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Willingness to Pay for Quality of Life Technologies to Enhance Independent Functioning Among Baby Boomers and the Elderly Adults

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Purpose: We report the results of a study designed to assess whether and how much potential individual end users are willing to pay for Quality of Life Technologies (QoLTs) designed to enhance functioning and independence. ***Design and Methods:*** We carried out a web survey of a nationally representative sample of U.S. baby boomers (aged 45–64; *N* = 416) and older adults (aged 65 and greater, *N* = 114). Respondents were first instructed to assume that they needed help with kitchen activities/personal care and that technology was available to help with things like meal preparation/dressing, and then they were asked the most they would be willing to pay each month out of pocket for these technologies. ***Results:*** We modeled willingness to pay some (72% of respondents) versus none (28%), and the most people were willing to pay. Those willing to pay something were on average willing to pay a maximum of $40.30 and $45.00 per month for kitchen and personal care technology assistance, respectively. Respondents concerned about privacy or who were currently using assistive technology were less willing to pay. Respondents with higher incomes, who were Hispanic, or who perceived a higher likelihood of needing help in the future were more willing to pay. ***Implications:*** Consumers' willingness to pay out of pocket for technologies to improve their well-being and independence is limited. In order to be widely adopted, QoLTs will have to be highly cost effective so that third party payers such as Medicare and private insurance companies are willing to pay for them.

Key Words: Technology, Willingness to pay, Aging, Disability, Personal care, Kitchen assistance

Two of the great success stories of the last century are the increased survival and longevity of children and adults with disability and the growth of the elderly population worldwide. This has fueled the demand for and sophistication of assistive technologies, sometimes referred to as Quality of Life Technologies (QoLTs; Schulz, 2013a; Schulz, Beach, Matthews, Courtney, & De Vito Dabbs, 2012), designed to optimize the health and independent functioning of persons with disabilities. Examples of QoLTs include systems designed to help manage medication taking including dispensing, adherence, and tracking; technologies designed to monitor and manage health conditions such as glucometers and blood pressure monitors; assistive technologies that compensate for sensory, physical, and cognitive impairments; technologies that assess and improve cognitive fitness such as thinking games and challenging puzzles; and social networking technologies that enable individuals to communicate, organize, and share information and resources with each other.

Interest in QoLTs is driven by multiple converging trends: the rapid pace of technological development, particularly in consumer electronics and communication; the unprecedented growth of the aging populations in the United States and worldwide; the increase in the number and survival of persons with disability; the growing interest on the part of business, industry, and government agencies in addressing health care needs with technology; and the unsustainable costs of caring for the elderly adults. Taken together, these trends have contributed to the strong conviction that technology can play an important role in enhancing QoL and independence of individuals with impaired functioning due to trauma, chronic disorders, illness, or aging. Moreover, this goal potentially could be achieved with high levels of efficiency, reducing individual and societal costs of health care (Schulz, 2013a; Schulz et al., 2012).

The success of a technology depends on the interplay of three important factors: (a) characteristics, needs, and preferences of the end user; (b) features of the technology; and (c) societal factors including social, health care, and regulatory policies. In addition to addressing the functional needs and capabilities of an individual, successful technologies also need to be esthetically pleasing, engaging, reliable, easy to learn, affordable, and cost effective. Issues of cost are paramount as experience with introduction of new medical technologies has taught us that new technology typically adds to health care costs. At least some of the blame for the rapidly rising health care costs in the United States is attributed to the proliferation of new technologies (Barbash & Glied, 2010; Callahan, 2008; Neumann & Weinstein, 1991). Thus, any new technology must early on address the question of who will pay for its adoption.

Although researchers have extensively studied an individual's willingness to pay for health care services by conducting discrete choice experiments in which willingness to pay is linked to treatment attributes such as efficacy and side effects (e.g., Marti, 2012) or cost-utility analysis in which willingness to pay for specific treatments is pegged to quality-adjusted life years (e.g., Hollingworth, McKell-Redwood, Hampson, & Metcalfe, 2012), little is known about individual end users' willingness to pay for technology that has the potential to improve QoL and enhance functional independence in everyday life. In one recent study (ENABLE Project), investigators assessed willingness to pay for assistive technologies to be used in the homes of people with dementia. The devices evaluated included items such as medicine reminders, locators, and gas stove monitors. In this small sample study (n < 100) recruited from five countries in Europe, the majority of family caregivers (81% on average) were willing to pay for the devices although the maximum amount they were willing to pay was in most cases below actual cost of the technology (Duff & Dolphin, 2007). In an Australian survey of members of the National Seniors Productive Ageing Research Register, three quarters of respondents (76.8%, sample size not specified) indicated that they would be unwilling to pay the full cost of using a range of assistive technologies such as home computers and monitoring devices (National Seniors Productive Ageing Centre, 2007). Mahoney, Mutschler, Tarlow, & Liss (2008) also assessed the feasibility of a remote monitoring system designed to enable employed family caregivers to monitor their relative while at work. When asked about their willingness to pay a monthly system fee, 6–8 of the 16 respondents indicated that they would be willing to pay anywhere from $10 to $130 per month, depending on the features of the system. These data should be viewed cautiously as they are based on small nonrepresentative samples, and only simple descriptive results are reported.

The purpose of this article is to report the results of a study designed to assess how much potential individual end users are willing to pay for QoLT. Our approach to this question is guided by existing models of technology adoption (Schulz, 2013b), which suggest that sociodemographic factors such as age and income predict technology uptake such that individuals who are younger and have higher incomes are more willing to embrace and pay for new technologies than older or lower income individuals. We also hypothesized that general attitudes toward technology, functional status, and the perceived likelihood of needing the technology would be related to willingness to pay because of prior research showing that these factors are related to the acceptance of QoLTs (Beach et al., 2009). More specifically, we predicted that more positive general attitudes toward technology would be associated with willingness to pay and that functional disability and greater perceived likelihood of needing the technology at some point in the future would be associated with willingness to pay. We address these questions with a web survey of a nationally representative sample of U.S. baby boomers (aged 45–64) and older adults (aged 65 and greater).

Methods

This work was conducted under University of Pittsburgh IRB protocol #PRO07080326.

Procedures

Participants completed an online survey consisting of a total of 95 questions that took an average of 25 min. The main outcomes of this article were willingness to pay each month out of pocket for technology that provided assistance with kitchen activities and personal care tasks. To provide context, the general survey introduction read as follows:

> This survey focuses on technology aimed at promoting independence and functioning among older and disabled adults. The goal of the survey is to get general reactions to different ways such technology could be designed and different things it might do. For some of the questions, we ask you to assume that you need help with certain daily activities at some point in the future. We know it can be difficult to imagine needing this kind of help, but please do the best you can and provide us with your opinions.

Note that respondents were not presented with specific technologies but rather were asked to imagine hypothetical technologies with specific functions. Following questions on general attitudes toward technology, an additional context-setting statement was provided, prior to questions specific to kitchen and personal care technology:

> As people age they often lose some of their ability to manage on their own. Technology can help people remain independent by monitoring their abilities and providing assistance when needed. This technology could help with a variety of tasks or activities, and provide assistance at varying levels of intensity – from simple passive monitoring to providing feedback, evaluation and coaching, to helping you with the task, or to performing the entire task for you. We are interested in your general reactions to such technology.

Details regarding willingness to pay questions are provided in the following Measures section.

Sample

Respondents were a nationally representative sample of 530 members of the Knowledge Networks (KN) *KnowledgePanel*, a probability-based, online, nonvolunteer access panel (www.knowledgenetworks.com). Sampled *non-Internet households*, when initially recruited, *were provided a netbook computer and free Internet service* to enable their participation as online panel members. This distinguishes the KN web panel from the vast majority of online panels that consist of self-selected volunteers with Internet access, thus excluding those without Internet access. *KnowledgePanel* members are initially recruited using a statistically valid sampling method with a published sample frame of residential addresses that covers approximately 97% of U.S. households. This involves probability-based sampling of addresses from the U.S. Postal Service Delivery Sequence File. Randomly sampled addresses are invited to join *KnowledgePanel* through a series of mailings (English and Spanish materials) and by telephone follow-up to nonresponders when a telephone number can be matched to the sampled address. Invited households can join the panel by one of several means: completing and mailing back an acceptance form in a postage-paid envelope; calling a toll-free hotline staffed by bilingual recruitment agents; or going to a dedicated KN recruitment Web site and completing the recruitment information online. The address sampling is conducted throughout the year on a rolling basis. *KnowledgePanel* consists of about 50,000 adult members (aged 18 and older) and includes persons living in landline only, cell phone only, and dual user (both landline and cell) households. The panel allows targeting of specific demographic groups based on a profile survey that all members complete when they join. On average, most KN panelists participate in two surveys a month, and the average panel life is 2 years. Although incentives are generally not offered for completion of specific surveys, panel members are entered into special sweepstakes with both cash and other prizes awarded.

This study targeted 400 "baby boomers" (defined as having age 45–64) and 100 "older adults" (defined as having age 65 and older) from the *KnowledgePanel*. For baby boomers, 1,478 panel members were initially sampled, 829 responded (56.1% cooperation), and 416 were able to view the videos that were included as part of the survey (but not discussed here), and they were included in the final sample (an overall completion rate of 28.1%). For older adults, 421 panel members were initially sampled, 240 responded (57.0% cooperation), and 114 were able to view the videos, and they were included in the final sample (an overall completion rate of 27.1%). The overall response rate is typical for surveys of similar length and complexity and considerably higher than those typically achieved with voluntary opt-in panels (<10%). A comparison of those who were able to view the videos and those who were not (due to various Internet connectivity issues, most panel members use their own computers and internet browsers) on various demographic characteristics revealed no statistically significant differences, lessening concerns about coverage bias. In sum, the sample consisted of 416 baby boomers aged 45–64, and 114 older adults aged 65 plus (total n = 530). The sample was 52% men; 34% had a high school education and 29% had at least a bachelor's degree. The sample was 82% White, 6% Black, 6% Hispanic, and 6% other race (primarily Asian).

Data from the *KnowledgePanel* are statistically weighted to adjust for (a) deviations from an equal probability of selection design ("base weight"); (2) noncoverage, initial panel nonresponse, and panel attrition ("panel demographic poststratification weight"); and (3) study sample design—in this case targeting 45- to 64-year olds and those 65 and older—and study nonresponse ("study-specific poststratification weight"). The poststratification weights use the most recent demographic data from the Current Population Survey (CPS) as benchmarks. The weights are combined into a final weight that results in the sample mirroring the U.S. population in terms of gender, age, race, education, census region, metropolitan area (vs. not), and Internet access (vs. not) to the closest extent possible. In the case of this survey, the weighting adjustment attempts to make the sample of 530 mirror the U.S. population of adults aged 45 and older. Because the sample was too small to accommodate a complete cross-tabulation of all combinations of the survey demographic variables with the benchmark CPS variables, a raking procedure was used. Through an iterative convergence process, the weighted sample data were optimally fitted to the marginal distributions. All data presented in this article are weighted using the final weight variable supplied by KN.

Measures

The survey measures used in this article are described in more detail in this section, beginning with the outcome variable. Then demographic and health-related variables, attitudes toward general technology, privacy concerns with kitchen and personal care technology, and perceived likelihood of needing help with kitchen and personal care tasks in the future are described.

Willingness to Pay.—Survey questions for *kitchen technology* asked the respondent to "assume you needed help with 'kitchen activities' and that technology was available to help you with things like *meal preparation and washing dishes*." Questions for *personal care technology* were prefaced with "assume you needed help with '*personal care*' and that technology was available to help you with things like *getting in and out of bed, dressing, and toileting.*" For each type of technology, four levels of assistance were specified, ranging from low (e.g., monitoring and reporting) to high (doing part of the task for you): (a) The technology monitors your performance of kitchen activities (personal care) and shares the information with family or health care providers; (b) the technology monitors your performance of kitchen activities (personal care) and provides evaluative feedback to you; (c) the technology monitors and coaches you—it gives you advice on how to complete kitchen activities (personal care); and (d) the technology monitors you and helps you complete kitchen (personal care) tasks. In addition, a fifth level of assistance was specified only for kitchen technology: The technology monitors you and does the kitchen tasks for you. After each level of assistance provided by the technology, respondents were asked the following willingness to pay question, "assume you needed help with 'kitchen activities' (personal care) and that technology was available to help you with things like meal preparation and washing dishes (getting in and out of bed, dressing, and toileting). What is the most you would be willing to pay each month out of your own pocket for technology like this?" The response format was open-ended, allowing the respondents to enter any value they chose. We decided to frame the willingness to pay (WTP) question in terms of monthly payments instead of a one-time fixed cost because of the high likelihood that such technologies would be offered on a lease basis and because most respondents have extensive prior experience paying for services on a monthly basis. We used two primary outcomes of WTP for analysis: (a) whether or not the respondent was willing to pay any amount for the technology across the various levels of assistance; and (b) among those who are willing to pay something, the maximum amount they were willing to pay across the four levels of assistance.

Demographic Variables.—The article examined gender, income, age, and race as correlates and predictors of WTP. Income was analyzed using four categories (<$25,000, $25,000–$49,999, $50,000–$100,000, >$100,000). Age was analyzed both as an ordinal variable (45–54, 55–64, and 65+) and as a continuous variable within multiple regression models. Race was categorized as White, Black, Hispanic, and other (primarily Asian). We also examined education but found it to be highly correlated with income and opted to include income in our modeling analyses.

Disability.—Respondents were asked "*Because of a health problem or disability, do you get help with . . .*" followed by a series of tasks that captured both instrumental activities of daily living (IADL) and more basic activities of daily living (ADL). There were six IADL items—taking medications, preparing meals, doing laundry, cleaning, shopping, and transportation—and five ADL items—bathing, dressing, grooming (e.g., shaving, brushing teeth), feeding yourself, and transferring in and out of a bed or chair. A three-level ordinal variable was created and coded "0" if the respondent did not report needing help with any IADL or ADL items, "1" if the they reported at least one IADL difficulty but no ADL difficulties, and "2" if help was needed for at least one ADL difficulty. This single variable was used as a general disability level measure.

Assistive Technology Use.—Current use of assistive technology for mobility was measured with the item "*On MOST DAYS do you use any of the following assistive devices to walk or get around?*" This was a "check all that apply" item that included cane, quad (four-pronged) cane, crutches, walker, wheeled walker, wheelchair (manual), wheelchair (power), scooter, prosthesis, and other (specify). If the respondent checked any option, he/she was coded as a current assistive device user. A dichotomous (yes/no) variable was utilized for assistive device use in all analyses.

General Attitudes Toward Technology.—These were measured with a standardized scale (Beach et al., 2009) consisting of 10 items presenting general statements about positive and negative characteristics of technology (five items each). Items were prefaced with "*To what extent do you believe that technology . . .*" A 10-point rating scale was used for each item, with "1" labeled "*Not at all*," and "10" labeled "*Completely*." Positive statements included "*makes life easy and convenient*," "*makes life more comfortable*," "*gives people control over their daily lives*," "*increases personal safety and security*," and "*brings people together*." Negative statements included "*reduces privacy*," "*makes people dependent*," "*makes life stressful*," "*makes people isolated*," and "*makes life complicated*." Positive and negative items were alternated in the scale. Previous work (Beach et al., 2009) has shown that these items form distinct positive and negative factors and that they operate somewhat independently. An exploratory factor analysis replicated this finding in this data set, and thus, separate positive and negative general technology attitude scales were constructed by computing the mean of the five positive and the mean of the five negative items. Cronbach's α was .78 for the positive scale and .74 for the negative scale.

Privacy Concerns With Kitchen and Personal Care Technology.—For both the kitchen and personal care technologies, the following question was asked, "*Please rate how concerned you would be about invasion of your privacy when using this technology in your home*." A 10-point rating scale was used with "1" labeled "*Not at all concerned with* *privacy invasion*" and "10" labeled "*Completely concerned with privacy invasion*."

Perceived Likelihood of Need for Future Help With Kitchen and Personal Care Tasks.—For kitchen technology, the following question was asked, "*How likely do you think it is that you will need help with 'kitchen' activities like meal preparation and washing dishes at some point in the future?*" The parallel question for the personal care technology was "*How likely do you think it is that you will need help with 'personal care' activities like getting in and out of bed, dressing and toileting at some point in the future?*" The response format was a sliding scale that could be moved between 0% and 100%. There was also a box which could be checked that stated "Already need help." Very few respondents checked this latter option, but for those who did, their probability estimate was recoded to 100% for analysis. There was a fairly high level of missing data on these items (n = 54 or 10.3% for kitchen activities; n = 68 or 12.8% for personal care activities). However, comparisons between those missing on these variables and those providing valid data revealed no significant differences on any of the survey demographic variables or the two outcome variables. Thus, these cases were dropped from the multivariate statistical analyses presented in this article. All available data were used for univariate and bivariate data analyses.

Statistical Analysis

Standard descriptive statistics (i.e., frequencies, means) were computed to tabulate univariate distributions. Because a significant portion of the sample was not willing to pay for any level of technological assistance (28%), we used a dichotomous variable (defined as willing to pay any amount vs. none) for both univariate analysis (chi-square tests) and in the context of logistic regression models. The models included potential predictors of willingness to pay, including demographic characteristics, attitudes toward technology, concern for privacy, perceived need, level of disability, and assistive device use. A second set of analyses focused on the subset of individuals who were willing to pay something (approximately 70%). We used the continuous outcome of maximum amount willing to pay (across different levels of technological assistance). Because there were some extreme positive outliers, we used a trimmed mean approach. Extreme outliers were defined as those that exceeded the 75th percentile plus three times the interquartile range. This translated to over $200 per month for both the kitchen and personal care modules. Among those willing to pay something, we then carried out a multiple regression analysis using the same predictors as with the logistic approach. The outcome variable was defined as the natural log of the maximum amount that each participant was willing to pay for any level of technological assistance. We used a log transformation to assure that the outcome variable approximated a normal distribution.

Results

Sample Descriptive Statistics

Weighted univariate descriptive statistics for all variables are shown in column 1 of Table 1. Unweighted sample demographics are fairly similar with a few exceptions. The weighted sample contains more women and a higher proportion of minorities. The sample reports fairly low levels of disability (over 90% with no IADL or ADL limitations), and only about 8% report current use of assistive technology (primarily canes). The sample exhibits moderately positive general attitudes toward technology (mean = 6.5 on a 10-point scale) but also exhibits some negative technology attitudes (mean = 5.8). There was moderate to great concern with invasion of privacy, particularly with personal care technology (means = 6.6 and 7.3 out of 10). Finally, and quite interestingly, respondents reported fairly low perceived likelihood of ever needing help with kitchen and personal care tasks, with the average being little more than a one-in-three chance for either.

Willingness to Pay Some Versus None—Univariate/Bivariate Analyses

As noted earlier, for kitchen assistance, 27.6% were not willing to pay anything out of pocket, whereas 72.4% were willing to pay at least something. For personal assistance, the percentages were 28.3 (none) and 71.7 (some amount). There was some evidence of a relation between any willingness to pay and income, race, and disabilities, as shown in Table 1. Higher levels of income had

Table 1. Descriptive Statistics and Bivariate Analyses of Relationships Between Demographic, Health, and Technology-Related Variables and Willingness to Pay None, Some, and Mean Amount (Kitchen Technology)

Variable	Descriptive statistics % (*n*)	Willingness to pay: none % (*n*)	Willingness to pay: some % (*n*)	Amount willing to pay among those willing to pay something Mean $ (*SD*)
Gender				
Female	51.7 (274)	24.5 (65)	75.5 (200)	38.1 (39.9)
Male	48.3 (256)	30.8 (77)	69.2 (173)	43.1 (40.6)
		27.6 (142)	72.4 (373)	40.3 (40.3)
Income				
<$25,000	22.5 (119)	42.9 (51)	57.1 (68)**	37.8 (32.6)
$25,000–$50,000	20.5 (109)	29.8 (31)	70.2 (73)	36.8 (36.9)
$50,000–$100,000	33.9 (180)	21.5 (37)	78.5 (135)	39.0 (40.5)
>$100,000	23.1 (122)	18.5 (22)	81.5 (97)	46.7 (47.0)
Age				
45–54	42.6 (226)	28.3 (63)	71.7 (160)	40.1 (38.8)
55–64	35.3 (187)	24.7 (45)	75.3 (137)	44.3 (43.1)
65+	22.1 (117)	30.3 (33)	69.7 (76)	34.3 (38.1)
Race				
Black	11.3 (60)	35.7 (20)	64.3 (36)*	60.6 (35.6)*
Hispanic	9.0 (48)	12.8 (6)	87.2 (41)	36.8 (36.3)
Other	6.1 (32)	19.4 (6)	80.6 (25)	44.8 (46.6)
White	73.6 (390)	28.8 (110)	71.2 (272)	38.1 (40.3)
Disabilities				
No disability	90.7 (480)	27.5 (128)	72.5 (337)*	39.2 (39.7)
Instrumental activities of daily living difficulties	6.5 (34)	35.3 (12)	64.7 (22)	50.9 (48.8)
Activities of daily living difficulties	2.8 (15)	0.0 (0)	100.0 (15)	48.7 (38.1)
Assistive devices				
No assistive device	92.4 (490)	27.2 (129)	72.8 (345)	40.0 (40.7)
Assistive device used	7.6 (40)	30.0 (12)	70.0 (28)	44.3 (35.7)

Note: All analyses are weighted (see text for explanation).
*$p < .05$. **$p < .01$ in chi-square or one-way analysis of variance tests of association between predictor variable and outcome variable.

a positive correlation with a willingness to pay at least some amount for the assistive use of technology. Those with any disabilities were also more willing to pay at least something. Hispanics were more likely than Whites to be willing to pay at least something. Gender, age, and those using assistive devices were not found to be significant in relation to WTP. Results were similar for kitchen and personal care technology (Table 2).

No significant differences were seen between the group willing to pay some amount (Some) and those not willing to pay anything (None) in terms of general attitudes toward technology. Average values were similar in terms of positive attitudes (Some, mean = 6.58, *SD* = 1.46; None, mean = 6.41, *SD* = 1.63) and negative attitudes (Some, mean = 5.77, *SD* = 1.67; None, mean = 5.87, *SD* = 1.65). Comparisons of *t*-tests were nonsignificant. This was also confirmed with nonparametric Mann–Whitney *U* tests. Average levels of concern about privacy were significantly different for the two groups (Some, mean = 6.26, *SD* = 2.56; None, mean = 7.72, *SD* = 2.62; $p < .01$), as were perceptions of future need for assistance (Some, mean = 41.7, *SD* = 30.5; None, mean = 23.2, *SD* = 30.1; $p < .01$). These results were confirmed with Mann–Whitney *U* tests. Those who had fewer privacy concerns and those who thought it was more likely they would need help in the future with kitchen tasks were more willing to pay at least something for kitchen technology.

Very similar results were seen with regard to assistance with personal care. No differences were found for positive attitudes toward technology between the two groups (Some, mean = 6.58, *SD* = 1.44; None, mean = 6.39, *SD* = 1.66) or for negative attitudes (Some, mean = 5.80, *SD* = 1.65; None, mean = 5.81, *SD* = 1.71). Levels

Table 2. Descriptive Statistics and Bivariate Analyses of Relationships Between Demographic, Health, and Technology-Related Variables and Willingness to Pay None, Some, and Mean Amount (Personal Care Technology)

Variable	Descriptive statistics % (*n*)	Willingness to pay: none % (*n*)	Willingness to pay: some % (*n*)	Amount willing to pay among those willing to pay something Mean $ (*SD*)
Gender				
Female	51.7 (274)	26.9 (71)	73.1 (193)	41.8 (45.4)
Male	48.3 (256)	29.7 (74)	70.3 (175)	48.4 (46.6)
		28.3 (145)	71.7 (368)	45.0 (46.0)
Income				
<$25,000	22.5 (119)	42.9 (51)	57.1 (68)**	42.6 (40.9)
$25,000–$50,000	20.5 (109)	29.1 (30)	70.9 (73)	44.1 (49.9)
$50,000–$100,000	33.9 (180)	25.6 (44)	74.4 (128)	45.2 (45.6)
>$100,000	23.1 (122)	16.8 (20)	83.2 (99)	47.0 (47.5)
Age				
45–54	42.6 (226)	27.8 (62)	72.2 (161)	42.7 (44.4)
55–64	35.3 (187)	26.4 (48)	73.6 (134)	49.2 (48.8)
65+	22.1 (117)	33.0 (36)	67.0 (73)	42.3 (44.1)
Race				
Black	11.3 (60)	32.1 (18)	67.9 (38)	83.5 (63.8)**
Hispanic	9.0 (48)	13.3 (6)	86.7 (39)	43.5 (40.3)
Other	6.1 (32)	38.7 (12)	61.3 (19)	63.2 (61.6)
White	73.6 (390)	28.8 (110)	71.2 (272)	38.6 (39.6)
Disabilities				
No disability	90.7 (480)	29.1 (135)	70.9 (329)*	44.7 (46.1)
Instrumental activities of daily living difficulties	6.5 (34)	32.4 (11)	67.6 (23)	47.6 (45.6)
Activities of daily living difficulties	2.8 (15)	0.0 (0)	100.0 (15)	45.4 (47.4)
Assistive devices				
No assistive device	92.4 (490)	28.1 (133)	71.9 (340)	45.2 (46.6)
Assistive device used	7.6 (40)	32.5 (13)	67.5 (27)	41.5 (38.8)

Note: All analyses are weighted (see text for explanation).
$^{*}p < .05$. $^{**}p < .01$ in chi-square or one-way analysis of variance tests of association between predictor variable and outcome variable.

of concern about privacy were again significantly different (Some, mean = 6.95, *SD* = 2.50; None, mean = 8.36, *SD* = 2.34; $p < .01$), as were levels of anticipated need for assistance (Some, mean = 45.9, *SD* = 30.3; None, mean = 24.7, *SD* = 30.9; $p < .01$). Again, significant *t*-test results were confirmed with nonparametric tests.

Maximum Amount Willing to Pay—Univariate/Bivariate Analyses

Among those willing to pay some amount, the mean amount respondents were willing to pay per month for kitchen technology was $40.34 (median = $25) and for personal care technology was $44.96 (median = $25). Among the subset of those willing to pay some amount per month for technological assistance, the only covariate found to be significant in analysis of variance was race (see Tables 1 and 2). Blacks were shown to be willing to pay more for technology than Whites.

Willingness to Pay Some Versus None—Logistic Regressions

Results are reported in Tables 3 and 4 for kitchen and personal assistance technologies, respectively. There was a significant effect for the Hispanic cohort, both for the kitchen and personal care technologies, using White as the reference level. The parameter estimate was positive, indicating higher percentages willing to pay some amount among Hispanics. Also, those with higher levels of income were more willing to pay at least something for both kitchen and personal care technology.

Concerns about privacy, perceived need for help in the future, and the use of ambulatory assistance devices were all predictive of willingness to pay something for both kitchen and personal care

Table 3. Logistic Regression on Willingness to Pay Some Amount for Kitchen Technological Assistance

	Estimate (B)	Standard error	Exp(B)	*p* Value
Demographics				
Race[a]				
Black	0.359	0.407	1.43	.38
Other	0.860	0.542	2.36	.11
Hispanic	1.920	0.570	6.82	<.01*
Age	−0.002	0.015	1.00	.87
Male[b]	−0.316	0.251	0.73	.21
Income[c]				
$25,000–$50,000	0.530	0.349	1.70	.13
$50,000–$100,000	1.007	0.329	2.74	<.01*
>$100,000	0.705	0.384	2.02	.07
Technology—positive attitudes	0.038	0.082	1.04	.65
Technology—negative attitudes	0.076	0.078	1.08	.33
Concern about privacy	−0.252	0.051	0.78	<.01*
Perceived need for help in future	0.023	0.005	1.02	<.01*
Need assistance with activities of daily living and/or instrumental activities of daily living	0.106	0.375	1.11	.78
Use of ambulatory assistance devices	−0.838	0.305	0.43	.01*

Notes: [a]Reference level, White.
[b]Reference level, Female.
[c]Reference level, <$25,000.
*$p < .05$.

Table 4. Logistic Regression on Willingness to Pay Some Amount for Personal Care Technological Assistance

	Estimate (B)	Standard error	Exp(B)	*p* Value
Demographics				
Race[a]				
Black	−0.168	0.398	0.85	.67
Other	−0.587	0.464	0.56	.21
Hispanic	1.261	0.533	3.53	.02*
Age	−0.009	0.015	0.99	.55
Male[b]	−0.191	0.252	0.83	.45
Income[c]				
$25,000–$50,000	0.520	0.346	1.68	.13
$50,000–$100,000	0.970	0.326	2.64	<.01*
>$100,000	1.144	0.383	3.14	<.01*
Technology—positive attitudes	0.059	0.081	1.06	.47
Technology—negative attitudes	0.009	0.074	1.01	.91
Concern about privacy	−0.249	0.056	0.78	<.01*
Perceived need for help in future	0.021	0.004	1.02	<.01*
Need assistance with activities of daily living and/or instrumental activities of daily living	0.526	0.442	1.69	.23
Use of ambulatory assistance devices	−0.795	0.318	0.45	.01*

Notes: [a]Reference level, White.
[b]Reference level, Female.
[c]Reference level, <$25,000.
*$p < .05$.

technologies. Those who were more concerned about privacy were less willing to pay anything, as were those who were currently using assistive technology. On the other hand, those who perceived a higher likelihood of needing help in the future with kitchen and personal care tasks were more willing to pay at least something for technology addressing these needs.

Maximum Amount Willing to Pay—Multiple Regressions

Results are reported in Tables 5 and 6 for kitchen and personal assistance technologies, respectively. As in the dichotomous outcome for willingness to pay some amount, multiple regression models on the log of maximum amount willing to pay revealed significant racial effects. Blacks and "other" minorities were willing to pay more compared with Whites for both types of technology. There was a nonsignificant trend toward those with higher levels of income being willing to pay more, as each level above the reference category(<$25,000) had a positive parameter estimate.

Among other covariates, the strongest predictor was perceived need for help in the future. For both the kitchen and personal care technologies, participants' indication of a high degree of perceived need for assistance in the future was positively predictive of willingness to pay more.

Discussion

Nearly one third of all baby boomers and older individuals are not willing to pay anything for technology that would help them with kitchen tasks or personal care when asked to assume that they needed help in these areas. Those willing to pay something were on average willing to pay a maximum of $40.30 per month for technology-based assistance with kitchen tasks and $45.00 per month for personal care assistance. The median amount willing to pay for both types of technologies was $25. When viewed from the perspective of current household expenditures among adults in the United States, the reluctance to pay for these services seems surprising. Most adults are willing to pay more for cell phone, cable TV, or computer connection fees than they are for technologies that could enable them to remain independent when faced with functional disabilities. What might explain this finding?

One of the most consistent findings in all four multivariate models tested was the association between perceived future need for help with kitchen tasks and personal care and willingness to pay. However, only about one third of respondents thought they might ever need such help, an unrealistically optimistic appraisal of the future, given the prevalence of functional disability among aged individuals. This finding is important because it suggests that attitudes about willingness to pay might change as awareness of impending disability increases. Indeed, although only a small sample, 100% of those individuals in our study who had one or more ADL impairments were willing to pay something for the technology.

Table 5. Multiple Regression on Natural Log of Maximum Amount Willing to Pay for Kitchen Technological Assistance

	Estimate (B)	Standard error	*t*-stat	*p* Value
Demographics				
Race[a]				
Black	0.627	0.225	2.79	<.01*
Other	0.827	0.255	3.25	<.01*
Hispanic	0.134	0.215	0.62	.54
Age	−0.006	0.008	−0.67	.50
Male[b]	−0.179	0.131	−1.37	.17
Income[c]				
$25,000–$50,000	0.068	0.207	0.33	.74
$50,000–$100,000	0.186	0.183	1.02	.31
>$100,000	0.333	0.203	1.64	.10
Technology—positive attitudes	0.008	0.045	0.17	.87
Technology—negative attitudes	−0.053	0.040	−1.34	.18
Concern about privacy	−0.015	0.026	−0.58	.56
Perceived need for help in future	0.006	0.002	2.71	<.01*
Need assistance with activities of daily living and/or instrumental activities of daily living	0.136	0.161	0.85	.40
Use of ambulatory assistance devices	0.071	0.242	0.30	.77

Notes: [a]Reference level, White.
[b]Reference level, Female.
[c]Reference level, <$25,000.
*$p < .05$.

Table 6. **Multiple Regression on Natural Log of Maximum Amount Willing to Pay for Personal Care Technological Assistance**

	Estimate (B)	Standard error	*t*-stat	*p* Value
Demographics				
Race[a]				
Black	0.744	0.240	3.09	<.01*
Other	0.774	0.290	2.67	<.01*
Hispanic	0.363	0.222	1.63	.10
Age	0.014	0.009	1.60	.11
Male[b]	−0.027	0.134	−0.20	.84
Income[c]				
$25,000–$50,000	0.062	0.213	0.29	.77
$50,000–$100,000	0.175	0.191	0.91	.36
>$100,000	0.303	0.210	1.44	.15
Technology—positive attitudes	0.017	0.048	0.35	.72
Technology—negative attitudes	0.012	0.043	0.29	.77
Concern about privacy	−0.032	0.027	−1.19	.24
Perceived need for help in future	0.007	0.002	3.07	<.01*
Need assistance with activities of daily living and/or instrumental activities of daily living	0.041	0.167	0.25	.81
Use of ambulatory assistance devices	−0.184	0.221	−0.83	.41

Notes: [a]Reference level, White.
[b]Reference level, Female.
[c]Reference level, <$25,000.
*$p < .05$.

The finding that Hispanics (logistic regression) and other minorities (multiple regression analysis) were more willing to pay for technology should be viewed cautiously as the sample size for these groups was small. On the other hand, recent Pew Research Center data show that both Black and English-speaking Latinos are as likely as Whites to own a mobile phone and are more likely to use their phones for a wider range of activities such as connecting to the Internet (Pew Report, 2012). Clearly, follow-up studies with larger samples are needed to address race/ethnicity differences in willingness to pay.

The literature consistently shows that more wealthier individuals with higher education have more positive attitudes toward technology (Wilkowska & Ziefle, 2011), and our findings extend this work by showing that it also applies to their willingness to pay for technology.

A necessary prerequisite to providing intelligent assistance for kitchen and personal care tasks is the ability to monitor the performance of the user. We have found in prior research that middle-aged and older individuals are concerned about the invasion of privacy associated with the use of QoLT (Beach et al., 2009), and our findings in this study show that privacy concerns may affect willingness to pay as well. These concerns can be mitigated by using nonvideo sensors to monitor performance and allow the user to determine who has access to the information collected by a technology system (Demiris, Oliver, Giger, Skubic, & Rantz, 2009).

It is also notable that several of our a priori predictions were not supported by the data. Age and attitudes toward technology were not related to willingness to pay. Older individuals were not more technology averse, as expected. Likewise, individuals with more positive general attitudes toward technology were not willing to pay more for its adoption in our multivariate models. We explored the possibility that these null findings were due to the covariation of age with other variables, such as perceived need and positive attitudes toward technology or the covariation of positive attitudes with age, education, and income, but we found no support for these alternative explanations. When age and attitude toward technology were examined as the sole predictor of WTP, none were statistically significant. Age and technology experience effects are typically found in studies examining attitudes toward technology. It may be that attitudes and WTP are substantially different outcomes with different predictors. Another possibility is the sampling strategy used in different studies. Representative national samples such as the one used in this study are rare in the literature, raising the possibility that differences between our work and others are related to sample selection strategies (Beach et al., 2009).

In sum, our findings show that willingness to pay out of pocket for technologies that help with kitchen tasks and personal care is determined by factors such as income, privacy concerns, perceived future needs, and possibly race and ethnicity. Even if we are able to address privacy concerns and educate users about the probable need for such technologies, it is still likely that these technologies will cost more than individuals are willing to pay. One of the limitations of this study is that we did not ask respondents who should pay for such technologies, but we suspect that the majority of older individuals share the view that technologies that enable independent functioning in the home among disabled individuals are entitlements and, therefore, should be paid for by government programs such as Medicare or Medicaid. If this is the case, then the burden of proof for these technologies will require cost-benefit analysis showing that these technologies are more cost effective compared with alternatives such as paid in-home human-based assistance or long-term care placement. Given the high cost of the alternative strategies, there should be strong incentive to develop QoLTs as a means for addressing the needs of our growing elderly population.

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