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Q: What contextual factors make older adults unique?

In my research, I define “older adults” as individuals ages 50 and older.

Adults ages 65 and above is formally considered seniors or older adults in most parts of the world. However, I distinguish adults ages between 50 and 70 as younger seniors and others as older seniors. I have found this distinction helpful when designing technologies for issues that can affect older adults from an earlier age and tend to exacerbate with time. For example, monitoring long-term pollution exposures causing adverse health outcomes or self-managing a chronic disease.

Cultural, socioeconomic, and geographical issues are some of the contextual factors that make older adults unique. That cognitive and motor abilities change—mostly worsen—with age is well-known in the literature and has been the primary focus of HCI research in the past. More recently, socioeconomic factors such as agency and privacy of older adults are being explored.

The two factors that I think have received less attention thus far in the literature are:

- (1) *Socioeconomic factors*: Research on smart homes and smart communities as senior living facilities continues to include high-end sophisticated technologies. But a majority of older adults live in developing countries and will rarely go on to live in “smart” homes or communities. How can we consider the geopolitical and cultural factors and use sub-optimal technologies to foster healthy *aging in place*?
- (2) *Social support*: Another factor that makes designing for older adults unique is thinking about how to incorporate their support system. To compensate for limited abilities due to age or comorbidities, older adults often get help in learning and using new technologies from family, friends, and relatives. When focusing on designing senior-friendly applications, we may indirectly cut off older adults from the technology ecosystem widely used by their support system. For example, if Amy uses a meditation app Calm and her grandmother, Melinda, uses Calm4Seniors, it creates fewer opportunities for Melinda to learn the technology from Amy. How can we design for such co-use, with a family member or caregiver? Not only to improve learnability but also promote shared interactions.

Q: Why do you think aging is an interesting area to research?

As people’s lifespan increases around the world, catering to older adults’ needs has become an important research area. The gerontology literature continues to promote *aging in place*, but adoption of technologies for older adults do not appear to soar. Every individual will grow old eventually, their physical and mental capacities will change, and new lifestyle problems will arise. To serve our seniors is a social imperative—wherein lies the importance of aging research.

Some of the reasons I think aging research is challenging are:

- (1) *Access to population* is not readily available and requires a substantial initial investment. Involving seniors in design and/or evaluation is more time and resource consuming than working with other readily available populations such as college students.
- (2) *Risk of bias*: Older adults do not constitute a homogenous population. When trying to involve older adults in research studies, I have often found a bias in recruited seniors, for example, retired university professors, staff, or highly-educated seniors from affluent backgrounds tend to self-select. It is important that

we are aware of this risk of bias and explicitly try to include seniors from underrepresented backgrounds.

- (3) *Age as a continuum*: Barring extenuating circumstances, health disorders, and skill acquisition, basic cognitive and motor abilities do not change significantly between ages 18 to 50. However, cognitive and motor abilities change significantly in older adults with time due to normal aging and comorbidities. When designing for older adults, we need to consider not only their current capacities but also how their cognitive, motor, and socioeconomic milieu may change soon—and significantly.

To the wider CHI community, aging research can contribute new methodologies, such as how to design with a vulnerable population, new design guidelines for accessibility, and fundamental knowledge about how interaction design issues evolve along the continuum of age. Moreover, this research will explore new domains, pertinent to older adults, thereby, informing and stimulating design innovation.

Q: What themes have you explored in your work?

I am currently exploring two themes in designing for older adults: (1) socioeconomic factors and (2) support system.

First, I am working on using low-cost sensors to help older adults self-track their long-term exposures to noise and air pollution that has been recently reported to increase the risk of mild-cognitive impairment (MCI). MCI describes the stages between normal cognitive changes due to aging and early dementia, e.g., amnesic type of MCI (aMCI) reflects the onset of Alzheimer disease. Technological feasibility of low-cost sensors in tracking air pollution has been studied as part of crowdsourcing, big data, and citizen science research, but I am trying to understand how seniors can track and limit long-term pollution exposures and what sub population of older adults would want to know more about their environment.

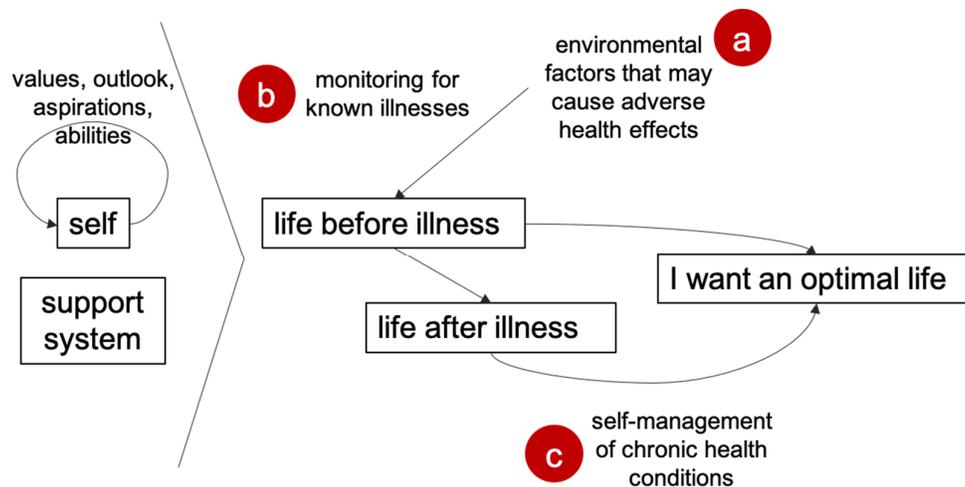


Figure 1. In my work, I am exploring how older adults can (a) self-track long-term air and noise pollution exposures (prevention), (b) monitor initial signs of mild-cognitive impairment (MCI) with the help of their support system (diagnosis), and (c) self-manage chronic heart failure post hospitalizations (care).

Second, I am exploring how older adults' support system can be leveraged toward initial screening and self-management of chronic illnesses. As individuals grow old, the risk and prevalence of adverse health conditions increase. Chronic conditions, such as Alzheimer's or Heart Failure (HF), are common among older adults. Nearly half of all Americans—about 45% of 133 million—suffer from at least one chronic disease, and the number is growing. One of the top ten chronic diseases in the US is heart failure (HF).

HF is among the most expensive conditions treated in US hospitals, with the highest hospital readmission rate for patients ages 65 and above; the prevalence of HF is expected to rise to over 8 million by 2030.

I am currently eliciting design requirements for technology solutions that can help older adults screen for and self-manage chronic health conditions. For example, how can older adults monitor initial signs of MCI with the help of their support system or how can HF patients self-manage their illness post hospitalization together with their informal caregivers (Figure 1).

Q: What research methods have you used to engage older adults in the design process or otherwise elicit relevant design criteria?

To elicit design requirements for looking up possible pollution exposures, I tried to understand how older adults use mobile map applications. To that end, I have used *direct observation* and a *think-aloud* protocol. We used goal-based tasks, such as *finding directions to the nearest ice cream shop and sending it to a friend*. Some interaction problems emerged, but the interaction complexity of an off-the-shelf application made it difficult to abstract them into basic design criteria. We are working on designing simpler applications focused on problem areas to understand how the depth and breadth of interaction affect usability in older adults.

Second, in a different project, I am using *semi-structured interviews* (60 to 90 minutes long) from older adults hospitalized with heart failure (HF) to design a self-management application post-hospitalization. So far, it has worked well in unearthing the design requirements.

Q: What aspects of aging, or what challenges in aging research, will continue to be relevant in decades to come, and why?

I think one of the main challenges that will continue to be relevant in decades to come is equitable adoption of technologies among older adults, particularly among the most vulnerable and underserved sub populations.

Second, computers will become integral to personal health-related assessments and interventions in aging research, and that will lead to new challenges in usability, transparency, policy, privacy, and ethics.

Finally, as autonomous agents become more common as assistants, ranging from autonomous vehicles to robot companions, it will become crucial to understand how to foster trust between autonomous agents and older adults.

Q: How will applications of the future differ from today for older adults?

I think tailored-made applications for seniors will continue to exist in the future.

Future technologies for older adults will aim to improve their mobility, help manage chronic diseases, and provide more ways of companionship (i.e., decreasing social isolation).

Because future older adults will constitute of today's tech-savvy adults, we may see more demand and adoption of computer technologies. But the availability of technologies improving the lived experience of older adulthood will not immediately imply accessibility or affordability; rather, it might exacerbate the digital divide in contemporary society.

Q: What are you hoping to get out of attending this workshop?

I am hoping to achieve the following by attending this workshop:

- (1) Connect with fellow researchers in this field.

- (2) Learn from veteran researchers about common pitfalls in aging research; hear their stories about how to sustain a successful research agenda in this field, focusing both on intellectual merit and logistical issues.
- (3) Look for opportunities of collaboration with researchers in this field with similar or complementary interests.
- (4) Learn about new research methods suitable for aging research and different visions for the future.
- (5) Learn about available resources, such as datasets, libraries, and case studies in aging research and explore ways to build federated datasets to stimulate aging research.

Q: Is there anything else you would like to tell us?

I am a junior faculty (Ph.D., 09/16) and new to aging research. My doctoral dissertation was not in this area. I do not have any senior HCI researchers in my department. So, I am looking to connect with other researchers in the field and learn from their experiences.

Bibliography

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