado.edu

ABSTRACT

Over recent years many novel and innovative technologies have emerged from academic and commercial domains aimed at encouraging changes in physical activity levels and, to a lesser extent, dietary intake. In view of the well-acknowledged inequalities in health between the rich and the poor, populations of low socioeconomic status stand to benefit most from advances in technology designed to promote health-related behavioral change. In this paper we use the findings of a recent study into the socioeconomic context of dietary behavioral change for low-income families to frame a discussion of the appropriateness of UbiComp research and innovation in this domain.

ACM Classification Keywords

H5.m. Information interfaces and presentation (e.g., HCI): Miscellaneous.

General Terms

health-related behavioral change, dietary intake, low income families, barriers to technology

INTRODUCTION

Over recent years many novel and innovative technologies have emerged from academic and commercial domains aimed at encouraging changes in physical activity levels (e.g., [4]) and, to a lesser extent, dietary intake (e.g., [3]). In view of the well-acknowledged inequalities in health between the rich and the poor, populations of low socioeconomic status stand to benefit most from advances in technology designed to promote health-related behavioral change.

The needs of underserved communities and populations have so far mostly been ignored in the wave of health-related technologies emerging from the HCI and UbiComp communities. The work being done by Khaled et al. [7,8] is an exception, that offers insights into the alternative strategies required to persuade change within individualistic and collectivist cultures. Grimes et al. [5,6] further

advances the concept of culturally sensitive design in their research of technology to promote positive dietary behaviors within low-income African American populations, also calling for a consideration of the environmental effect of behavioral choices and culturally relevant behavioral modification suggestions.

The study we discuss in this paper investigates the broader socioeconomic context of dietary behavioral change for low-income families, and considers if and how technology can assist them in overcoming barriers to change. We were initially motivated to study the issues faced by this particular population by Barton et al's [2] recent study into the prevalence of cardiovascular disease (CVD) risk factors amongst preschoolers in low-income families. The study reported that 87% of children in low-income families were already exposed to at least one modifiable risk factor by preschool age; poor diet being the most prevalent. CVD remains the biggest killer in the US [1], and more importantly for this work, remains most prevalent in communities of low socioeconomic status.

Participants in our study were aware of the weaknesses their family's dietary habits and were motivated to make changes, but lacked financial, strategic, and social resources needed to do so. Our initial reactions were 'they have so many problems, how on earth can technology possibly help?' The next section provides a brief overview of the study. The main focus of this paper is a discussion surrounding the potentially obstructive perspective that just because a population has multiple problems, that we—as technologists—are not in a position to help. Or, to put it more skeptically, just because a problem is difficult we shouldn't bother trying to address it.

THE STUDY

We conducted our studies in the same low-income communities in which Barton et al. found children had at least one modifiable CVD risk factor [2]. We collaborated with a trusted resource within those communities, The Bridge Project, to conduct this research.

The Bridge Project is a community outreach project with four centers situated within public housing neighborhoods in which families often fall on or below the poverty line. The project provides after-school and summer school

programs for children within these neighborhoods, and college and trade school scholarships. In the after-school programmes, children aged 3 to 18 attend their local centre between 3pm and 8pm each weeknight. They are given the opportunity to participate in various activities including a literacy program, art classes, and technology education.



Figure 1: The Bridge Project Community Outreach Project

Method

After the Bridge Project management team agreed to collaborate on the study, one of the authors spent time at the centers answering questions that the staff had about the study and familiarizing herself with the centers, their activities, and the children—and allowing them to familiarize themselves with her. She spent time helping clean dishes, putting deliveries away, helping the preschoolers in their IT sessions, and helping the middle-schoolers during their homework-hour. Formal collaboration with a trusted party eased recruitment of participants, while informal familiarity helped to establish a rapport with the family caregivers once they were recruited.

The primary caregivers of children up to the age of eight were invited to take part in either a focus group or one-to-one interview. The focus group and interviews were transcribed and coded during data analysis sessions, then analyzed for emergent themes.

The Participants

We worked with administrators from the Bridge Project to recruit primary caregivers of children under eight years old who lived in the public housing community and spoke English. A total of 17 participants were recruited for the study. The participant group was primarily Latino ($n=12$), but included African American ($n=3$) and White ($n=2$) individuals. Although not exactly proportional, this sample does compliment the most common ethnic orientations of the Bridge Project families (52%, 20%, 10% respectively).

All of the participants were women between the ages of 20 and 56 years old (average age = 32.3; $s.d.$ = 10.1). The

women were the primary caregivers for between two and five children (average $n = 3$; $s.d.$ = 0.94) that ranged from one week to 16 years old. Three were married, one was engaged, and 13 were single. Eight women were not working outside of their homes at the time of the interviews, seven women worked full time, and two women worked part-time. Their out-of-home jobs included everything from sales associate to personal banker to janitor. The number of people in the participant's social network who helped them care for their children ranged from zero to four (average $n = 1.35$; $s.d.$ = 1.16).

From a technological standpoint, nine participants owned a computer, however 16 participants had access to a computer either in their home or at a community centre. Sixteen of the participants had at least one year of experience with computers—they felt the most competent with using the Internet and moderately comfortable with using word processing, email and chat programs. Thirteen of the participants owned mobile phones and used their phones daily. Those who owned mobile phones had at least two years of experience using their phone, and felt comfortable using their phones for making and receiving calls, sending and receiving text messages, and taking pictures with their phones.

Summarized Findings

The purpose of this summary is to provide some context for the discussion that follows. For a more detailed account of the findings please refer to [9].

The majority of participants had been bereaved or had looked after family members with chronic diseases. Many were themselves experiencing ill health or physical discomfort, or were already concerned that their children were overweight. The majority of participants acknowledged the benefits of a healthful diet and wanted to make dietary changes but did not know where to start.

Given the observed level of awareness with respect to the risks and consequences of poor dietary intake, and the overarching concern about the need to make changes, it would not be unreasonable to presume that an area of informational need is the nutritional components of a healthy diet. However, all of our participants were aware of the strengths and shortcomings of their diet. All of the caregivers had an awareness of 'good' and 'bad' foods, many referring to the food pyramid when asked about what constitutes a healthy diet.

It is one thing to be aware of the food pyramid, and quite another to be able to translate that into everyday dietary practices. Despite a desire to change, many of our participants were simply overwhelmed by the task of changing their families' dietary behavior. While the food pyramid tells us what should be in our diet, it does not address the practicalities of buying, preparing or even eating the food.

One of the most common barriers that prevented most participants from purchasing health foods was the fear of waste. Participants were highly sensitive to waste because with their limited resources, they had to consume each food item they purchase or risk the possibility of not having enough food for the rest of the month. Picky eaters were the most cited source of wasted healthy food. Children in ten of the participants' households refused to eat healthy foods purchased, thus the foods would rot. In extreme cases, participants had given up on purchasing healthy foods. Put simply, participants simply did not have the luxury of an expendable income that is necessary to experiment with food.

There were isolated examples of times when a participant had overcome such barriers, typically through involvement in a formal outreach program or a knowledgeable family member. In an ideal world the benefit of experience would be passed between family and community members, but we found that the transient nature of the housing project and lack of trust in neighbors means that the benefit of experience did not disseminate throughout the community.

A PLACE FOR TECHNOLOGY?

We set out to investigate the issues and factors relating to dietary intake and behavioral change within low-income families, with a view to better understand the dynamics of behavioral change and scope for potential technological involvement. Essentially, what we have found was:

- a breakdown in communication within traditional health promotion media
- messages being conveyed by health professionals do not address the financial and strategic resources required to make behavioral change
- social resources, such as the benefit of common interests and experience, are not being shared within the community
- a more complex representation of behavioral change than is currently accounted for in technological approaches to promoting health-related behavioral change
- self-awareness and desire to change does not mean an individual is equipped to make changes

There are many issues that may prevent technology being considered to be an obvious or appropriate solution to this population's problems. Here we consider two such issues and argue that they are not suitable reasons for not pursuing this kind of research: the complex and multifaceted nature of the problem space, and the cost associated with technological interventions.

How can technology possibly help?

We cannot ignore the broader socioeconomic context of this population when considering the scope for potential technological interventions. Indeed, an explicit intention of the study described in this paper was to explore the socioeconomic context of dietary behavioral choices and

change. For some, acknowledging the social, economic, and political constraints faced by this population render technological interventions inappropriate. The kinds of issues that the study participants face could be solved with social and political change, is it possible that technology can provide assistance without corresponding social or political change?

Of course social and political change is necessary if socioeconomic status is to stop being an indicator for inequalities in health. However, we would argue that the need for social and political change does not preclude technology from contributing. If anything, technology should be considered as a resource or vehicle for such change.

When considering how to promote dietary change on a more local level, we need to be realistic about the scope of impact that a Ubicomp system or application will have. Because of the multifaceted nature of the problems faced by this population, there will be no silver bullet. Rather, interventions (technical and non-technical) are more realistically viewed as small hammers that can be used to chip away at a large problem.

Potential 'small hammers' that address different aspects of the problems faced by this population include:

- budgeting applications that helps a family plan a meal together based on their fluctuating budget [9]
- context-aware schedulers that highlight opportunities for discounted goods [9]
- community resources that employ anonymous and asynchronous comms in an effort to overcome the current socially obstructive issues of trust and lack of time
- agents that work in collaboration with caregivers to introduce new types of food into their child's diet

Our findings suggest that there is scope for low-cost, accessible, and appropriate technological interventions in this area that address the existing gaps in communication and empower people to take practical steps towards achieving goals that are within their means. We are not saying that one application will solve this population's problems. What we are saying is that if it is done well, it may play a role in lowering some of the existing barriers to behavioral change. It need not or should not do the job on its own, but can and should be considered as part of a wider community-based approach. Rather than being an argument against innovations in this area, we would argue that the complex and multifaceted nature of this problem space is an argument for innovation in this area.

But if they can't afford food...

The fact that participants had little or no expendable income has obvious implications for the design of Ubicomp systems and the scope of impact. If an individual has to choose between meat and fruit because he or she cannot afford to buy both, what is the likelihood of that individual

buying high-spec technology? The answer is very little, of course. However, as can be seen from the study participants, low-income families do have access to technology. The technology is not the most up to date and it is not necessarily always on (or always there), but a technology infrastructure does exist.

Researchers should utilize the networks and technology already available to the population. Recent data, also reflected in our own findings, show that low-income households are about twice as likely to have cable TV and mobile phone service than Internet access (<http://www.eia.doe.gov/emeu/recs/>). Thus, researchers should consider hybrid systems that capitalize on the mobility of phones with the display space of a television.

Even when using seemingly appropriate and inexpensive platforms, financial constraints may prove prohibitive. For example, although mobile phone ownership was relatively high, any additional applications and services deployed outside the constraints of a user trial will incur costs to the families themselves: sending/receiving texts and GPRS data download/upload costs. Overlooking problems of scalability and cross-platform compatibility, if the system is not subsidized it is unlikely that these families will be able to afford them. Subsidization may well be a necessary component if a system is to be successfully and widely deployed. Given the financial burden of chronic diseases associated with poor dietary intake and the higher incidence of such conditions in low-income populations, it is likely that governmental subsidization is a feasible strategy. Cost remains an issue to be considered, but no longer needs to be considered prohibitive if it exceeds the expendable income of the individual end-user.

CONCLUSION

We do not have to look very far afield in order to find communities and populations who do not fit with the traditional profile of a Ubicomp study participant or, perhaps more pertinently, of potential consumers. Framed by our experience so far, this paper has presented typical arguments against the appropriateness of Ubicomp applications designed to promote health-related behavioral change in low-income populations. We then offered alternative perspectives on the same issues to provide counterarguments. Although cost is indeed a barrier to potential deployment and adoption outside the constraints of a research study, technical infrastructure does already exist in these communities, as do alternative sources of acquisition and financial support.

The problems faced by this population can seem overwhelming for researchers and prompt doubts about the likelihood of Ubicomp interventions making a difference. One important argument in favor of pursuing efforts to develop Ubicomp for the purpose of health promotion in low-income populations is that current approaches—no matter how much more obviously suitable—are simply not

working. If they were, the findings of Barton et al.'s study [2] would have been very different.

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