Low-Literacy Search Behavior: Designing to Increase Information Retrieval and Successful Task Completion on Government Means-Based Program Websites

by

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Abstract

The purpose of this observational study is to support existing research on low-literacy user interactions and behaviors, and to observe how low-literacy users interact with and perceive means-based government program websites. There is substantial research on interaction design for mobile websites and applications. Although there is existing research specifically focusing on low-literacy mobile usage, the topic needs further attention. In the United States, a majority of low-income adults are owners of smartphones and an increasing number are using smartphones as their main source of internet access. Since there is a correlation between low literacy and low income, websites and applications targeted to low-income or low-literacy adults should follow the appropriate mobile design guidelines. Means-based government programs are used by millions of Americans and provide necessities including assistance with food, shelter, and healthcare. It is critical their websites be designed to match the capabilities of low-literacy users. For this study, usage of three means-based government websites by adults with low literacy levels was initially observed. A mobile prototype of one of the observed sites was developed based on the findings from the initial study. The prototype was then compared with its current active counterpart. The findings of this study not only supported existing mobile design guidelines for low-literacy users, the study also identified additional relevant behaviors and perceptions of low-literacy users when interacting with means-based government program websites.

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Chapter 1: Introduction

According to the most recent United States "National Assessment of Adult Literacy," more than 93 million American adults read at a basic or below-basic reading level ("National Assessment of Adult Literacy", 2015). Adults who read at these levels are considered to have low literacy and can understand short and commonplace texts (2015). Having low literacy skills often translates into low-level computing skills (Fox, 2005). Adults with low literacy levels often encounter related challenges while reading text on interfaces, as doing so requires skills such as scrolling, providing input, and navigating, in addition to the effort needed to comprehend texts (Brunskill et al., 2011).

Low-literacy adults find mobile devices such as cell phones easier to use than computers, as they are able to interact directly with the interface (Kavanaugh et al., 2013). Smartphones in particular often reduce the need to be familiar with formal computer conventions. Websites and applications designed for smartphones are more likely to have smaller amounts of text and shorter navigation items. This is helpful for low-literacy users, as it means that they encounter fewer obstacles and less text. However, low-literacy users still experience more challenges than high-literacy users when accessing the internet through smartphones.

As an increasing number of Americans own smartphone devices (over 77%), more people are using their phones to access information, such as news; to complete household tasks, including paying bills; and to participate in social media (Pew Research Center, 2017). A growing number of smartphone users use their phone as their primary tool for accessing the internet. "Smartphone-dependent" adults do not have broadband internet service at home and rely on their smartphones for access (Smith, 2015). Since a majority of Americans are smartphone owners, and a growing number of those owners are using their phones as their primary internet access point, it is important that websites and applications are designed to reflect mobile guidelines and best practices for usability.

There is a strong correlation between low literacy and poverty (Cooper & Reimann, 2003). Among the Americans who earn less than $30,000 per year, 64% own a

smartphone device. Due to affordability, low-income individuals are more likely to be smartphone- dependent and use their phones to complete online tasks.

Smartphone-dependent users tend to be low-income individuals and are less likely to have health insurance or own their own home (Smith, 2015). The United States government provides numerous programs to help low-income individuals and families. Many of these programs provide assistance with needs such as healthcare, housing, and food. The largest programs, including Medicaid, the Supplemental Nutrition Assistant Program (SNAP), and the Housing Choice Voucher Program (Section 8), are used by millions of Americans every day. Many of these programs host websites to provide information to current and potential participants. These websites vary in content, design, and capabilities. For example, some sites allow online applications (e.g. SNAP), while others provide instructions for applying and directing users to program agents (e.g. Section 8). Regardless of their capabilities, the program websites provide an opportunity for participants to learn more about critical livelihood benefits and services.

It is not only important to provide online informational content for these programs, but also vital to display this information based on who is searching for the information and how it is being accessed. As previously stated, because of affordability and usability, low-literacy and low-income adults are more likely to use a smartphone to access the internet. Therefore, websites that focus on assisting low-income adults should be designed for low-literacy adults and accessible on a mobile device.

Problem Description

When interacting with websites and applications, low-literacy users have lower task completion rates and higher rates of task abandonment compared to adults with higher literacy levels. Therefore, websites and applications that are targeted to users with low literacy should be designed to improve accessibility for these populations. The United States government does have a digital strategy in place to increase the usability of its websites. However, there needs to be additional concentration on government means-based assistance program websites. Since many of these programs help users access

important necessities, such as shelter, food, and health insurance, it is vital that they are easy to use and access by program participants. The overlap among the population of low-literacy adults (93 million), adults who receive government assistance (52.2 million), and low-income adults who own smartphones (64%) indicate the potential volume of traffic a government assistance program website could receive (Pew Research Center, 2017; Hyer, 2015). If websites are not designed with low-literacy users in mind, it could result in a poor user experience for many program participants.

The field of research on mobile design and user interaction is growing stronger and more established as more people own and use smartphones for internet access. Research on mobile design and interaction for low-literacy users is also increasing. However, the field needs more informative research on low-literacy user behavior. This study focuses on government assistance program websites in particular, due to the large participant size of the programs. Regardless of users' literacy status, the field of interaction design requires continuous research, as devices evolve and change, as do the capabilities, behaviors, and expectations of users.

Statement of Purpose

The purpose of this observational study is to support existing research on low-literacy user interactions and behaviors, and to examine how low-literacy users interact with and perceive means-based government program websites. This will be done by completing the following steps:

- Examining how low-literacy users interact with program websites
- Implementing rapid iterative testing and evaluation (RITE) of low-literacy guidelines and best practices for interaction and design (Wixon, 2003)
- Examining the perceptions and experiences of low-literacy users on program websites

Overall, these items will lead to a better understanding of how to design for the largest target audiences for the tested programs: low-literacy and low-income adults. The research aims to augment existing research in the field of low-literacy interaction design

as specifically related to the United States government's means-based assistance websites.

The framework of this study includes the literature review (chapter 2) that will follow in the next chapter. The literature review will provide an overview of current research on adult literacy, low-literacy user behavior, smartphone usage and best practices, e-government and digital strategy, and government assistance programs and websites. In chapter 3, the methodology of the study design will be explained with the results of the study disclosed in chapter 4. The discussion in chapter 5 will apply the results of the study to existing research and define new findings. The study will conclude with recommendations for means-based government websites, limitations of the study, and topics for future research.

Chapter 2: Literature Review

Adult Literacy

According to the "National Assessment of Adult Literacy," "literacy is the ability to use printed and written information to function in society, to achieve one's goals, and to develop one's knowledge and potential" (2015). When a person has a low-literacy level, it can be related to circumstances including, but not limited to, the following: learning disabilities, mild cognitive impairment, decrease in reading capability due to aging, and limited proficiency in English (Summers & Langford, 2015).

Low literacy refers to a low skill level in reading and comprehension that results in the ability to understand only basic and simple texts. With practice, low-literacy adults can potentially perform the skill of reading automatically. In this case, lack of practice is one variable that could lead to low literacy, as "learning literacy involves the same general processes people use for learning throughout their lives: observing and copying, listening to explanations from others, practicing, and repeating, trial and error, working alongside others, and learning from experience" (McCaffery et al., 2007). These processes are likely to occur through formal education; some people may teach themselves to read and write, but most people learn these skills in schools and educational settings (2007).

The quality and years of schooling are the strongest correlations for a person's literacy skill level (McCaffery et al., 2007). McCaffery argued that "disparities in power and access are at the core of literacy acquisition and literacy education" (2007). Therefore, when there are disparities blocking potential learning opportunities, the situation can result in reduced access to information and, eventually, to less income.

Cognitive Functioning

Another cause of low literacy is dysfunction in the frontal lobe of the brain. Executive functioning is strongly associated with this area of the brain. Dawson et al. reported that "executive functioning refers to a set of interrelated skills that promote the initiation, control, and coordination of purposeful behaviors via their collective influence

on other domains of cognition" (2015). The control of behavior through executive functioning involves task monitoring, rule learning, response inhibition, and planning (Baskin-Sommers et al., 2015). Damage to the frontal lobes can produce distinct and clinically different syndromes that can result in personality changes, high levels of distractibility, and mental flexibility (Baars & Gage, 2013). These syndromes can undermine a person's cognition and increase the difficulty of staying focused when completing a task such as reading.

Aging can also affect cognitive functioning, as people experience "at least some physical and cognitive impairment as they get older" (Chan, 2012). Mavrodairs et al. argued that "cognitive impairment and dementia are increasing globally and the increase is predicted to be proportionately greater in developing regions. Projections indicate that by 2050 the number of individuals older than 60 years will be approximately 2 billion and will account for 22% of the world's population" (2013). In general, and specifically with regard to the aging population, a decline in cognitive functionality, whether mild or severe, can negatively affect an individual's literacy level.

Another cause of low literacy is the presence of a language barrier: "American research has identified three key elements in learning to read: alphabetics, fluency, and comprehension; reading and writing require an understanding of the relationship between sound and symbol" (McCaffery et al., 2007). Thus, if a person cannot form relationships between words and sounds due to a lack of familiarity with a language, then the person will have low literacy or no literacy in that specific language.

The National Assessment of Adult Literacy

According to the "National Assessment of Adult Literacy" (NAAL), 43% of American adults are in the basic or below-basic literacy level ranges" ("National Assessment of Adult Literacy," 2015). The NAAL, sponsored by the National Center of Education Statistics, is a "nationally representative assessment of English literacy among adults 16 and older" (2015). The most recent assessment took place in 2003, and the results were published in 2005. It is considered "the most current indicator of the nation's

progress in adult skills in literacy, numeracy, and problem-solving in technology-rich environments" (2015).

The assessment tests three types of literacy—prose, document, and quantitative literacy—and seven literacy skill sets (2015).

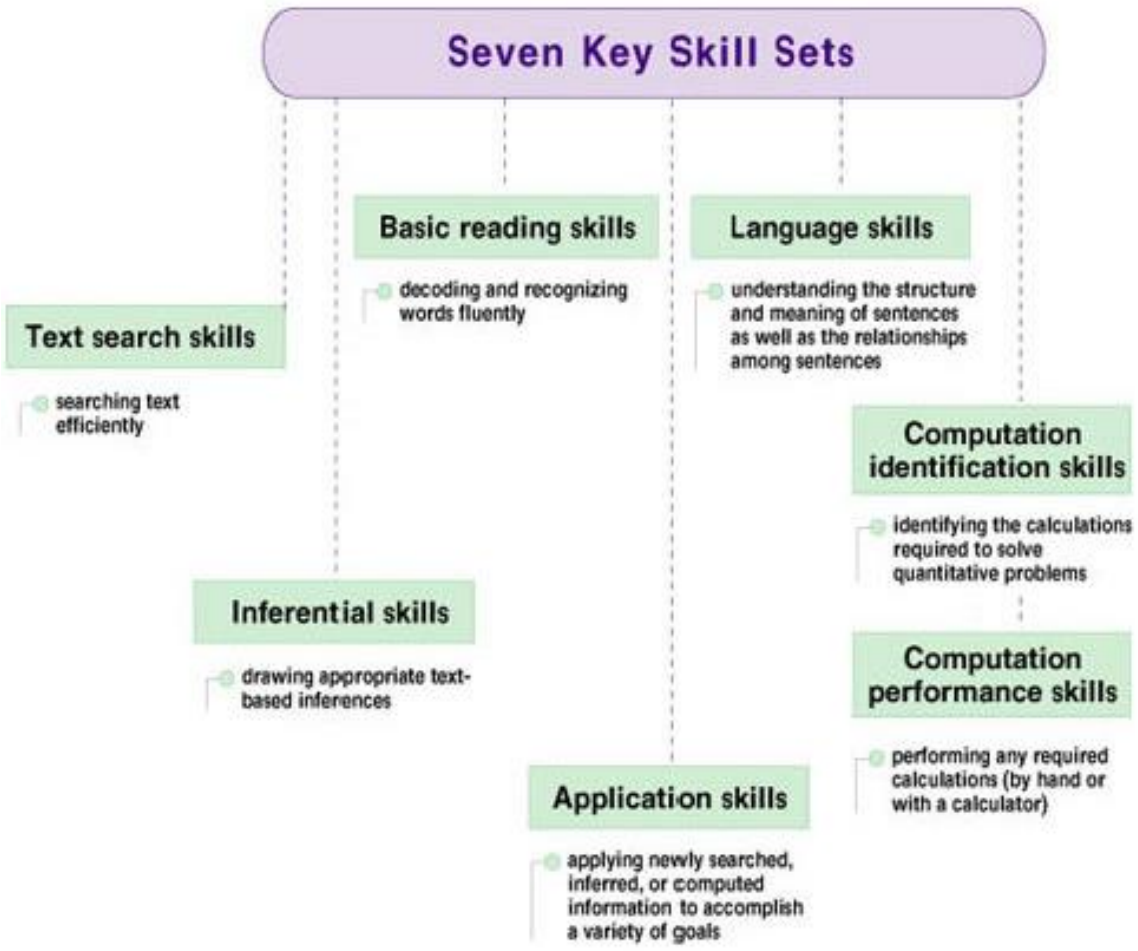

Figure 1: "National Assessment of Adult Literacy" Key Skill Sets

(White & McCloskey, 2005)

The assessment scores were grouped into the following performance levels:

Overview of the literacy levels

Level and definition	Key abilities associated with level	Sample tasks typical of level
Below Basic indicates no more than the most simple and concrete literacy skills. Score ranges for *Below Basic*: Prose: 0–209 Document: 0–204 Quantitative: 0–234	Adults at the *Below Basic* level range from being nonliterate in English to having the abilities listed below: • locating easily identifiable information in short, commonplace prose texts • locating easily identifiable information and following written instructions in simple documents (e.g., charts or forms) • locating numbers and using them to perform simple quantitative operations (primarily addition) when the mathematical information is very concrete and familiar	• searching a short, simple text to find out what a patient is allowed to drink before a medical test • signing a form • adding the amounts on a bank deposit slip
Basic indicates skills necessary to perform simple and everyday literacy activities. Score ranges for *Basic*: Prose: 210–264 Document: 205–249 Quantitative: 235–289	• reading and understanding information in short, commonplace prose texts • reading and understanding information in simple documents • locating easily identifiable quantitative information and using it to solve simple, one-step problems when the arithmetic operation is specified or easily inferred	• finding in a pamphlet for prospective jurors an explanation of how people were selected for the jury pool • using a television guide to find out what programs are on at a specific time • comparing the ticket prices for two events
Intermediate indicates skills necessary to perform moderately challenging literacy activities. Score ranges for *Intermediate*: Prose: 265–339 Document: 250–334 Quantitative: 290–349	• reading and understanding moderately dense, less commonplace prose texts as well as summarizing, making simple inferences, determining cause and effect, and recognizing the author's purpose • locating information in dense, complex documents and making simple inferences about the information • locating less familiar quantitative information and using it to solve problems when the arithmetic operation is not specified or easily inferred	• consulting reference materials to determine which foods contain a particular vitamin • identifying a specific location on a map • calculating the total cost of ordering specific office supplies from a catalog
Proficient indicates skills necessary to perform more complex and challenging literacy activities. Score ranges for *Proficient*: Prose: 340–500 Document: 335–500 Quantitative: 350–500	• reading lengthy, complex, abstract prose texts as well as synthesizing information and making complex inferences • integrating, synthesizing, and analyzing multiple pieces of information located in complex documents • locating more abstract quantitative information and using it to solve multistep problems when the arithmetic operations are not easily inferred and the problems are more complex	• comparing viewpoints in two editorials • interpreting a table about blood pressure, age, and physical activity • computing and comparing the cost per ounce of food items

Figure 2: Overview of Literacy Levels

(Hauser et al., 2005)

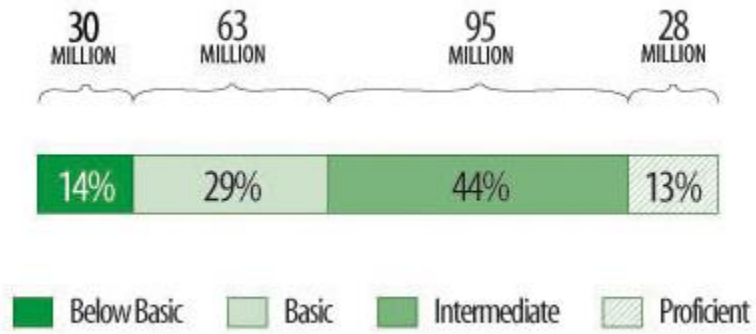

Figure 3: 2003 "National Assessment of Adult Literacy" Adults

("National Assessment of Adult Literacy", 2015)

In the tested population, 14% and 29% scored in the below-basic and basic literacy levels, respectively ("National Assessment of Adult Literacy", 2015). Those considered to have low-literacy—or in other words, basic and below-basic users—can understand short and commonplace texts, as well as complete tasks such as one-step arithmetic problems (2015).

Literacy and Attention

In order to perform the tasks associated with the different types of literacy, the readers must be able to successfully learn and process the information presented to them. Learning is the process of acquiring memories, and it is easier to accomplish when attention is not divided by distractions (Baars & Gage, 2013). Attention, along with interaction, is one of the keys to learning and concerns being aware and processing experiences with the ability to bring something to mind (2013).

The more people pay attention to new items and experiences, the more learning can occur, especially when people want to interact with the item they want to learn about (Baars & Gage, 2013). There are two parts to attention: the first is the source of attentional control that decodes what to pay attention to, and the second is the target of attention that is selected for further processing (2013). People pay attention to new information and, eventually, once it is understood clearly, the brain is able to store the

information. If the material is difficult to comprehend, repeated attention is required before a person can successfully store it (2013).

It is more difficult to learn and encode information with divided attention than with full attention (Baars & Gage, 2013). Attention is limited, and when processing new information, people tend to take familiar paths rather than explore new information that requires more effort (Johnson, 2014). Johnson stated that "exploring new paths involves problem-solving, which severely taxes our attention and short-term memory. In contrast, taking familiar, well-learned routes can be done fairly automatically and does not consume much attention or short-term memory" (2014).

Low-literacy users can experience many challenges when reading due to the issue of attention. As noted, if the material is difficult, more attention is required to store the information. Dense and complex text is considered difficult for low-literacy users and thus requires a greater level of attention. Additionally, if attention is divided, it is less likely that successful learning can occur. Low-literacy users read content word by word, which can cause the reader to miss action cues or content outside of the main focus area (Kodagoda & Wong, 2008). This deep focus on words could lead to two results: inattentional blindness, whereby the mind is occupied with a task, goal, or emotion, causing it to miss objects and events that would have otherwise been noticed or remembered; and change blindness, whereby people do not notice differences in the environment other than the ones their goals explicitly force them to pay attention to (Johnson, 2014). These "blind spots" can cause low-literacy users to miss objects or differences they may have noticed had they not been occupied decoding each word.

When a person has to refocus attention, it pulls attention away from the actual task and increases the chance of the user losing track of what he or she was doing (Johnson, 2014). Being distracted from the task and losing track of progress can create more challenges and frustrations for low-literacy users. Since low-literacy users are likely to abandon a task if it becomes too overwhelming, divided attention or a lack of focus could contribute to task abandonment and unsuccessful task completion (Kodagoda & Wong, 2008).

Since attention refers to bringing something to mind, a memory can be defined as "a lasting brain representation that is reflected in thoughts, experiences, or behaviors" (Baars & Gage, 2013). A person's existing knowledge, in addition to the person's current goals and concerns, determine how the memory interprets and processes information (2013). Johnson suggested that "activating a memory consists of reactivating the same pattern of neural activity that occurred when the memory was formed" (2014).

Long-term memory is a memory store, and once memories are stored, they are no longer conscious but can be retrieved from and reenter the memory (Johnson, 2014; Baars & Gage, 2013). Each type of long-term memory (perceptual memory, autobiographical memory, linguistic and semantic memory, visual knowledge, declarative knowledge, and habits and motor skills) can be used through the working memory (Baars & Gage, 2013). The declarative memory is based on conscious events and concepts. Within declarative memory is memory of conscious events, known as episodic long-term memory, and the memory of facts and concepts, known as semantic long-term memory (Johnson, 2014).

Baars and Gage defined working memory as "the set of mental processes holding limited information in a temporarily accessible state in the service of cognition" (2013). Also known as the capacity of attention, the working memory is everything we are conscious of at a given time: "it is a few perceptions and long-term memories that are activated, and we remain aware of them over a short period" (Johnson, 2014). Working memory allows us to access small amounts of information for 10 to 30 seconds and embeds our immediate experiences into the past, present and future (Baars & Gage, 2013).

Working memory is limited in capacity and vulnerable to distraction. When items are lost from the working memory, it typically corresponds to actions such as losing track of a current task (Johnson, 2014). If the items are not rehearsed, the chance of losing focus and attention increases (2014).

To reduce the chances of losing focus and attention, processing information automatically drains minimal energy from the limited-capacity working memory

(Handley et al., 2015). These processes do not require awareness or intention and do not interfere with other ongoing cognitive activity (2015). Therefore, automatic encoding normally has little effect on the processing of other information components. As Hasher and Zacks explained, "Among the aspects of events encoded automatically into memory are spatial location, time, frequency of occurrence, and word meaning" (1979).

The working memory works best when the maximum amount of resources is available to process less familiar and more complex operations. Therefore, automatic processes reduce the strain on the working memory, which " prevents the cognitive system from becoming overloaded by processing demands" (Hasher & Zacks, 1979).

Automatic processing is considered to originate from heredity and practice (Handley et al., 2015). Innate factors in automatic processing include encoding the frequencies of locations and the times of events. A significant degree of practice can contribute to the development of automatic processes. Skills such as reading, communication, and individual intelligence levels can become automatic based on the amount of practice (Hasher & Zacks, 1979).

Since automatic processing is a component of reading, task difficulty has the potential to disrupt performance. One way to make reading become automatic is through extensive practice and, thus, this differs from innate automatic processes: "Reading is an example of an activity that includes many processes that must be quickly and accurately coordinated" (Hasher & Zacks, 1979). If reading is not practiced, it will require more attention and possibly overload the working memory. When it is practiced and becomes automatic, the additional demands of the skill become less cumbersome and distracting: "Activation of meaning from printed words may also be an automatic process, at least for literate adults reading familiar materials" (1979).

Hasher and Zacks asserted that "effortful processes require the expenditure of attention and effort as they use a portion of the limited-capacity system" (1979). Humans are often not always aware of the effort processes that are being used; examples include deliberate rehearsal and elaborate mnemonic activities (Handley et al., 2015). Unlike automatic processes that can be innate in nature or eventually practiced into automaticity,

effortful processes are based on individual differences and capabilities (2015). Variations in capacity can affect the efficiency of effortful processes and lead to errors in performance if too much cognitive capacity is occupied.

Low-literacy adults have, at most, the ability to read and understand short prose and simple documents. Thus, they are less likely to have reading as a practiced automatic process. Low-literacy users have to dedicate more effort and use more of their limited working memory capacity to successfully comprehend textual information.

Whatever the causes, adults with low-literacy levels can experience a variety of challenges performing daily activities. The major contributors to these challenges include the amount of attention, processing, and memory required by the task. Low-literacy readers can vary greatly in these differences, based on educational experience and practice, brain function, age, and language barriers.

Low-Literacy User Behavior

Research has suggested that compared to those with higher literacy levels, people with lower levels have different cognitive skills for abstracting and comparing information (Cutrell, 2010). These skills can affect how information is read and processed both in digital and non-digital formats. A lack of experience in formal structures, such as reading and writing, can affect how someone performs the technological version of the structure—for example, reading or typing an email (Marsden, 2003).

Low-literacy users have lower reading and comprehension skills, in addition to an increased chance of having poorer computing skills than users with higher literacy levels (Kavanaugh et al., 2013). While using a website or application, attention is required to interact with the interface and comprehend its content. Low-literacy users may be more likely to divide their attention to first navigate an unfamiliar layout and to read content, such as directions, making it more difficult for them to successfully complete tasks.

As technology use, and specifically mobile device use, steadily increases among people with low-literacy, it is imperative to understand their user patterns and challenges

they may face. Prior to looking at interactions with mobile devices, general computer literacy was examined. Gupta defined computer literacy as "an individual's ability to operate a computer system, have basic understanding of the operating system, to save, copy, paste, delete, open, print documents, use computer application software to perform personal or job-related tasks, and use web browsers and search engines on the internet to retrieve information" (2006). If an individual has a low educational level, this can result in lower reading literacy, which can directly affect computing literacy (Kavanaugh et al., 2013). Therefore, usability can be a barrier for novice users and low-literacy populations (Brunskill et al., 2011). Furthermore, a study found that novice users with higher levels of education can more successfully navigate computer interfaces compared to novice users with low literacy (Cutrell et al., 2013).

Computer Literacy

Correlations between constructs of computer and reading literacy show that many people with low reading skills often have low computing skills (Fox, 2005). Study observations by Cutrell et al. (2013) have suggested that due to the strain on working memory, "people with low literacy have difficulty with computer user interfaces even when they are absent of text. It can be speculated that among other items, the hierarchical information architectures that traditional computing software depend upon—menus, folders, and so on—pose challenges for people whose cognitive skills may be underdeveloped due to low levels of education" (2013). An ethnographic investigation on low-literacy users found many barriers for technology use, including "traditional textual interfaces, scrolling, non-numeric input, and understanding technical language" (Brunskill et al., 2011).

Low literacy correlates strongly with poverty, and without basic computer skills, it may be difficult for low-literacy users to complete tasks that they need to perform online, such as completing an employment application (Cooper & Reimann, 2013; Allison, 2004). Although there has been an increase in technology use, people with low education and low income are still "unable to use information technologies at levels sufficiently high enough to completely participate" in the same manner as other users

(Kavanaugh et al., 2013). This issue can pose problems for low-literacy users, as the government provides an increasing amount of accessible information and services online.

Low-Literacy User Mobile Device Usage

Recently, there has been an increase in the number of people with low socioeconomic status who are using simple computing devices such as mobile phones (Kavanaugh et al., 2013). The portability and affordability of mobile devices provide more opportunities for first-time and low-literacy users to obtain and use such devices (Fournier at al., 2013). Compared to personal computers and other technology, mobile devices have a low learning curve, and this is also true for individuals with low reading skills (Kavanaugh et al., 2013). Research has shown that low-literacy adults find it easier to learn to use mobile devices than computers (Kavanaugh et al., 2007).

Low-Literacy User Task Abandonment

While reading, low-literacy users tend to focus on all the content presented in front of them (Khan, 2010). If too much information is presented, the user can become overwhelmed and abandon the website, application, or task. Task abandonment can also occur when users assume they have all of the information they need, regardless of whether it is incorrect or incomplete (Summers & Summers, 2005). Tactics for reducing task abandonment include presenting information in alternative ways, such as images or videos that assist with making sense of information (Kodagoda & Wong, 2008).

The frustration and task abandonment that occurs when low-literacy users have to use extensive effort to understand the content with which they are interacting is supported by the findings of cognitive load theory (CLT), which is concerned with the learning of complex cognitive tasks, in which users are often overwhelmed by the number of interactive elements that need to be processed simultaneously before meaningful learning can commence (Paas et al., 2010). Since more stress is placed on the working memory while low-literacy readers are trying to read and decode meanings, this can lead to frustration and a possible cognitive overload. To reduce cognitive overload for low-literacy users during website and application interactions, information needs to be presented in a manner that allows them to easily read and interpret meaning.

The ease of content interaction with mobile devices is beneficial to low-literacy users. Users interact directly with the interface while using mobile devices, as opposed to using a mouse and keyboard as the channels for interacting with what is presented on the computer screen: "Multi-touch interfaces have shown great potential mainly due to their ease of use, efficiency, and intuitive nature" (Kim & Maher, 2007). Tangible user interfaces encourage an interactive social experience and provide the user with an opportunity to think about virtual and abstract information in a direct and palpable manner, while receiving immediate feedback to the stimuli given through physical objects (Kin et al., 2009). The direct interactions between the user and the device reduce the experience required with formal structures. The more simplistic design of mobile devices and interfaces aims to exclude formal structures, such as extensive and multi-layered menus.

Low-Literacy User Search Behavior

Interacting with websites and applications requires the use of long-term, and working memory. Searching tasks are examples of how interactions can place a strain on working memory. Using a search function involves entering a term, performing the search, and reviewing the results. Reviewing the results can divert attention away from the initial task, and due to the limited capacity of working memory, could cause the user to forget the initial term that was searched for (Johnson, 2014). These steps can burden working memory capacity due to the need for immediate recall; therefore, search tasks should provide clear and continuous feedback (2014).

In particular, adults with low-literacy may lack confidence when they are asked to search for and identify textual information (Canny et al., 2010). They also use less focused and less efficient search strategies (Kodagoda & Wong, 2008). Searching is a task that could potentially tax the working memory, and since they have poorer searching skills (in both performing the search and identifying applicable information), low-literacy users are more prone to failing to complete searching tasks or completing them with more errors.

Navigating a website or application involves using its structure to search for and locate information. One of the purposes of navigation is to consistently tell the user where he or she is within a site. When there is a lack of consistency in navigation, low-literacy users are more likely to become confused or frustrated and abandon a task (Khan et al., 2012). Chaudry has pointed out that "low-literacy users like the ability to start every task from the same location" (2012). Therefore, even if a user becomes lost or confused, the navigation should provide an obvious starting point to redo the task or start a new one. Along with being consistent, navigation should only include necessary information and should not be overly extensive: "Requiring a user to drill down through eight levels of dialog boxes, web pages, menus, or tables – especially with no visible reminders of their location – will probably exceed the user's working memory capacity, thereby causing him or her to forget where he or she came from or what his or her overall goals were" (Johnson, 2014). Streamlined navigation is more critical for low-literacy users, as they are more likely to have a smaller working memory capacity while performing tasks that also involve reading and comprehension.

Although they find devices such as smartphones easier to learn to use, low-literacy users still experience more challenges while using technological devices compared to their counterparts with higher literacy capabilities. The correlations between computer and reading literacy explain why low-literacy users encounter more obstacles while attempting to complete tasks. Performing navigation and search tasks are major components of using both browser and mobile interfaces. These tasks can be difficult for low-literacy users, as they require concentration on multiple items, including textual information. As the user is devoting resources to comprehending the text, other items may act as distractions or even overwhelm the user. Therefore, low-literacy users have higher chances of abandoning or incorrectly completing tasks. From a design perspective, websites (and specifically mobile websites, as they are more commonly accessed by low-literacy users) should accommodate for variance in reading literacy and computer literacy skill levels.

Smartphone Usage and Best Practices

More than 77% of American adults own some variation of a smartphone, with ownership being more common among younger adults and those with higher education and income levels (Pew Research Center, 2017). A majority of smartphone owners "follow along with breaking news, share pictures or videos, or learn about community events" through their phone's internet capabilities (Smith, 2015). Out of this population, a percentage depend on smartphones as their primary internet access point. "Smartphone-dependent" refers to the 7% of the American population who have a smartphone but do not have home broadband internet service or have limited options for going online without their phones (2015).

Americans use their smartphones for tasks including texting, internet browsing, locating directions, and online banking. Among American smartphone owners, 40% use their phone to look up government services or information (Smith, 2015). Therefore, 31% of the American population has used a smartphone to access government information.

Differences in income and device access contribute to how and why certain populations use their smartphones. Users with higher incomes are more likely to own multiple internet-enabled devices, such as desktop computers and tablets. Smith outlined that "compared with smartphone owners from households earning $75,000 or more per year, those from households earning less than $30,000 annually are nearly twice as likely to use a smartphone to look for information about a job—and more than four times as likely to use their phone to actually submit a job application" (2015). Smartphone-dependent users are also less likely to have a bank account, have health insurance, or own their own home (2015).

% of U.S. adults who own the following devices

	Any cellphone	Smartphone	Cellphone, but not smartphone
Total	95%	77%	18%
Men	96%	78%	18%
Women	94%	75%	19%
White	94%	77%	17%
Black	94%	72%	23%
Hispanic	98%	75%	23%
Ages 18-29	100%	92%	8%
30-49	99%	88%	11%
50-64	97%	74%	23%
65+	80%	42%	38%
Less than high school graduate	92%	54%	39%
High school graduate	92%	69%	23%
Some college	96%	80%	16%
College graduate	97%	89%	8%
Less than $30,000	92%	64%	29%
$30,000-$49,999	95%	74%	21%
$50,000-$74,999	96%	83%	13%
$75,000+	99%	93%	6%
Urban	95%	77%	17%
Suburban	96%	79%	16%
Rural	94%	67%	27%

Figure 4: U.S. Adult Cellphone Ownership

(Pew Research Center, 2017)

Although users are more likely to own a smartphone if they have higher education and income levels, the percentage of low-income smartphone owners is rising. Among the Americans who earn less than $30,000 annually, 64% own a smartphone (Pew

Research Center, 2017). As there is a strong correlation between low literacy and poverty (Cooper & Reimann, 2003), the increasing number of lower-income and smartphone-dependent users also indicates an increase in low-literacy smartphone users. Since low-literacy users access online information through their smartphones, mobile websites and applications should follow established design best practices for this demographic.

Design Best Practices for Low-Literacy Users

Technology in general, and more specifically, smart phones and portable tablet devices, are becoming more available and affordable for mass consumption. Users of these devices can be sorted into many groups by age, literacy level, socioeconomic status, or expertise. As more people gain access to devices and the internet, the digital divide separating the groups narrows. As the divide contracts, it is critical that the best design practices are applied for as many user groups as possible.

Recent research has identified characteristics and established best practices for designing interfaces and applications for low-literacy users. In general, low-literacy adults have different skills for abstracting and comparing information than those with higher literacy levels (Cutrell, 2010). Some of these differences include the tendency for some low-literacy users to read every word in a text to make sure they are not missing the information they are looking for (Summers & Langford, 2015). Although there is an increase of technology use among this population, low-literacy users are often unable to successfully complete tasks in the same manner as other users. Barriers for technology use include "traditional textual interfaces, scrolling, non-numeric input, and understanding technical language" (Brunskill et al., 2011). They also "read as little as possible and may skip hard words or dense sections of text and read only as much they think they need to before taking action" (Summers & Langford, 2015). Low-literacy users experience difficulty when identifying and recovering from errors while using websites and applications. Based on these challenges, plain language and plain interactions should be critical components of interaction design for low-literacy users (2015).

In addition to using plain language and plain interactions, best practices for low-literacy users include using clear and consistent navigation. Providing "bread crumbs," or location information, gives participants the ability to navigate forward easily but also the option to retrace steps when needed (Chaudry et al., 2012). To help with errors, websites should have error recovery mechanisms that help bring attention to errors and assist with correction (2012). Because low-literacy users abandon tasks if they believe they have enough information, a "review mechanism would help orient users and prevent premature abandonment of tasks" (2012).

Best practices and guidelines for mobile website and application design cover a wide range of areas including, but not limited to, satisfaction, content, ease of use, aesthetics, user goals, security, learnability, complexity, search accuracy, and menu navigation. Mobile websites and applications have to present information or task cues on significantly smaller screen sizes than the standard internet browser accessed on a computer monitor. Displaying the same amount of information on a mobile device has the potential to create a negative user experience: "Many mobile applications do not prioritize the most essential aspects of the application and content is ineffectively presented" (Forrester Research, 2011). Instead of simply omitting information, or even attempting to abbreviate the content, the designer must first prioritize the information the user will be searching for, specifically in the mobile setting. For example, a mobile bank website should display quick access to personal account information as the user may want to check available funds on the go, compared to a standard browser website that may include general account and bank policy information. It is less likely that a user would want to read wealth management information in an active, moving setting. This is not to say a user would never want to view the content from a mobile device; however, the website or application should place the most frequently used information in a central or prominent location. Mobile websites should avoid displaying unwanted user information based on the context of use—for example, a task that cannot be completed from a mobile site (Inostroza & Rusu, 2014). In addition to unwanted or unusable information, if a task involves actions such as completing a form or making a purchase,

options that are not essential to the specific task should be hidden until needed (Android, 2015).

Once the content topics are prioritized, the content itself should be structured in the simplest form possible: "Presenting a large body of content on mobile devices is problematic because the application interface is overloaded with information, site links, and text" (Adipat et al., 2011). Being overloaded with content and information can cause users to become frustrated with the site (Deloitte, 2012). When creating the content for mobile websites and applications, the text should be short, be concise, and assist the user with navigation or task completion as necessary. Terminology that the target user understands should be used; in particular, technical jargon should be avoided. Android noted that "people get overwhelmed when they see too much at once; tasks and information should be broken into small, digestible chunks" to reduce distractions (2015). Short phrases and simple words should be used, "as people are likely to skip sentences when they're long" (Android, 2015).

As the number of people with access to mobile devices increases, the demographics of users changes and expands. Different demographic groups with various skill levels are interacting with the same websites and applications. If a website has a target audience that spans users with different skill levels, the site should accommodate the level that needs the most assistance for successful task completion. In order to design specifically for adults with low-literacy levels, there are more precise guidelines to follow compared to those for general audiences. Implementing these guidelines is becoming more critical as low-literacy adults are not only comfortable with mobile devices, but also relying on them rather than desktops for internet access (Chaudry et. al., 2012). Although research has shown that low-literacy adults find it easier to learn on mobile devices than on computers, they still may need explicit information and assistance while interacting with the interface (Brunskill et. al., 2011).

To establish best practices for low-literacy adults, their content interaction behaviors need to be considered. People with low-literacy levels have different cognitive skills for abstracting and comparing information than those at higher levels (Cutrell,

2010). An example includes the ability for educated and literate individuals to interpret generalized information, such as instructions, better than low-literate individuals, who tend to find generalized information more difficult to comprehend (Cutrell, 2010). Instead of scanning and summarizing information, low-literacy readers may read content word by word. Reading one word at a time can create problems when searching for information, as it takes more concentration, and the reader can miss action cues or content outside of the main area of focus (Kodagoda & Wong, 2008; Chadwick-Fias et al., 2003).

Websites and applications rely on textual content to explain information and provide direction. Homepages, navigation items, and confirmation pages include text that needs to be read and understood by the user. Multiple studies have concluded that to enhance comprehension of content for low-literacy users, different types of media should be used to partially or totally replace textual content on interfaces (Aluisio & Gasperin, 2010). However, this is not the final solution, since "people with low-literacy have difficulty with UIs even when they are absent of text" (Cutrell et al., 2013).

The navigation of mobile websites and applications is another obstacle for low-literacy users. Hierarchical navigation menus with many levels can be confusing for low-literacy users; therefore, keeping the navigation as linear as possible will create a more positive experience. Navigation through tasks can lead to additional issues. When low-literacy users have to determine future steps within a process or task, they may focus on small, specific pieces of content, which can deter them from deciding on the next step (Kodagoda & Wong, 2008). If the next step cannot be determined, a low-literacy user is likely to attempt a trial and error approach to complete tasks (2008). Therefore, when designing for low-literacy users there should be a back button within the site navigation for short recoveries and a home button for restarts (Chaudry et al., 2012).

Based on the research from low-literacy users' interaction with mobile websites and applications, several guidelines have been identified. These guidelines do not have the same level of reconfirmed support as guidelines for general mobile usability. Nevertheless, attention to the subject is growing, and more studies are being conducted to

support or oppose these guidelines. A critical guideline is that contextual information should be at the appropriate level. If the content is presented in large texts that contain numbers and complex words, it can overwhelm the user and lead to task abandonment (Summers & Summers, 2005). Main menu items should be shown on the homepage and additional menus should be removed to avoid clutter (Khan et al., 2012). Since low-literacy users focus on small areas, additional options will either lead to confusion or go unnoticed. If possible, menu text links should be supplemented with large color-coded buttons. These color-codes should remain consistent and allow the user to establish relationships with their corresponding actions (2012). Finally, search paths should be visible to users, so that they can locate their progress within a process or task (2012).

Design Best Practices for General Audiences

Users with higher literacy levels have more expansive skill sets for reading comprehension and task completion compared to those with lower literacy levels. In addition to best practices for general mobile usability, practices have been identified to accommodate the additional assistance needs of low-literacy users. There are multiple similarities between low-literacy and higher-literacy users. The most significant factor is to prioritize information on mobile devices. The limited amount of space available on the screen of a mobile device strengthens the importance of prioritizing the information that the user will view first. Doing so reduces confusion for the general user, but more importantly, it provides a focus area for low-literacy users, as it has been established that they focus on small areas of content at a time. Breaking content into smaller chunks is also recommended for both groups. Large amounts of text can lead to frustration and task abandonment in general, and this is even more true for users with lower literacy skills. Creating open and negative space provides a better experience for both the general and low-literacy user. While negative space provides a more "tranquil" and less cluttered experience for the general user, it helps the low-literacy user locate the area of focus (Apple, 2015; Kodagoda & Wong, 2008).

Establishing relationships and consistency is another area of common ground for low-literacy and higher-literacy level users. Regardless of literacy level, users should be

able to determine the website's or application's interaction relationships. Once the user understands how to interact with the site or application, a higher concentration level can be used for content comprehension. If the relationships are inconsistent, the user will need to devote more time to learn and understand the navigation. When a process or task is clearly defined, it helps the user, regardless of literacy level, to locate their progression within the website or application. Finally, there should be clear instructions for how to go back a step or restart a task. Along with assisting the general user, the feature of going back a step or restarting a task is extremely important for low-literacy users who are more likely to complete a task through trial and error.

Just as there are similarities between best practices for low-literacy users and general users, there are also contrasting ideals. General best practices suggest using hierarchal navigation menus that create space on the homepage and allow the user to dig for information that may not have a priority position. This tactic allows for priority information to remain visible while still allowing access to secondary information. Recommendations for low-literacy users state the opposite: navigation should be as linear and shallow as possible. Going through layers and establishing relationships could add to task difficulty for a low-literacy user. Although the use of graphics and other versions of media is preferred compared to text in both sets of best practices, more detail needs to be considered for low-literacy users. If images are used in conjunction with generalized content and meanings are not explicitly stated, then low-literacy users will still have difficulty interacting with the interface (Cutrell et al., 2013). Similarly, the use of over-generalized text could be confusing for low-literacy users. Simple text is a guideline for both groups, but the text needs to be both blatant and explicit, and not merely shortened to save space. Information that could be cut out to eliminate clutter for the general user could be critical for the low-literacy user in understanding the content or determining how to complete the task.

The main tension area between the two groups, regardless of navigation, content, images, graphics, and searching, is the balance of extracting the correct information. General mobile practices share the consensus that prioritized content leads to a better user

experience and provides just enough information for the user to navigate the site or application. Designers assume a specific skill level for general users, and although, like low-literacy users, these users can also be overwhelmed and confused with too much information, they can navigate the websites and applications with less assistance. They are better able to pick up on implied hints and directions; therefore, the designer with the general user in mind could end up leaving out pertinent information required by the low-literacy user. To create the best experience for both groups, the content should be concise while providing enough direction for the users to successfully complete tasks. Information or processes that designers could assume the general user is familiar with and omit to reduce redundancy should be evaluated from the prospective of the low-literacy user. If supporting content is needed, it should be included, as including it would be a much smaller annoyance to a general user than omitting it would be an obstacle to a low-literacy user.

E-Government and Digital Strategy

The United States federal government and its agencies have more than 500 external citizen websites, and the total increases exponentially when state and local government websites are considered (USA.gov, 2015). Federal, state, and local governments have provided external, citizen-facing websites since the 1990s and have increased the number of sites available over the last two decades, as more citizens have personal internet access from their homes or mobile devices (U.S. General, 2015). These websites provide a variety of purposes and services based on the department or agency. Some sites are information based with limited action required by the user, while others provide extensive services where users can complete tasks such as submitting forms and applying to programs. Online presence also provides citizens with opportunities to communicate directly with elected officials through email, forums, and social media plug-ins for websites.

A majority of United States government websites, regardless of their federal, state, or local affiliation, are often designed and maintained by an internal team within a

specific department or agency. Although two websites might fall within the United States government umbrella, such as HealthCare.gov and Grants.gov, they are not connected in any way and do not resemble one another. Therefore, government websites vary greatly in design, functionality, and usability. In comparison, the United Kingdom's government website (www.gov.uk) hosts all of the government's departments and 385 agencies or public bodies (Government Digital Service, 2018). Gov.uk's user-friendly design was awarded first place in the United Nations E-Government Survey 2016: "The survey measures e-government effectiveness in the delivery of basic economic and social services to people in five sectors, namely, education, health, labor and employment, finance, and social welfare" (United Nations, 2018).

The United States Office of E-Government and Information Technology, "headed by the federal government's chief information officer (CIO), develops and provides direction in the use of internet-based technologies to make it easier for citizens and businesses to interact with the federal government, save taxpayer dollars, and streamline citizen participation" (Office of Management and Budget, n.d.). Federal agencies are required to comply with the E-Government Act of 2002, which was passed into law on November 15, 2002. The act defines electronic government (e-government) as "the use by government of web-based internet applications and other information technologies, combined with processes that implement these technologies, to enhance the access to and delivery of government information and services or bring about improvements in government operations" (Library, n.d.). The act establishes the following requirements and guidelines for e-government: Office of Management and Budget Electronic Government Services (Section 101) capital planning and investment control; development of enterprise architectures; information security; privacy; access to, dissemination of, and preservation of government information; and accessibility of IT for persons with disabilities (Library, n.d.). The Federal Management and Promotion of Electronic Government Services (Section 202) requires agencies to communicate policies, guidance, and related IT standards to all relevant agency officials, and to develop, maintain, and promote an integrated internet-based system for delivering

government information and services to the public (Library, n.d.). The remaining sections of the act focus on information security to protect the confidential information of the federal government and its citizens.

In support of the E-Governance Act, the Digital Government Strategy was developed in 2012 to provide government agencies with the "strategies to innovate more with less, and enable entrepreneurs to better leverage government data to improve the quality of services to the American people" (Digital Government, 2017). The Digital Government Strategy has three goals:

1. To enable the American people and an increasingly mobile workforce to access high-quality digital government information and services anywhere, anytime, and on any device.
2. To ensure that as the government adjusts to this new digital world, we seize the opportunity to procure and manage devices, applications, and data in smart, secure, and affordable ways.
3. To unlock the power of government data to spur innovation across our nation and improve the quality of services for the American people (Digital Government, 2017).

To accomplish these goals, the strategy establishes four overarching principles:

1. An *information-centric approach* for managing and presenting discrete pieces of data that are most useful to the consumer;
2. A *shared platform approach* to help agencies work together to streamline development and standards to ensure consistency in information delivery;
3. A *customer centric approach* to influence the creation and management of data that allows customers to shape, share, and consume information, whenever and however they want it; and

4. A platform of *security and privacy* to ensure the safe and secure delivery and use of services (Digital Government, 2017).

The Digital Government Strategy has several priorities for improving user experience on government websites. One priority is to improve customer-facing services for mobile use. This priority requires agencies to provide mobile-friendly versions of their most high-priority sites and services. Agencies should either update existing sites or create mobile versions for services and information that have not already been placed online (Digital Government, 2017).

The Digital Government Strategy is not the only initiative to place high priority on the government's mobile presence. The Making Mobile Gov Project first launched in 2011 and has been evolving along with changes in technology and user preferences:

> The case for Mobile Gov is driven by: the ubiquity of mobile use in the U.S.; opportunities to use mobile to improve the efficiency of service delivery in government; innovations in mobile that can propel new government services/service delivery; and improved transparency through increased access to government data and information. (U.S. General, 2015)

The government plans to use new mobile technology to provide information and to engage the public in an efficient and creative way: "Agencies are starting by taking existing information or services and repackaging them for new devices. In mobile form, these services can provide immediate alerts, save call center costs, and make the most of existing government data stores" (U.S. General, 2015).

One of the Making Mobile Gov Project's goals, improving transparency, aims to bridge the digital divide and provide more access to government information. Mobile Gov has examined survey data, including Pew results, from low-income and disabled citizens; this data indicates that groups such as low-income teenagers are more likely to access the internet via cell phones than via desktop computers (U.S. General, 2015):

> If government wants to reach everyone, mobile is definitely part of the mix. A report on collaboration in a local community found that transparency is associated with residents' personal feelings of empowerment. Put simply, people who think that their government delivers services and shares information believe they can have an impact on government. This suggests that good, open mobile products can build trust and engagement between citizens and the government. (U.S. General, 2015)

Examples of Mobile Gov initiatives include the mobile USA.gov website and application, the National Archives and Records Administrative mobile website, and the Recovery.gov app, which allows citizens to track government spending on projects funded by the American Recovery and Reinvestment Act of 2009 (U.S. General, 2015).

Government Assistance Programs and Websites

The E-Government Act, the Digital Government Strategy, and the Making Mobile Gov Project exemplify the federal government's initiatives in bridging the digital divide. The goal of all these initiatives is to provide transparent online access to government information and services for all citizens. As technology advances and increasingly more citizens use mobile devices, the goal extends to include mobile-friendly websites and applications for accessing information and services.

Government assistance programs include housing assistance programs, such as Section 8, Medicaid, and SNAP. Millions of Americans are enrolled in these programs annually. The 2012 United States census revealed that "approximately 52.2 million (or 21.3% of) people in the United States participated in major means-tested government assistance programs each month in 2012" (Hyer, 2015). Furthermore, Hyer reported that "participation rates were highest for Medicaid (15.3%) and the SNAP, formerly known as the food stamp program (13.4%)" (2015).

The demographics of means-based government assistance program beneficiaries

range in ethnicity, family structure, age, education, and employment. For example, 41.6% of the black population were likely to participate in an assistance project each month (Hyer, 2015), followed by Hispanics (36.4%), Asians and Pacific Islanders (17.8%), and non-Hispanic whites (13.2%) (2015). Among married-couple households, 14.7% were beneficiaries compared to single female-households (50%) and single male-households (29.5%) (2015).

Education level and employment showed correlations between program enrollments. Among non-high school graduates, 37.3% received benefits compared to the decreasing 21.6% of high school graduates and 9.6% of individuals with at least one year of college education (Hyers, 2015). Furthermore, 6.7% full-time workers participated in means-tested programs, while 33.5% of the unemployed population received benefits (2015).

Means-Based Program Websites

As previously stated, low literacy correlates with low income. Government assistance programs have a web presence, and these websites allow users to access program and eligibility information from any location through the internet or a wireless connection. This not only offers more privacy for program seekers, but also provides the conveniences of not physically visiting an agency office or making phone calls for preliminary questions. Additionally, if a user prefers to visit an agency in person or speak to a representative on the phone, the websites can still be used as tools to find agency locations and updated phone numbers.

Following the goals of the E-Government Act and the Digital Government Strategies, users have access to information and services provided by government agencies through these websites. As the websites are managed by different agencies, they are unique and have different requirements and steps for task completion.

The Medicaid website provides an overview of the program, eligibility, benefits, and financial information: “Medicaid provides health coverage to millions of Americans, including eligible low-income adults, children, pregnant women, elderly adults and people with disabilities” (Medicaid, n.d.). Tasks that can be completed on the website

include determining eligibility and reading guidelines for completing an application through the online marketplace. Medicaid's mobile site design is not an exact replica of its standard browser site. The mobile site focuses on three tasks: learning how to apply for coverage, commenting on or viewing pending demonstrations, and signing up for website updates.

Another example is SNAP, which "offers nutrition assistance to millions of eligible, low-income individuals and families and provides economic benefits to communities" (USDA, 2015). The information on the SNAP website includes instructions on how to apply, guidelines for reporting lost cards, and eligibility requirements. There are no program-related tasks that can be completed on the website, as each state handles and manages its own applications. There is also no mobile version of the USDA SNAP website.

The Federal Public Housing Assistance (Section 8) program is the "federal government's major program for assisting very low-income families, the elderly, and the disabled to afford decent, safe, and sanitary housing in the private market" (HUD, 2015). The website includes information on eligibility, voucher instructions, and participant obligations. Users cannot apply for the program through the website, but the website provides copies of forms to print and deliver to a local HUD office.

The Low-Income Home Energy Assistance Program (LIHEAP) "helps keep families safe and healthy through initiatives that assist families with energy costs" (Office of Community, 2015). The website provides program information such as eligibility criteria and regulations and includes audio playback of text. The website also has functionality for online form and application completion and submission. There is no mobile version of the website. However, users can still use the audio reader on a mobile device.

The Temporary Assistance to Needy Families (TANF) "program has served as one of the nation's primary economic security and stability programs for low-income families with children. TANF is a block grant that provides $16.6 billion annually to states, territories, the District of Columbia, and federally-recognized Indian tribes"

(Office of Family, n.d.). Although the website provides program information, users are referred to a phone number to receive any help through the program. There is no mobile version of the website. The TANF website has an audio text reader that can be used both on a browser and mobile device.

The National School Lunch Program (NSLP) "is a federally assisted meal program operating in public and nonprofit private schools and residential child care institutions. It provides nutritionally balanced, low-cost or free lunches to children each school day" (USDA, 2015). The NSLP website provides program and eligibility information; however, families have to contact the student's school directly for application information. The NSLP website does not have a mobile version.

Although most of the websites are not mobile-friendly, the information can still be accessed on a mobile device, which is important as many low-literacy users rely on them rather than on desktops to access the internet (Chaudry et al., 2012). Therefore, users in search of government assistance program information can still access this on a mobile device, even though it is not fully optimized for mobile use. The availability of this information follows the guidelines of the E-Government Act and many aspects of the Digital Government Strategy, such as enhancing access to government information by presenting useful information to the customer.

In summary, research shows there is large population of low-literacy American adults with low income who could potentially own smartphones. This population may qualify for numerous government means-based programs and could consequently use their smartphones to learn about or apply to those programs. Existing research on low-literacy user behavior has begun to establish best practices for designing websites and applications for low-literacy users. These practices, some varying from general population best practices, aim to reduce the amount of challenges low-literacy users may encounter such as large text, complex words, and difficult navigation. The amount of attention required to read and interact with a website could overload a low-literacy user's cognitive processes, which could lead to task abandonment. The purpose of this observational study is to support research on low-literacy user behavior and to examine

how this population specifically interacts and perceive means-based government program websites. The following chapter will outline the methodology used in the study.

Chapter 3: Methodology

The purpose of this study was to strengthen the research on the value of mobile design for low-literacy users of government benefit websites and explore how low-literacy users specifically interact with and perceive these sites. The study had three parts:

- *Phase I:* Observe participants as they use smartphones to complete tasks on current government benefit program websites. In this phase, three websites were explored with similar tasks
- *Prototype Development:* Develop a mobile website prototype of one of the tested government program websites based on the observations from the Phase I sessions and existing research into design practices effective with low-literacy users.
- *Phase II:* Use rapid iterative testing and evaluation (RITE) methods to observe participants as they complete the same tasks on both the active government website and the developed prototype.

Study Participants

There were 19 participants in the rapid iterative testing and evaluation (RITE). Each participant was required to own a smartphone, be at least 18 years of age, and have a Rapid Estimate of Adult Literacy (REALM) score below 60. A REALM score below 60 indicates the participant has the literacy level of or below that of an 8th-grader (Murphy et al., 1993). If a participant had completed the REALM for another University of Baltimore study within the calendar year of this study, the participant was not required to retake the assessment. A majority of study participants were contacted via phone to schedule an appointment from an existing study participant list from the University of Baltimore's Usability Lab. The remaining participants were recruited in front of Penn Station across the street from the university.

All of the observation sessions took place at the University of Baltimore's Usability Lab. Upon arrival, the participants were asked to complete a consent form and a

compensation form. Once the forms were completed, the participant took the REALM exam if necessary. After completing the REALM exam, participants were asked questions based on their internet usage. These questions and a summary of the response can be seen in Table 1 below.

Table 1: Participant Internet Behavior

	Total
How many days a week do you use the internet?	
Every day	14
5–6 days per week	2
3–4 days per week	1
2 or fewer days per week	2
What type of tasks do you do on the internet? *(participants could provide more than 1 answer)*	
Social media	6
Email	6
Shop	6
Check the news	5
Watch videos/media	3
Search for jobs	2
Pay bills	1
Play games	1
What are your favorite websites? *(participants could provide more than 1 answer; only top 4 included)*	
Facebook	6
Google	5
YouTube	3
Instagram	2
What is your preference: phone or computer?	
Phone	9
No preference	8
Computer	1

Materials

For each session, each participant used a smartphone to interact with the test websites. The phone was attached to a camera dock that recorded the screen interactions and allowing the researcher to observe what was occurring on a computer monitor instead of sitting directly next to or behind the participant.

During Phase I, participants were asked to use their own phones to provide a more natural environment and eliminate the extraneous factor of interacting with an unfamiliar smartphone. However, some participants' search histories could be seen as they used their internet browsers to complete the tasks. Search histories displayed past visited sites and caused two participants to become nervous and uncomfortable. One of participants became distracted from the task and had to start again after history information was displayed. In order to eliminate seeing personal information, Phase II participants were all given a smartphone (iPhone) from the Usability Lab. As owning a smartphone was a requirement to participate, there was no evidence of unsuccessful task completion due to not understanding how to operate the actual phone as all participants were able to operate the phone (tap on links, tap on search bars, type in search bars, return to previous pages, etc.) with no or minimal assistance.

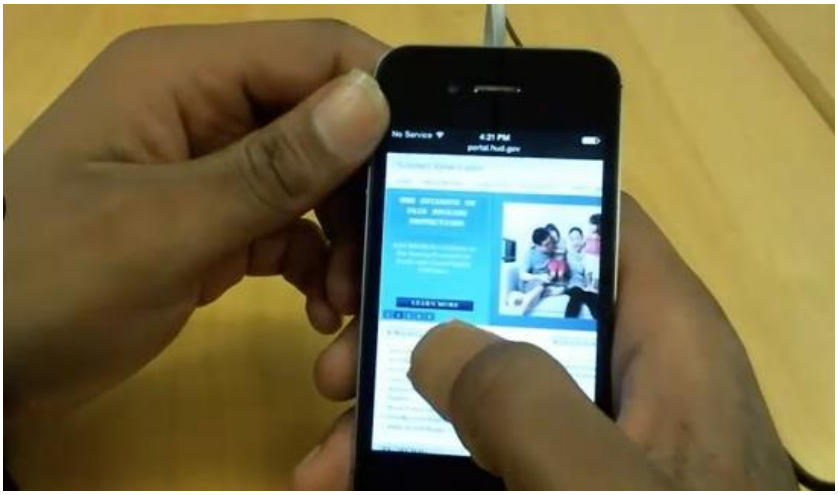

Figure 5: View of Participant Using Phone with Camera Dock

Phase I: Initial Observation

Phase I of the study included four participants. The participants were asked to visit the following program websites on their smartphones: Section 8 (HUD), SNAP (USDA), and Medicaid. Although the tasks varied from site to site due to differences in programs and information, all tasks were designed to test whether the participants could locate, read, and determine the answers to basic questions about each program.

A task was considered successfully completed if the participant could fully answer the question based on information he or she found on the program website. A task was considered unsuccessful if a participant abandoned the task, already knew the answer without completing the actions to locate the information on the site, or if the participant was on the correct page but could not locate the information to answer the question.

Qualitative observation also took place throughout each session. In addition to notes on interactions and behaviors, participants were asked questions if they were unable to complete a task. These questions included but were not limited to the following:

- "Can you explain to me what you found on this page?"
- "What did you expect to find on this page?"
- "What information do you think is missing or would be helpful on this page?"
- "Where would you put [insert function i.e., contact information] if you designed this site?"

The tasks used in Phase I are summarized in Table 2 on the following page:

Table 2: Tasks for Phase I

HUD
Task 1: Locate HUD website and identify basic program information
Task 2: Determine program eligibility
Task 3: Locate programs for purchasing housing
SNAP
Task 1: Determine program eligibility
Task 2: Determine how much a family of three must earn to qualify
Task 3: Determine if there is an online application
Medicaid
Task 1: Determine program eligibility
Task 2: Locate a plan the participant is eligible for
Task 3: Locate a phone number for assistance

The results of Phase 1 will be discussed in further detail in the following chapter. The observations that were key to prototype included task completion rates: 1 out of 12 possible task completions for HUD tasks; 5 out of 12 possible task completions for SNAP tasks; and 3 out of 12 possible task completions for Medicaid tasks.

Each of the participants displayed the following behaviors during Phase I sessions:

- Assumption that entire department or agency site was relevant to the task
- Difficulty locating correct contact information
- Performing input searches to find the correct webpage
- Difficulty distinguishing links

Prototype Development

Based on qualitative observations from Phase I, a mobile website prototype of the Department of Housing and Urban Development (HUD) was designed and developed to retest against the existing Department site (site as of December 2016).

The platform ProtoIO was used to develop and test the prototype. The platform allowed participants to freely explore the prototype as if it were an active webpage. The limitation of the prototype was that it was not a fully built out website. If participants clicked on a link to a filler page that was not relevant to the task and that did not have its own specific content, they received this alert: "Prototype test page, please go back or return to home." Participants were informed that some pages would not work, as the prototype was for testing purposes; however, 2 participants still became confused when interacting with a filler page.

The design of the prototype was based on the results of Phase 1. Each of the Phase I participants demonstrated the following behaviors and interactions, which are presented here along with the designs implemented to improve task completion rates:

- *Assumption that entire department or agency site was relevant to the task*

  Government benefit programs are run through federal departments or agencies and it is common for those departments or agencies to be the hosts of their program websites. Therefore, multiple programs or department or agency content (offices, press releases, administration, etc.) can be on one website. When tasked to find specific program information, the participants searched the entire site under the assumption that all content applied just to the program they were currently focusing on (for example, searching for HUD agency office locations and looking under the "Office" header that houses department administrative offices). This led to confusion and task abandonment. To solve this issue, the prototype was designed to prioritize external consumer information. Program participants are looking for how to gain or learn more about specific programs; therefore, the links to these items monopolize the prototype homepage. Additional agency or department information was not removed from the prototype, but rather moved to less prominent locations. If a user wanted to

learn about the department administrators or various offices, the information would still be easily accessible.

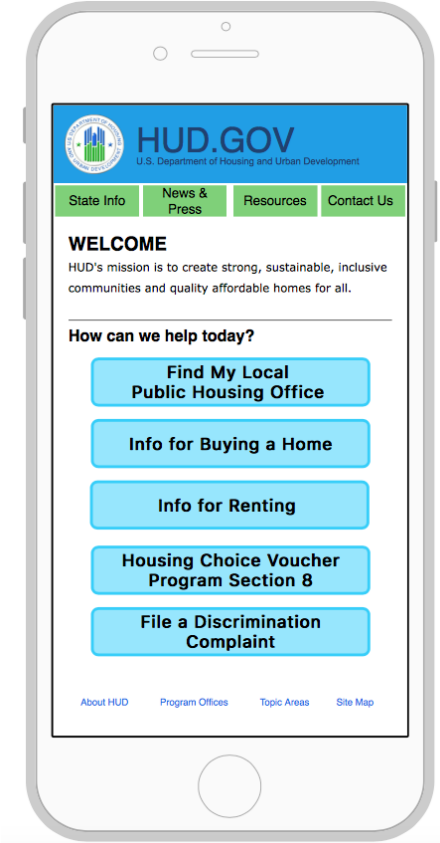

Figure 6: Prototype Screenshot: Homepage

- *Difficulty locating correct contact information*

Each participant assumed the entire department or agency site applied to their current task, thus they identified incorrect contact information (for example, selecting the first phone number encountered even if it was for a different office or program). Part of this problem was addressed by making consumer-related content the most prominent and placing problem-solving information in the main content area. Additionally, the prototype allowed participants to click on agency offices and view individual agency pages instead of reading off a scrolling list. This change was integrated after a participant tried to click on an agency within a list for more

information and was confused why it did not work. The distinction not only allowed participants to read from the list, but also isolated the specific information they were searching for.

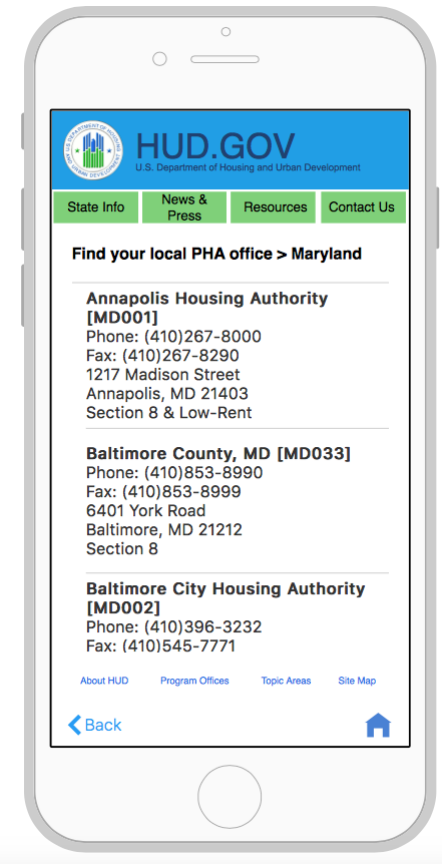

Figure 7: Prototype Screenshot: Agency List

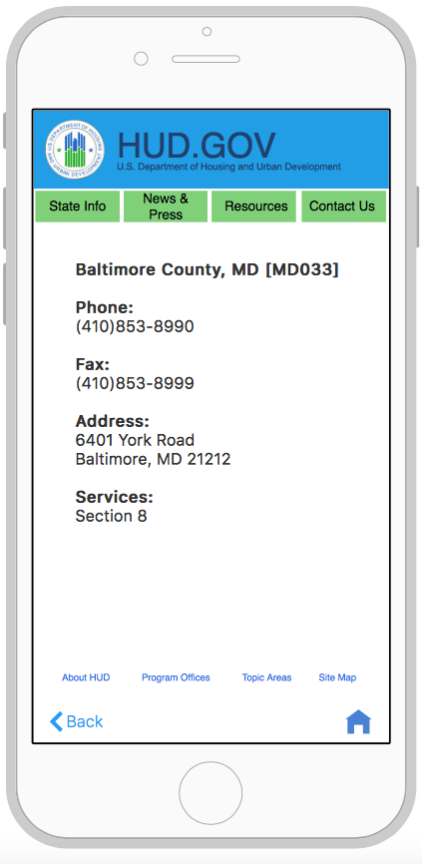

Figure 8: Prototype Screenshot: Agency Page

- *Performing input searches to find the correct webpage*

Each participant defaulted to performing a search when overwhelmed with the amount of content on a page. A search function was not available on the prototype platform. Additionally, due to the size of many government websites, the searches performed by the Phase I participants yielded large and complex result pages. Performing a search did not improve any of the participants' task completion rates. The homepage was reduced to five main categories (Find My Local Public Housing Office, Info for Buying a Home, Info for Renting, Housing Choice Voucher Program

Section 8, File a Discrimination Complaint), which filtered into more expansive content pages that each provided only information on their specific category. The Housing Choice Voucher was given a separate link outside of "Info for Renting," as it is the largest HUD rental assistance program.

- *Difficulty distinguishing links*

The program websites in Phase I used large chunky blocks of text with hyperlinks embedded within paragraphs. Each of participant either missed these links due to not reading entirely through paragraphs or due to the fact the link was not easily distinguishable from regular text. If there was a large block of text, all participants would quickly scroll past the text and subsequently miss the links embedded within the text. To fix this problem, large paragraphs were either edited into shorter paragraphs or broken down into lists when the paragraph included numerous links. Additionally, links were colored a bright blue to distinguish them from regular text.

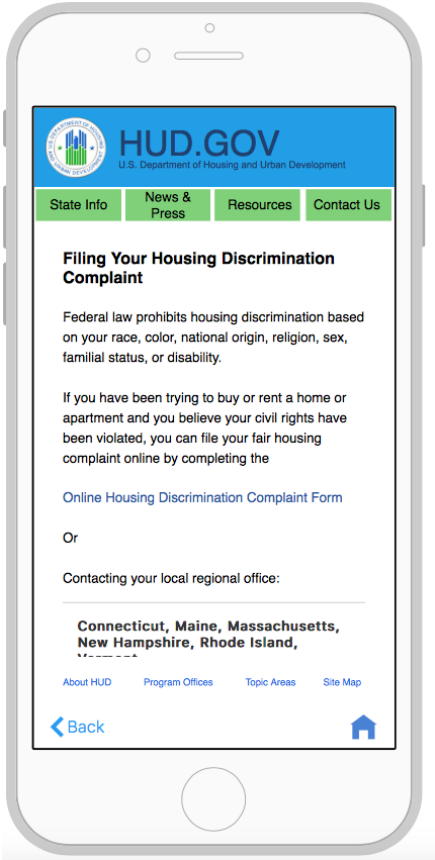

Figure 9: Prototype Screenshot: Discrimination Complaint

Phase II: Prototype Rapid Iterative Testing and Evaluation (RITE)

Phase II of the study included 15 participants. The participants were asked to complete identical tasks on the Prototype and the existing HUD website. The HUD website was selected as it has the lowest Phase I task completion rates in comparison to the SNAP and Medicaid sites. Eight participants were exposed to the prototype site first, followed by the HUD site; and seven participants were exposed to the HUD site first, followed by the prototype site.

Rapid Iterative Testing and Evaluation was used for Phase II. Changes in the prototype were made based off observed participant behaviors (Wixon, 2003). This method increased the quality and reliability of the observations as it provided verification

if changes improved task completion and allowed for the discovery of additional issues within the changed prototype (2003).

As in Phase I, each of the tasks was developed for the participant to locate, read and determine the answer to a basic question about the program. For Phase II, all tasks focused on the HUD Section 8 Housing Voucher Program. Successful task completion was again determined if the participant could answer the question based on information located and read on the website. Tasks were considered unsuccessful if the participant abandoned the task, answered the question from previous experience, or reached the correct page but could not locate the information to answer the question. Qualitative observations were also taken into account, following the same probing protocol as Phase I. The tasks used in Phase II testing are summarized in Table 3 below:

Table 3: Tasks for Phase II

Identical Tasks for HUD website and prototype
*Task 1: Browse the internet to find information on Section 8
Task 2: Determine Section 8 eligibility
Task 3: Locate a phone number for assistance
Task 4: Locate a local agency office address
Task 5: Determine if it is possible to keep voucher status after moving
**Task not attempted while using prototype*

Chapter 4: Results

The purpose of this study is to better understand how low-literacy users interact with and perceive government program websites. Since low literacy correlates with low income, HUD's Section 8 program, USDA's SNAP, and Medicaid were selected for exploration (Cooper & Reimann, 2003). It is becoming more common for low-income adults to own smartphones (often before owning a computer); therefore, participants were tested only on smartphone devices (Smith, 2015).

Phase I Results

The first phase of the study was completed by four participants. The purpose of Phase I was to analyze how participants interacted with different government websites and to identify problems areas to be addressed in the prototype. Each participant used the HUD, USDA, and Medicaid websites. The results of task completion for Phase I can be seen in Tables 4 and 5:

Table 4: Phase I Successful Task Completion

	Number of participants out of 4	
HUD	**Unsuccessful**	**Successful**
Task 1: Find basic program information	4	0
Task 2: Determine program eligibility	3	1
Task 3: Locate programs for purchasing housing	1	0
SNAP		
Task 1: Determine program eligibility	3	1
Task 2: Determine how much a family of three must earn to qualify	3	1
Task 3: Determine if there is an online application	1	3
Medicaid		
Task 1: Determine program eligibility	3	1
Task 2: Identify a plan the participant is eligible for	4	0
Task 3: Identify a phone number for assistance	2	2

Table 5: Phase I Individual Successful Task Competition

	Task 1	Task 2	Task 3
HUD			
P001			
P01			
P02		Completed	
P04			
SNAP			
P001			Completed
P01			
P02	Completed	Completed	Competed
P04			Completed
Medicaid			
P001			Completed
P01			
P02	Completed		
P04			Completed

Table 5 displays the individual task completion for each participant in Phase I. Participant P02 completed 5 out of 9 total attempted tasks; Participants P001 and P04 completed 2 out of 9 total attempted tasks; and P01 completed 0 out of 9 total attempted tasks. Each participant demonstrated the following behaviors in Phase 1:

- Assumption that entire department or agency site was relevant to the task
- Difficulty locating correct contact information
- Performing input searches to find the correct webpage
- Difficulty distinguishing links

These behaviors influences the design of the prototype that was used in Phase II.

Phase II Results

During Phase II, 15 participants used the HUD website (which has been updated since the completion of this study) and the prototype designed based on the results of Phase I. Seven participants first used the website, followed by the prototype, while eight participants used the prototype first, followed by the HUD website.

Phase II Task Completion Results: Each participant attempted identical tasks on the website and prototype, except for one. Participants were asked to use an internet browser during the HUD portion of testing, but the prototype was preloaded for participant use, since it could not be accessed through a search engine. The task competition data is summarized in Table 6 below:

Table 6: Phase II Successful Task Competition

	Number of participants out of 15	
Phase II Successful Task Completion	HUD	Prototype
*Task 1: Locate HUD Website	3	-
Task 2: Determine Section 8 eligibility	3	11
Task 3: Locate a phone number for assistance	4	14
Task 4: Locate a local agency office address	3	11
Task 5: Determine if it is possible to keep voucher status after moving	3	2

**Task not attempted while using prototype*

Table 7: Phase II Individual Successful Task Completion

Participant	Website Task 2	Prototype Task 2	Website Task 3	Prototype Task 3	Website Task 4	Prototype Task 4	Website Task 5	Prototype Task 5
P06	Completed	Completed		Completed	Completed	Completed		
P07				Completed		Completed		
P08		Completed		Completed		Completed		
P09		Completed		Completed		Completed		
P10			Completed	Completed	Completed	Completed		
P11	Completed	Completed	Completed	Completed		Completed	Completed	Completed
P12		Completed		Completed		Completed		
P13		Completed		Completed		Completed		
P14		Completed		Completed				
P15		Completed	Completed	Completed			Completed	
P16	Completed	Completed	Completed	Completed	Completed	Completed		
P17		Completed		Completed		Completed	Completed	Completed
P18								
P19				Completed		Completed		
P20		Completed		Completed				

Table 7 displays each participant's individual task competition rate. With the exception of P15 on Task 5, all participants who successfully completed a task on the website also had successful task completion for the identical task on the prototype.

Conversion Rate Significance: The chi-square test was applied to each task to determine if the difference in task competition rates between the HUD website and prototypes were statistically significant.

Task 2 (Determine Section 8 eligibility) Conversion Rate Significance:

Table 8: Task 2 Conversion Rate Significance

	Successful	**Unsuccessful**	**Total**
HUD	3*(a)*	12*(b)*	15*(m)*
Prototype	11*(c)*	4*(d)*	15*(n)*
Total	14*(r)*	16*(s)*	30*(N)*

"The chi-square test can be used when the expected cell counts are greater than 5." (Lewis & Sauro, 2012)

$$\frac{(r\ x\ m)}{N} = \frac{(14\ x\ 15)}{30} = 7$$

$$\frac{(s\ x\ m)}{N} = \frac{(16\ x\ 15)}{30} = 8$$

$$\frac{(r\ x\ n)}{N} = \frac{(14\ x\ 15)}{30} = 7$$

$$\frac{(s\ x\ n)}{N} = \frac{(16\ x\ 15)}{30} = 8$$

$$X^2 = \frac{(ad-bc)^2\ N}{mnrs}$$

$$X^2 = \frac{(3\ x\ 4 - 12\ x\ 11)^2\ x\ 30}{15\ x\ 15\ x\ 14\ x\ 16}$$

$$X^2 = 8.5714$$

$$p\text{-}value = 0.003$$

When p-value < .05 there is a statistically significant difference between conversion rates (Lewis & Sauro, 2012). The results of Task 2 conversion rates are statistically significant.

Task 3 (Locate a phone number for assistance) Conversion Rate Significance:

Table 9: Task 3 Conversion Rate Significance

	Successful	**Unsuccessful**	**Total**
HUD	4*(a)*	11*(b)*	15*(m)*
Prototype	14*(c)*	1*(d)*	15*(n)*
Total	18*(r)*	12*(s)*	30*(N)*

Chi-square test:

$$\frac{(r\ x\ m)}{N} = \frac{(14\ x\ 15)}{30} = 7$$

$$\frac{(s\ x\ m)}{N} = \frac{(16\ x\ 15)}{30} = 8$$

$$\frac{(r\ x\ n)}{N} = \frac{(14\ x\ 15)}{30} = 7$$

$$\frac{(s\ x\ n)}{N} = \frac{(16\ x\ 15)}{30} = 8$$

$$X^2 = \frac{(ad-bc)^2\ N}{mnrs}$$

$$X^2 = \frac{(4\ x\ 1\ -11\ x\ 14)^2\ x\ 30}{15\ x\ 15\ x\ 18\ x\ 12}$$

$$X^2 = 13.8889$$

$$p\text{-}value = .0002$$

P-value = <.05, therefore the results of Task 3 conversion rates are statistically significant.

Task 4 (Locate a local agency office address Conversion) Rate Significance:

Table 10: Task 4 Conversion Rate Significance

	Successful	**Unsuccessful**	**Total**
HUD	3*(a)*	12*(b)*	15*(m)*
Prototype	11*(c)*	4*(d)*	15*(n)*
Total	14*(r)*	16*(s)*	30*(N)*

Chi-square test:

$$\frac{(r\ x\ m)}{N} = \frac{(14\ x\ 15)}{30} = 7$$

$$\frac{(s\ x\ m)}{N} = \frac{(16\ x\ 15)}{30} = 8$$

$$\frac{(r\ x\ n)}{N} = \frac{(14\ x\ 15)}{30} = 7$$

$$\frac{(s\ x\ n)}{N} = \frac{(16\ x\ 15)}{30} = 8$$

$$X^2 = \frac{(ad-bc)^2\ N}{mnrs}$$

$$X^2 = \frac{(3\ x\ 4 - 12\ x\ 11)^2\ x\ 30}{15\ x\ 15\ x\ 14\ x\ 16}$$

$$X^2 = 8.5714$$

$$p\text{-}value = 0.003$$

P-value = <.05, therefore the results of Task 4 conversion rates are statistically significant.

Task 5 (Determine if it is possible to keep voucher status after moving) Conversion Rate Significance:

Table 11: Task 5 Conversion Rate Significance

	Successful	**Unsuccessful**	**Total**
HUD	3*(a)*	12*(b)*	15*(m)*
Prototype	2*(c)*	13*(d)*	15*(n)*
Total	5*(r)*	25*(s)*	30*(N)*

Chi-square test:

$$\frac{(r\ x\ m)}{N} = \frac{(5\ x\ 15)}{30} = 2.5$$

$$\frac{(s\ x\ m)}{N} = \frac{(25\ x\ 15)}{30} = 12.5$$

$$\frac{(r\ x\ n)}{N} = \frac{(5\ x\ 15)}{30} = 2.5$$

$$\frac{(s\ x\ n)}{N} = \frac{(25\ x\ 15)}{30} = 12.5$$

$$X^2 = \frac{(ad-bc)^2\ N}{mnrs}$$

$$X^2 = \frac{(3\ x\ 13 - 12\ x\ 2)^2\ x\ 30}{15\ x\ 15\ x\ 5\ x\ 35}$$

$$X^2 = 0.24$$

$$p\text{-}value = 0.64$$

P-value = >.05, therefore the results of Task 4 conversion rates are not statistically significant.

Phase II Qualitative Analysis: Throughout each HUD session, in addition to recording notes on task completion, notes on participants' behaviors and opinions (which were either prompted by questions or spoken without prompt, since participants were encouraged to think aloud) were recorded. Each recording was watched for review and note taking. The notes were compiled and sorted into a spreadsheet to identify pattern behaviors among participants. The findings of Phase I focused on improvement areas for the prototype design, while findings from Phase II focused on site interaction, initial browser search performance, and perception of government websites. The categories of site interaction and government website perception were predetermined based on data from the literature review. Browser search performance was determined based on observations from both Phase I and Phase II as each participant displayed challenges in this category. The following four behaviors and preferences were the most common:

- *Assumption that the department or agency site was only for the program they were searching (consistent with Phase I findings):* 14 of the 15 participants interacted with the website as if it was solely for the Section 8 program instead of the entire HUD department and its various other programs. The overwhelming amount of content made one participant say, "I would not fool with it. I think it was designed to make people not want it [Section 8] because they know the list is backed up, so, they have it designed to deter people from it."
- *Trust of first website encountered through an internet browser search:* 13 of the 15 participants trusted the first website they clicked on as the official Section 8/HUD website. Participants input a variety of searches when asked to find the Section 8/HUD website and often clicked one of the first three links listed on the result page. When one participant looked at the yielded responses, the participant commented, "They have a zillion and one websites and they do not have what you actually need, everyone has created their own HUD housing sites and it's confusing."

- *Poor search performance:* 12 of the 15 participants were unable to locate the HUD Section 8 website through internet research. This behavior differs from trusting the first website as one participant continued to search and located the HUD website after spending time on the first encountered site and eventually finding the HUD website. This participant believed that both sites were trustworthy official sites when in fact, that was only true for the latter. A common search behavior included selecting the first populated Google search as they typed, even if the populated terms were not helpful to the search (for example, after typing in *Section 8,* clicking on *Section 8 rentals*). The populated searches would result in rental listing sites instead of program information pages. A participant also commented on how they prefer to speak into their phone instead of type searches—"it's the easier way"—which may have resulted in poor search performance, as they were using lab supplied phones.
- *Preference for completing program tasks in person or on the phone:* 9 of the 15 participants mentioned at some point throughout their session that they would prefer to speak with someone in person or on the phone when learning about benefit programs. Most cited not trusting the internet or themselves to perform such important tasks as the main reason they would rather go to an agency office instead. Below is a list of comments from 5 different participants in regards speaking or interacting with a person for assistance:
    - "No, you have to call for something like that. I wouldn't do something as delicate as that on the internet. That's your life."
    - "The process is too long, and you have to jump through a lot of hoops. There should be an application you can print out and bring to an office to save time."
    - "No it's not there, maybe it's because I'm old school, I want to be in contact with someone, I want to speak to someone to get my point across."
    - "I don't want to try, I'd rather call."

- "Everything on here would turn me off" The application will ask you about your mother and your five ancestors so I don't have time to even fool with this site."

The results in this chapter will be further discussed in the following chapter.

Chapter 5: Discussion

Effect of Mobile Design on Low-Literacy User Behavior

The first phase of this study was to observe how low-literacy users interact with three current government program websites while using smartphone devices. Based on the results of Phase I and existing research, a prototype was developed to improve the task completion rates for one of the tested websites. The following problem areas were identified:

- Assumption that the entire department or agency site was relevant to the task;
- Difficulty locating correct contact information;
- Performing input searches to find the correct webpage; and
- Difficulty distinguishing links.

These problem areas are consistent with the findings of previous research. For low-literacy users, content presented in large texts with complex words can overwhelm the user and lead to task abandonment (Summers & Summers, 2005). Main menu items should be clearly visible on the homepage and if possible use large colorful buttons (Khan et al., 2012). Finally, performing input search tasks can cause users to divert attention from their original task as attention is used to focus on reviewing the search results (Johnson, 2014).

The mobile HUD website prototype was designed with prioritized content broken down into short paragraphs and lists; homepage menu items made a focal point with large colorful buttons; non-program information (including administrative information and news communications) was relocated to a less prominent area on the homepage; the input search bar was removed; and links were separated from other texts (i.e., not within paragraphs) and made a consistent, distinct color.

These changes increased overall task completion rate for Phase II testing. While using the prototype, participants were more successful in three of the four identical tasks performed on the current government website. The only task that had a decline in completion was *Task 5: Determine how to keep program status after moving* with a

decrease of 7%. Based on observations, participants either selected “Info for Renting” on the homepage instead of “Housing Choice Voucher—Section 8” option or were not sure what option to select on the homepage to learn about moving status. The poor label choice decreased task completion. This finding is consistent with prior research outcomes demonstrating that if the next step cannot be determined, a low-literacy user will employ a trial and error approach or simply abandon the task (Wong, 2008).

This study explored how the use of mobile design can affect low-literacy user behavior. The findings strengthened existing research on low-literacy behavior as task completion rates improved by an average of 55%. The limitations of these results include not being able to use a task search bar function in the prototype. Although the search function did not increase task completion rates on the actual government site, it was a preference of the participants and a function they will encounter and can use on actual websites. This area requires more study, as government websites tend to be large and yield large results through input searches. The search phrase “find section 8 apartment” on the HUD website yielded 653,000 results. These abundant results confused participants and did not help them locate the information they were searching for. The search results need to have better filter systems in place, based on typical low-literacy searches (i.e., complete phrases), or have standard “action-based” information displayed somewhere on the results page to direct users to commonly searched items or topics. For example, if a user searches the term “Section 8,” there should be a section on the results page with action links, including “I want to apply for Section 8” and “I want to find my local agency.” Finally, several participants mentioned they prefer to speak into their phones and let the phone initiate the search. It helped them search for words they were unable to spell, and it was faster for inputting long questions or phrases. Integrating this function within government websites, specifically those with large page counts, could help improve low-literacy user experience.

It is also important to note that the official government websites are managed externally. After the conclusion of participant observations, the HUD mobile website was

redesigned to reflect many mobile user-friendly best practices. However, the findings of Phase II indicate that there is still room for improvement, even after the redesign. As more low-literacy users receive access to smartphone devices, these large means-based programs will have to continually update their websites to remain in line with their consumer base as device capabilities and user behaviors will continue to evolve and change.

Importance of Centralized Government Websites

Research studies have found that 40% of American smartphone owners use their phone to look up government services or information (Smith, 2015). Since 77% of American adults own a smartphone, this is a substantial user population. Among Americans who earn less than $30,000 annually, 64% own a smartphone (Pew Research Center, 2017). Therefore, there is also a large sample of adults who are eligible for means-based government assistance programs and have access to smartphone devices. The goals of the United States government's Digital Government Strategy include enabling people to have access to high-quality information; ensuring the government adjusts to the new digital world; and unlocking the power of government data (Digital Government, 2017). To accomplish the goals, the strategy aims to take an information-centric approach, a shared platform approach, and customer-centric approach (2017). This initiative is extremely important, and if the government continues to adopt this strategy, it will create a better experience for low-literacy users.

Of the 15 Phase II study participants, 14 believed that the site they were using applied only to the current program they were attempting to find information on. For example, participants were often confused when the title "Program Offices" was a link to the administration of various HUD programs instead of locations of local agency offices. Additionally, when they wanted to learn about Section 8, "Resources" was a common selection that often frustrated them because the information was not exclusive to the particular program. The HUD browser website has also been updated since the completion of testing for this project. Unfortunately, the updated site still prominently displays "News" on the homepage, as it did on the previous version. This information

adds more content and clutter to the page and often annoyed participants as they viewed it on the smart device because they did not understand why it was important or how it applied to the task they were trying to complete. The updated site features "Housing Choice Voucher" on the homepage without mention of Section 8. If users are unaware that is the official name for the program and are only searching for Section 8 information, this cue could be easily missed.

If the government continues to use its Digital Government Strategy, it will need to not only streamline government websites, but also find a way to isolate large program information for users. The United Kingdom's e-government site was rated the most user-friendly website in 2016 by the United Nations E-Government Survey (United Nations, 2018). The website hosts all major departments and 385 agency webpages (www.gov.uk, 2018). Thus, users have very similar experiences regardless of the site they are visiting. This tactic also assists in the identification of official websites, which is discussed further in the next section.

Low-Literacy Users Trust in Non-Official Websites

The results of Phase II Prototype Rapid Iterative Testing and Evaluation (RITE) found that 13 out of the 15 participants believed they had found the correct HUD website through their initial browser search. Often clicking on the first link in their Google search results, after seeing housing listings or "HUD" written in a prominent area on the page, participants indicated that this is where they would go to get program information. This finding is consistent with existing research: task abandonment can occur when low-literacy users assume they have all the information they need, even if it is incorrect or incomplete (Summers & Summers, 2005).

For government programs in particular, further research should be done to see if streamlined government websites and branding would make official websites easier for low-literacy users to correctly identify. During Phase I, one participant stated that he was unaware the Food Stamps program was now called SNAP, and that he would not have thought the official site was correct for the program he was searching for. Additionally,

he did not know the USDA was the department that ran the program, and he questioned why it was the largest logo on the SNAP website.

Further testing is also needed to determine whether including approved program websites would help low-literacy users identify the correct program information. The HUD website provides information on the department's programs on a national level and can help users learn about the different programs offered, eligibility levels, and agency contact locations and information. However, there are also approved HUD sites for local agencies and offices. The Neighbor Works Home Ownership Center offers HUD approved consulting agencies in the Baltimore area. If HUD has approved external agencies, links to these resources should be provided through the main website. A short-term solution would be to display an approved indicator, such as a logo, for external websites to display so users know it is HUD verified. A long-term solution would involve the consolation of multiple government websites.

Preference for Performing Tasks with Agency Assistance

One goal of this study was to examine how low-literacy users perceived government websites and what expectations they had of those sites. As stated, a majority of American adults who earn less than $30,000 annually own smartphones. Means-based programs were tested in this study due to the correlation between low literacy and low income. Prior to beginning either phase of the study, participants were asked about their usual internet behaviors. The most common tasks performed on the internet were based on social media and entertainment with the top four favorite sites being Facebook, Google, YouTube, and Instagram. Among the 15 participants tested in Phase II, 9 said they would prefer to speak with someone on the phone or in person when dealing with something related to housing, such as the Section 8 program. The participants were comfortable locating information online but said completing applications or checking their status should be done with the help of a person who works for the program.

The most common reasons for not wanting to apply for a program online included not trusting the website to complete the application and not trusting themselves to

complete the application accurately. As low-literacy users are more likely to have a lack of experience in formal structures such as reading and writing, this can affect how they perform the technological version of the structure (Marsden, 2003). The participants believed performing tasks that could affect their housing and living situations were "too important" to perform online.

Further research should be carried out on the above finding. User preferences and expectations change with experience, exposure and device capabilities. Although a majority of participants did not prefer to complete an application online, it is possible low-literacy users may be more accepting to the idea in the future. It is also possible there would be a continued preference to perform certain tasks, such as completing applications, in person or over the phone.

These findings show the importance of allowing low-literacy users to access contact information, help and assistance information, and agency location information quickly and easily. Directing users to assistance phone lines and physical agency locations should be a priority on all government assistance program websites as it is likely low-literacy users are accessing the site to find help and assistance and not necessarily complete and submit an application.

A participant stated that it would be helpful if the websites provided applications online or checklists to print out in order to prepare for an agency visit. The participant said it would help cut down time spent in the agency office but still allow for assistance and approval when completing important paperwork. In contrast, one participant had a strong preference for completing applications online, commenting that "speaking with people was annoying, and I prefer to do it on my own."

All of the participants stated it was helpful to have program information available online, whether it was an application, contact information, or instructions on how to apply. Where practical (depending on the program), all means-based programs should eventually have online application functionalities. Even if it is not a preference for a majority of targeted users, it will still be helpful for those who prefer to complete the task online. All steps leading to applying for a program or seeking assistance should be easily

distinguishable for all users. If a user wants to find an office location or phone number, view an application, or eventually submit an application, the website should be designed to help low-literacy users to successfully complete those tasks.

Chapter 6: Conclusion

The purpose of this study is to support existing research on low-literacy user interactions and behaviors, and to identify possible design guidelines for means-based government program websites. This was accomplished through examining how low-literacy users interact with program websites, implementing and rapid iterative testing and evaluation (RITE) of low-literacy guidelines and best practices for interaction and design (Wixon, 2003); and exploring the perceptions and experiences of low-literacy users while accessing program websites.

The findings of this study are consistent with the outcomes of existing research. By integrating low-literacy mobile interface guidelines, participants had an overall higher successful task completion rates than on the existing websites. Low-literacy behavior, in particular with government assistance program websites, include difficulty identifying official government websites and assuming entire agency or department sites apply to a single program. All participants remarked that it is good for government programs to have websites to access information. However, a majority of the participants did not trust the websites or themselves to complete large tasks such as completing applications and had a strong preference of visiting an agency or seeking help over a phone call.

Recommendations

Based on these findings, government means-based assistance programs should carry out continuous usability testing on the low-literacy adult population as their experience, confidence and expectations of performing tasks such as submitting an application may change over time. This would ensure that the websites that can potentially serve millions of Americans are aligned with current behaviors.

Current websites should be designed to reduce the amount of non-program-related information and tasks presented on the department, agency or program homepage. This reduction would include items such as news, administrative information or other non-essential content that could confuse or frustrate a low-literacy user.

Integrating voice input search capabilities would also be helpful for low-literacy users, as it reduces the amount of words they have to correctly spell to yield accurate results. An input search results page should also display common "action-based" items to help users to navigate to commonly searched information.

Finally, as stated in the US Digital Government Strategy, government websites should be streamlined. If they are more consistent with one another, they may be easier for users to identify and trust as the official pages.

Limitations

There were several limitations of this study. This was an observational study and not an experimental exploration of measuring the design changes implemented by the prototype. Therefore the results of the study do not rule out all confounding factors and are inconclusive.

The small sample size of participants reduced the confidence level and increased the margin of error of the study results. The small sample size was due to difficulty recruiting participants who met the criteria: 8th grade reading level or below (assessed by the REALM exam) and owner of a smartphone. Time available and time needed to run each study session also contributed to the small sample size. Each session took at least 45 minutes and had to take place in the University of Baltimore's Usability Lab. Finally, available funding limited the number of participants that could be recruited to participate in the study. Although the sample size was too small to provide conclusive evidence on low-literacy behavior on means-based government websites, it did provide a basis and rationale to continue larger-scaled studies on this topic.

Further Research

There is room for further research on how low-literacy users interact with means-based program websites. Examination of the following topics would contribute to a better user experience on program websites:

- Tensions of umbrella websites
- Can clear and consistent branding and visual design can improve differentiation between official government websites and non-official websites?

With millions of low-literacy adults in America and millions of individuals who participate in means-based government assistance programs, it is imperative that they are able to find accessible information on these programs. The sites and applications that host this information should be designed to follow best practices for mobile design. More importantly, they should follow the best practices for low-literacy users. Mobile design is a priority when considering low-income and low-literacy adults as it is common for them to use smartphones as a primary access point for the internet. Continually improving and testing the design of government means-based program websites will lead to higher usability for low-literacy users and ideally higher program satisfaction for participants.

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Appendix A: IRB Approval

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June 2, 2016

Brittany Miller
University of Baltimore
1420 N. Charles Street
Baltimore, MD 21201

Dear Ms. Miller:

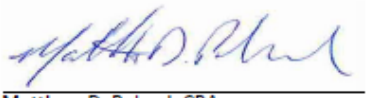
This letter serves as official confirmation of the Institutional Review Board's review of your protocol for a study entitled "Low-Literacy Search Behavior: Designing to Increase Information Retrieval and Successful Task Completion on Government Mean-Based Program Websites," submitted for review on May 9, 2016.

The Institutional Review Board considered your request and concluded that your protocol poses no more than minimal risk to participants. In addition, research involving the use of widely acceptable survey/interview procedures where the results are kept confidential and the questions pose minimal discomfort to participants is exempt from IRB full-committee review per 45 CFR 46.101 (b) (2). As a result, the Institutional Review Board has designated your proposal as exempt.

Investigators are responsible for reporting in writing to the IRB any changes to the human subject research protocol, measures, or in the informed consent documents. This includes changes to the research design or procedures that could introduce new or increased risks to human subjects and thereby change the nature of the research. In addition, you must report any adverse events or unanticipated problems to the IRB for review.

If you have any questions, please do not hesitate to contact me directly by phone or via email.

As authorized by P. Ann Cotten, C.P.A., D.P.A.
Chair, Institutional Review Board



Matthew D. Poland, CRA
Coordinator, Institutional Review Board

cc: K. Summers

Appendix B: Participant Consent Form

Whom to Contact about this study:
Principal Investigator: Brittany Larkins
Department: Information & Interaction Design, Yale Gordon College of Arts and Sciences
Telephone number: 410-234-9283

CONSENT FORM FOR PARTICIPATION IN RESEARCH ACTIVITIES
Designing to Improve the Usability of Government Program Websites

I. INTRODUCTION/PURPOSE:
I am being asked to participate in a research study. The purpose of this study is to observe how people interact with government benefit program websites in order to establish methods for improvement.

My involvement in this study will begin when I agree to participate and will last for approximately 30 minutes. About 30 persons will be invited to participate.

II. RISKS AND BENEFITS:
My participation in this study does not involve any significant risks and I have been informed that my participation in this research will not benefit me personally, but will improve online access to government benefit programs.

III. CONFIDENTIALITY:
Any information learned and collected from this study in which I might be identified will remain confidential and will be disclosed ONLY if I give permission. All information collected in this study will be stored in a locked file cabinet in a locked room. Only the investigator and members of the research team will have access to these records. If information learned from this study is published, I will not be identified by name. By signing this form, however, I allow the research study investigator to make my records available to the University of Baltimore Institutional Review Board (IRB) and regulatory agencies as required to do so by law.

Consenting to participate in this research also indicates my agreement that all information collected from me individually may be used by current and future researchers in such a fashion that my personal identity will be protected. Such use will include sharing anonymous information with other researchers for checking the accuracy of study findings and for future approved research that has the potential for improving human knowledge.

The session will be recorded:

☐ Yes, I give the researcher permission to use my video recording to review my session. My video and identity will not be shared outside the research team.

☐ No, I do not give the researcher permission to use my video recording.

IV. SPONSOR OF THE RESEARCH:
This research study is for a doctoral dissertation.

V. COMPENSATION/COSTS:
My participation in this study will involve no cost to me. I will be paid for my participation in $40.00 cash.

VI. CONTACTS AND QUESTIONS:

The principal investigator, Brittany Larkins has offered to and has answered any and all questions regarding my participation in this research study. If I have any further questions, I can contact Brittany Larkins at 410-234-9283 or Brittany.miller@ubalt.edu .

For questions about rights as a participant in this research study, contact the UB IRB Coordinator: 410-837-6199, irb@ubalt.edu.

VII. VOLUNTARY PARTICIPATION

I have been informed that my participation in this research study is voluntary and that I am free to withdraw or discontinue participation at any time.

I will be given a copy of this consent form to keep.

VIII. SIGNATURE FOR CONSENT

The above-named investigator has answered my questions and I agree to be a research participant in this study. By signing this consent form, I am acknowledging that I am at least 18 years of age.

Participant's Name: _____ Date: _____

Participant's Signature: _____ Date: _____

Investigator's Signature: _____ Date _____

Appendix C: Phase I Testing Script

Study Setup

- ☐ REALM Exam Sheet
- ☐ Consent Form
- ☐ Camera docked and set for record

If the participant has taken the REALM exam for the University of Baltimore within the last calendar year, skip to consent form. If the participant has not completed the REALM exam, start here:

Hi, [participant name]. My name is [proctor name], and I'm going to be walking you through this session today.

REALM Exam

- ☐ Use REALM instructions and administer the exam
- ☐ After the exam, total the score
- ☐ If the score is above 60, compensate with half pay and thank the participant for his or her time
- ☐ If the score is below 60, proceed with the study

Please sign the consent form; please note for research purposes we will be recording this session. The video will only record your hands and the device and will only be seen by people working on this project. If you are uncomfortable with this or any other information on this form you do not have to participate in this study.

- ☐ Hand participant consent form

Thank you, we are ready to begin the study. I'll start by reviewing the purpose of the study. We're asking people to use different web sites so we can see what works well and what doesn't work well. The entire session should take about an hour.

We are testing the different sites, not you. You can't do anything wrong here.

As you use the site, I'm going to ask you as much as possible to try to think out loud: to say what you're looking at and what you are trying to do.

If you have any questions throughout the session, please do not hesitate to ask.

Do you have any questions before we start?

- Answer any questions
- Lead participant to the observation table

Do you own a smart phone with internet access? If so, we would like for you to use it during the study. If you don't, it's okay we have a device here.

- Set phone on mount and prep camera for recording

We will begin to record the session now

- Start camera recording

Ok, before we look at the websites, I have a few quick questions.

How many days a week do you think you use the internet?

What type of tasks do you do on the internet? (social media, read the news, send emails)

Do you have any favorite websites?

What do you use most often to visit those sites, the phone or a computer?

Thank you, now we will begin to look at the websites.
Please remember to think out loud as much as possible while going through the web site. Feel free to follow along using the sheet.
Let's say you have a friend moving to Baltimore from Texas, and they need help finding out about housing programs like Section 8. Can you help her find out if she is eligible?

- Observe as participant attempts to start the task
- If they find the correct website, continue to next task
- If they don't find the correct website, direct them: "Please type in the address www.hud.gov
- Wait for page to load and confirm the participant is on the correct website

So, how would you find basic information on section 8?

- Observe as the participant attempts the task
- If the participant finds the correct page, ask next question
- If the participant is having difficulty, probe about what they are finding and then move to next task

Let's say your friend decides to just call about section 8, or go in to talk to somebody. Can I watch you find that information?

- Observe as the participant attempts the task
- If the participant finds the phone number, ask if there is an address
- If the participant is having difficulty, probe about what they are finding and then move to next task

Great, how can you tell if your friend was eligible for section 8?

- Observe as the participant attempts the task
- If the participant finds the correct page, ask next question
- If the participant is having difficulty, probe about what they are finding and then move to next task

Let’s say you have another friend who has been doing well and they would really like to buy their first house. Are there any programs that would help them buy a home in Baltimore, MD?

- Observe as the participant attempts the task
- If the participant finds the correct page, ask next question
- If the participant is having difficulty, probe about what they are finding and then move to the next site

Thank you, that was really helpful. How was it? Is there anyway the website could have been easier for you? Was there anything really confusing or anything that was helpful?

Ok, now we will test another website.

Let's say you have a cousin in Baltimore with two children who needs to apply for food stamps. Can you help her find out if she is eligible?

- Observe as participant attempts to start the task
- If they find the correct website, continue to next task
- If they don't find the correct website, direct them: "Please type in the address www.fns.usda.gov/snap"

How much can a family of three make each month to qualify?

- Observe as participant attempts to start the task
- If the participant finds the correct page, ask next question
- If the participant is having difficulty, probe about what they are finding and then move to next task

Can they apply online?

- Observe as participant attempts to start the task
- If the participant finds the correct page, ask next question
- If the participant is having difficulty, probe about what they are finding and then move to next task

Can you find the online application?

- Observe as participant attempts to start the task
- If the participant finds the correct page, ask next question
- If the participant is having difficulty, probe about what they are finding and then move to the next site

Thank you! How did you feel about this site? Could it have been easier? What was confusing? Was there anything helpful?

Ok, now we will our final website.

Thanks, this is the website for Medicaid, the government program that provides healthcare.

Let's say you have another cousin who moved to Baltimore. This one wants to learn about Medicaid. This sheet has the family's information. ****pass family info sheet****

- Observe as participant attempts to start the task
- If they find the correct website, continue to next task
- If they don't find the correct website, direct them: "Please type in the address www.medicaid.gov/ "
- Wait for page to load and confirm the participant is on the correct website

Can you figure out if they are eligible?

- Observe as participant attempts to start the task
- If the participant finds the correct page, ask next question
- If the participant is having difficulty, probe about what they are finding and then move to the next task

Can you find a plan they are eligible for?

- Give participant 10 minutes to find and complete the eligible assessment using the provided information
- If the participant finds the correct page, ask next question
- If the participant is having difficulty, probe about what they are finding and then move to the next question

Is there anyone to call if you have any questions?

- Observe as participant attempts to start the task
- If the participant finds the correct page, ask next question
- If the participant is having difficulty, probe about what they are finding and then move to closing questions.

Great, that was really helpful! How did you feel about this website? Is there anything that could have made it easier? Was there anything really confusing or helpful?

- Stop video recording
- Give participant the incentive and sign the form acknowledging they received it
- Thank them for their time, provide compensation, and escort them out

Appendix D: Phase II HUD Followed by Prototype Script

Study Setup

- REALM Exam Sheet
- Consent Form
- Camera docked and set for record

If the participant has taken the REALM exam for the University of Baltimore within the last calendar year, skip to consent form. If the participant has not completed the REALM exam, start here:

Hi, [participant name]. My name is [proctor name], and I'm going to be walking you through this session today.

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- Use REALM instructions and administer the exam
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sites so we can see what works well and what doesn't work well.

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As you use the site, I'm going to ask you as much as possible to try to think out loud: to say what you're looking at and what you are trying to do.

If you have any questions throughout the session, please do not hesitate to ask.

Do you have any questions before we start?

- ☐ Answer any questions
- ☐ Lead participant to the observation table
- ☐ Set phone on mount and prep camera for recording

We will begin to record the session now

- ☐ Start camera recording

Ok, before we look at the websites, I have a few quick questions.

How many days a week do you think you use the internet?

What type of tasks do you do on the internet? (social media, read the news, send emails)

Do you have any favorite websites?

What do you use most often to visit those sites, the phone or a computer?

Thank you, now we will begin to look at the websites.

Please remember to think out loud as much as possible while going through the web site.

Let's say you have a friend moving to Baltimore from Texas, and they need help finding out about housing programs like Section 8.

So, how would you find basic information on section 8?

- Observe as participant attempts to start the task
- If they find the correct website, continue to next task
- If they don't find the correct website, direct them: "Please type in the address www.hud.gov
- Wait for page to load and confirm the participant is on the correct website

- Observe as the participant attempts the task
- If the participant finds the correct page, ask next question
- If the participant is having difficulty, probe about what they are finding and then move to next task

Great, how can you tell if your friend was eligible for section 8?

- Observe as the participant attempts the task
- If the participant finds the correct page, ask next question
- If the participant is having difficulty, probe about what they are finding and then move to next task

Let's say your friend decides to just call about section 8, or go in to talk to somebody. Can I watch you find that information?

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- If the participant finds the phone number, ask if there is an address
- If the participant is having difficulty, probe about what they are finding and then move to next task

Can you find the address of the local public housing agency your friend could go to if they wanted to speak to someone in person?

- Observe as the participant attempts the task
- If the participant finds the phone number, ask if there is an address
- If the participant is having difficulty, probe about what they are finding and then move to next task

Let’s say you have another friend who has been doing well and they would really like to buy their first house. Are there any programs that would help them buy a home in Baltimore, MD?

- Observe as the participant attempts the task
- If the participant finds the correct page, ask next question
- If the participant is having difficulty, probe about what they are finding and then move to the next site

Thank you, that was really helpful. How was it? Is there anyway the website could have been easier for you? Was there anything really confusing or anything that was helpful?

Ok, now we will test another website.

Hand participant phone with prototype loaded

Let's say you have a friend moving to Baltimore from Texas, and they need help finding out about housing programs like Section 8.

So, how would you find basic information on section 8?

- Observe as the participant attempts the task
- If the participant finds the correct page, ask next question
- If the participant is having difficulty, probe about what they are finding and then move to next task

Great, how can you tell if your friend was eligible for section 8?

- Observe as the participant attempts the task
- If the participant finds the correct page, ask next question
- If the participant is having difficulty, probe about what they are finding and then move to next task

Let's say your friend decides to just call about section 8, or go in to talk to somebody. Can I watch you find that information?

- Observe as the participant attempts the task
- If the participant finds the phone number, ask if there is an address
- If the participant is having difficulty, probe about what they are finding and then move to next task

Can you find the address of the local public housing agency your friend could go to if they wanted to speak to someone in person?

- Observe as the participant attempts the task
- If the participant finds the phone number, ask if there is an address
- If the participant is having difficulty, probe about what they are finding and then move to next task

Let's say you have another friend who has been doing well and they would really like to buy their first house. Are there any programs that would help them buy a home in Baltimore, MD?

- Observe as the participant attempts the task
- If the participant finds the correct page, ask next question
- If the participant is having difficulty, probe about what they are finding and then move to the next site

Thank you, that was really helpful. How was it? Is there anyway the website could have been easier for you? Was there anything really confusing or anything that was helpful?

- Stop video recording
- Give participant the incentive and sign the form acknowledging they received it
- Thank them for their time, provide compensation, and escort them out

Appendix E: Phase II Prototype Followed by HUD Testing Script

Study Setup

- ☐ REALM Exam Sheet
- ☐ Consent Form
- ☐ Camera docked and set for record

If the participant has taken the REALM exam for the University of Baltimore within the last calendar year, skip to consent form. If the participant has not completed the REALM exam, start here:

Hi, [participant name]. My name is [proctor name], and I'm going to be walking you through this session today.

REALM Exam

- ☐ Use REALM instructions and administer the exam
- ☐ After the exam, total the score
- ☐ If the score is above 60, compensate with half pay and thank the participant for his or her time
- ☐ If the score is below 60, proceed with the study

Please sign the consent form; please note for research purposes we will be recording this session. The video will only record your hands and the device and will only be seen by people working on this project. If you are uncomfortable with this or any other information on this form you do not have to participate in this study.

- ☐ Hand participant consent form

Thank you, we are ready to begin the study. I'll start by reviewing the purpose of the study. We're asking people to use different web

sites so we can see what works well and what doesn't work well.

The entire session should take about an hour.

We are testing the different sites, not you. You can't do anything wrong here.

As you use the site, I'm going to ask you as much as possible to try to think out loud: to say what you're looking at and what you are trying to do.

If you have any questions throughout the session, please do not hesitate to ask.

Do you have any questions before we start?

- ☐ Answer any questions
- ☐ Lead participant to the observation table
- ☐ Set phone on mount and prep camera for recording

We will begin to record the session now

- ☐ Start camera recording

Ok, before we look at the websites, I have a few quick questions.

How many days a week do you think you use the internet?

What type of tasks do you do on the internet?

Do you have any favorite websites?

What do you use most often to visit those sites, a phone or a computer?

Thank you, now we will begin to look at the websites.
Please remember to think out loud as much as possible while going through the web site. Feel free to follow along using the sheet.

Hand participant phone with prototype loaded

Let's say you have a friend moving to Baltimore from Texas, and they need help finding out about housing programs like Section 8.

So, how would you find basic information on section 8?

- Observe as the participant attempts the task
- If the participant finds the correct page, ask next question
- If the participant is having difficulty, probe about what they are finding and then move to next task

Great, how can you tell if your friend was eligible for section 8?

- Observe as the participant attempts the task
- If the participant finds the correct page, ask next question
- If the participant is having difficulty, probe about what they are finding and then move to next task

Let's say your friend decides to just call about section 8, or go in to talk to somebody. Can I watch you find that information?

- Observe as the participant attempts the task
- If the participant finds the phone number, ask if there is an address
- If the participant is having difficulty, probe about what they are finding and then move to next task

Can you find the address of the local public housing agency your friend could go to if they wanted to speak to someone in person?

- Observe as the participant attempts the task
- If the participant finds the phone number, ask if there is an address
- If the participant is having difficulty, probe about what they are finding and then move to next task

Let's say you have another friend who has been doing well and they would really like to buy their first house. Are there any programs that would help them buy a home in Baltimore, MD?

- Observe as the participant attempts the task
- If the participant finds the correct page, ask next question
- If the participant is having difficulty, probe about what they are finding and then move to the next site

Thank you, that was really helpful. How was it? Is there anyway the website could have been easier for you? Was there anything really confusing or anything that was helpful?

Ok, now we will test another website.

Let's say you have a friend moving to Baltimore from Texas, and they need help finding out about housing programs like Section 8.

So, how would you find basic information on section 8?

- Observe as participant attempts to start the task
- If they find the correct website, continue to next task
- If they don't find the correct website, direct them: "Please type in the address www.hud.gov
- Wait for page to load and confirm the participant is on the correct website

- Observe as the participant attempts the task
- If the participant finds the correct page, ask next question
- If the participant is having difficulty, probe about what they are finding and then move to next task

Great, how can you tell if your friend was eligible for section 8?

- Observe as the participant attempts the task
- If the participant finds the correct page, ask next question
- If the participant is having difficulty, probe about what they are finding and then move to next task

Let's say your friend decides to just call about section 8, or go in to talk to somebody. Can I watch you find that information?

- Observe as the participant attempts the task
- If the participant finds the phone number, ask if there is an address
- If the participant is having difficulty, probe about what they are finding and then move to next task

Can you find the address of the local public housing agency your friend could go to if they wanted to speak to someone in person?

- Observe as the participant attempts the task
- If the participant finds the phone number, ask if there is an address
- If the participant is having difficulty, probe about what they are finding and then move to next task

Let’s say you have another friend who has been doing well and they would really like to buy their first house. Are there any programs that would help them buy a home in Baltimore, MD?

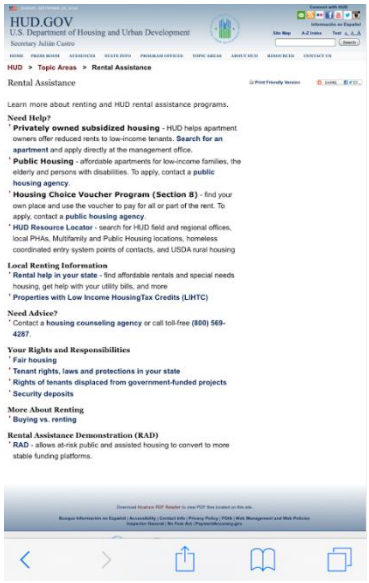
- Observe as the participant attempts the task
- If the participant finds the correct page, ask next question
- If the participant is having difficulty, probe about what they are finding and then move to the next site

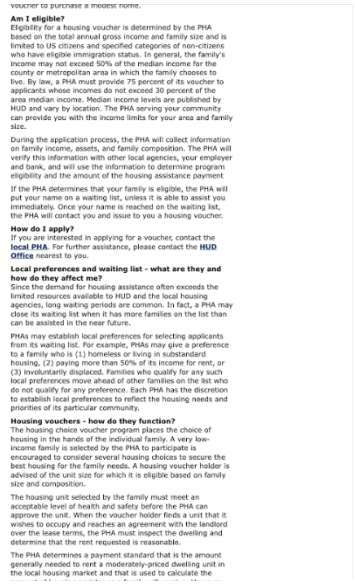
Thank you, that was really helpful. How was it? Is there anyway the website could have been easier for you? Was there anything really confusing or anything that was helpful?

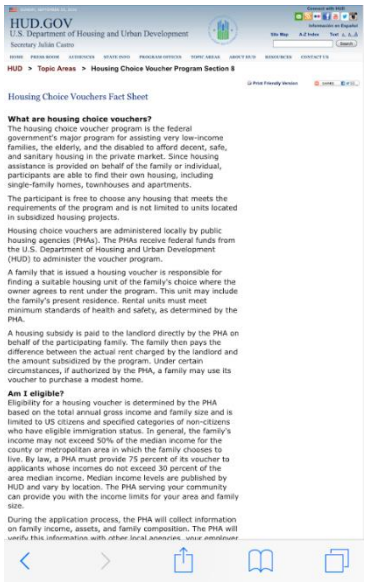
- Stop video recording
- Give participant the incentive and sign the form acknowledging they received it
- Thank them for their time, provide compensation, and escort them out

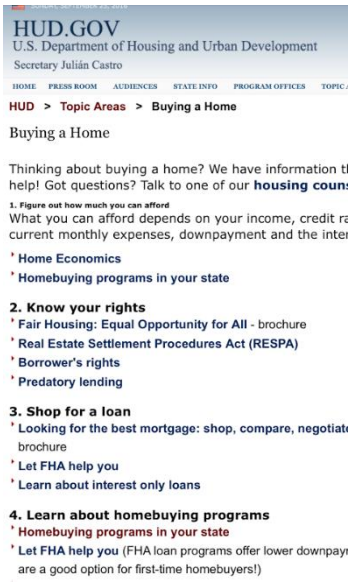
Appendix F: Tested Government Website Screenshots

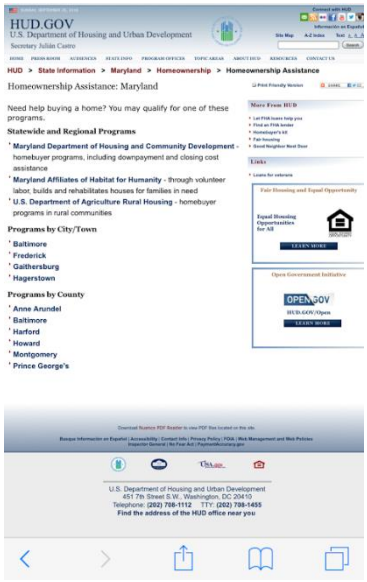
HUD



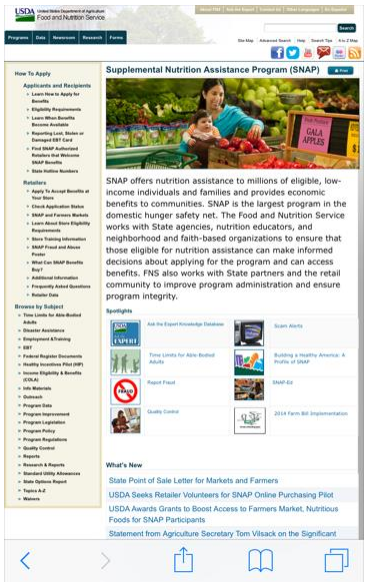


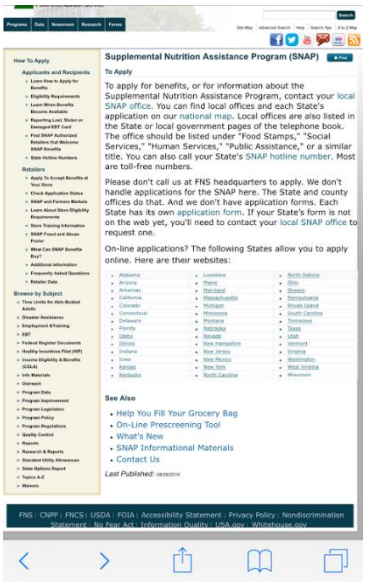


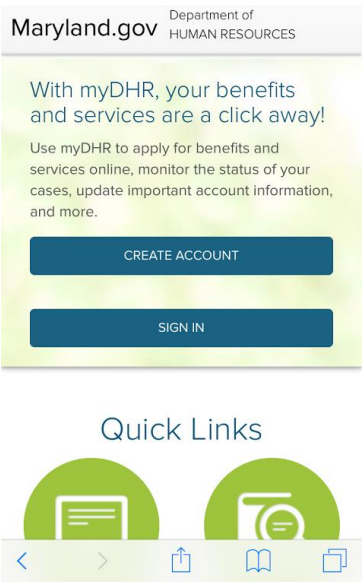


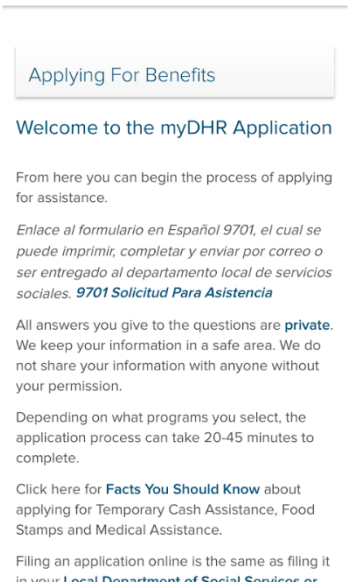


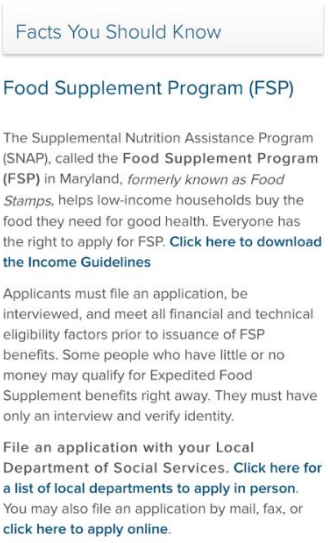
SNAP

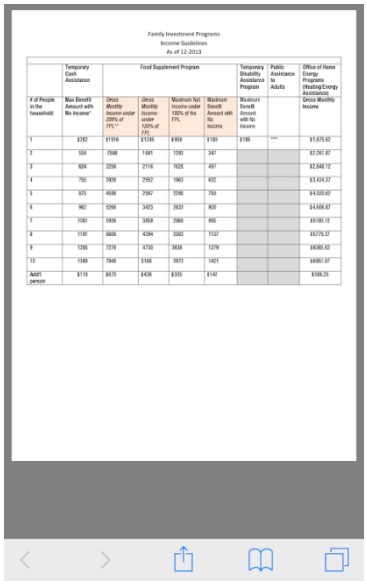






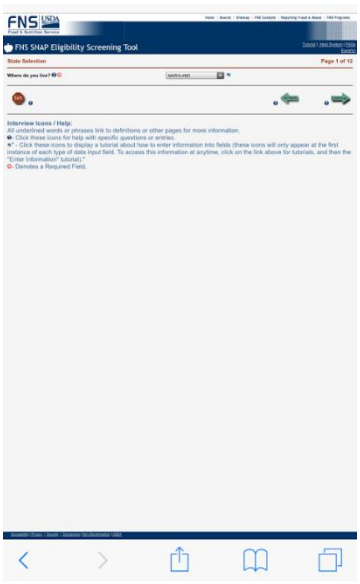






Family Investment Programs
Income Guidelines
As of 12-2013

# of People in the household	Temporary Cash Assistance	Food Supplement Program				Temporary Disability Assistance Program	Public Assistance to Adults	Office of Home Energy Programs (Heating/Energy Assistance)
	Max Benefit Amount with No Income*	Gross Monthly Income-under 200%* of FPL**	Gross Monthly Income-under 130% of FPL	Maximum Net Income-under 100% of the FPL	Maximum Benefit Amount with No Income	Maximum Benefit Amount with No Income		Gross Monthly Income
1	$282	$1916	$1245	$958	$189	$185	***	$1,675.42
2	550	2586	1681	1293	347			$2,261.87
3	824	3256	2116	1628	497			$2,848.12
4	755	3926	2552	1963	632			$3,434.37
5	671	4596	2987	2298	751			$4,020.62
6	982	5266	3423	2633	903			$4,606.87
7	1081	5936	3858	2968	995			$5,193.12
8	1181	6606	4294	3302	1127			$5,779.37
9	1285	7276	4730	3638	1279			$6,365.62
10	1389	7946	5166	3973	1401			$6951.87
Addl person	$119	$670	$436	$335	$142			$586.25



FNS SNAP Eligibility Screening Tool

State Selection

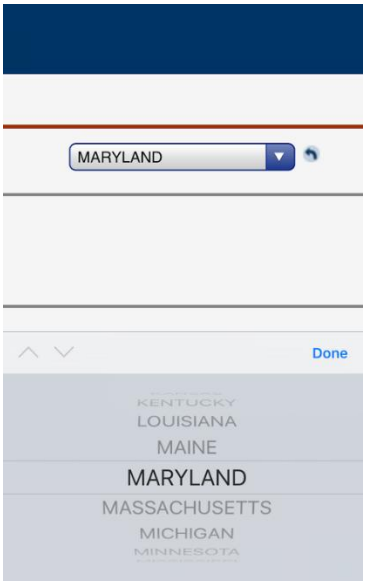
Page 1 of 12

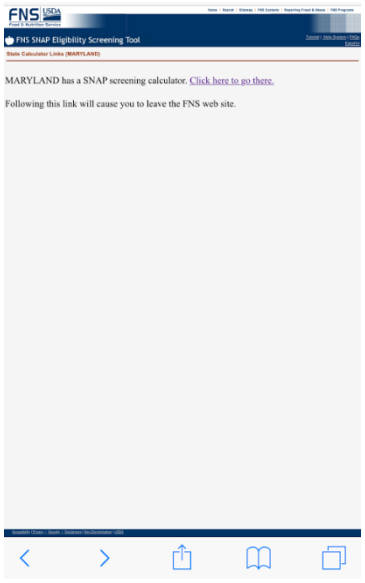
Where do you live?

Interview Icons / Help:

All underlined words or phrases link to definitions or other pages for more information.

- Click these icons for help with specific questions or entries.
- - Click these icons to display a tutorial about how to enter information into fields (these icons will only appear at the first instance of each type of data input field. To access this information at anytime, click on the link above for tutorials, and then the "Enter Information" tutorial).*
- Denotes a Required Field.





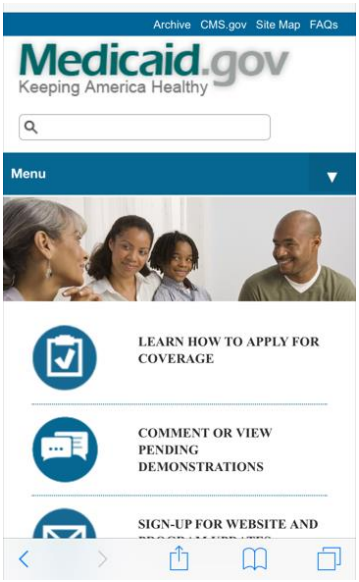
FNS SNAP Eligibility Screening Tool

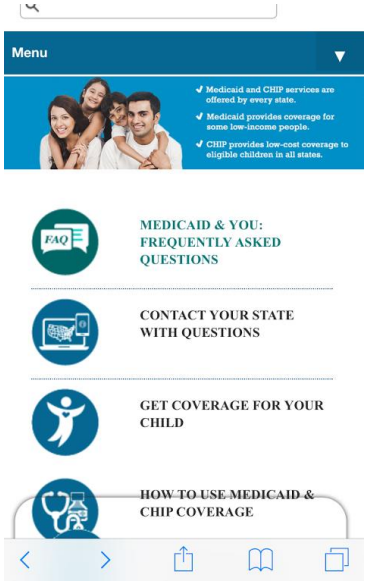
State Calculator Links (MARYLAND)

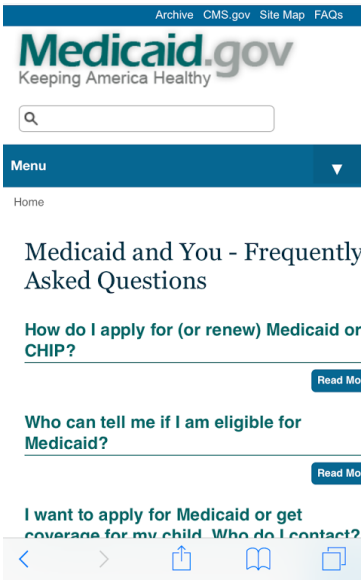
MARYLAND has a SNAP screening calculator. Click here to go there.

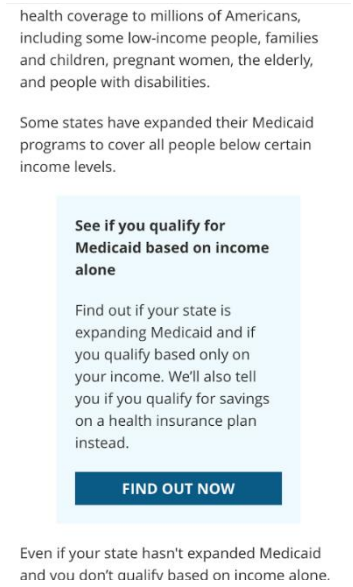
Following this link will cause you to leave the FNS web site.

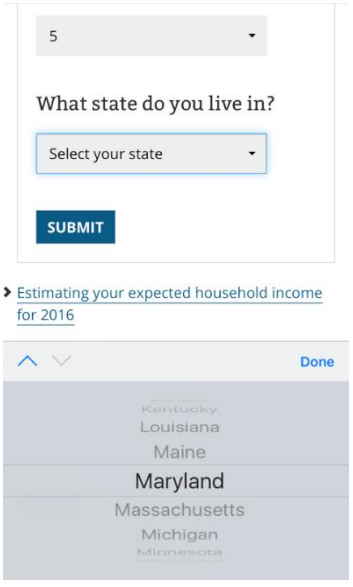
MEDICAID

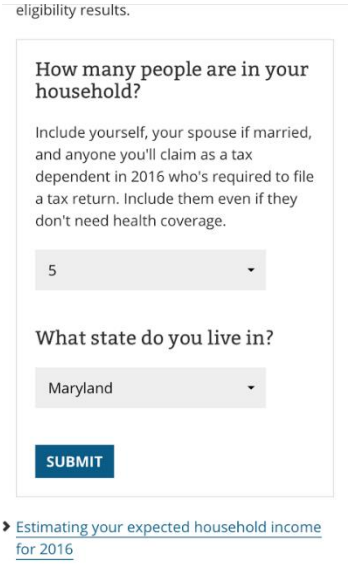


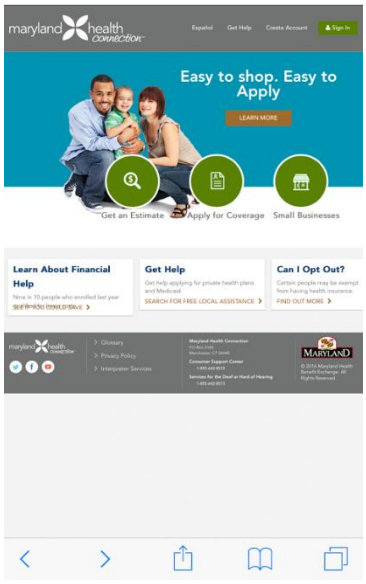


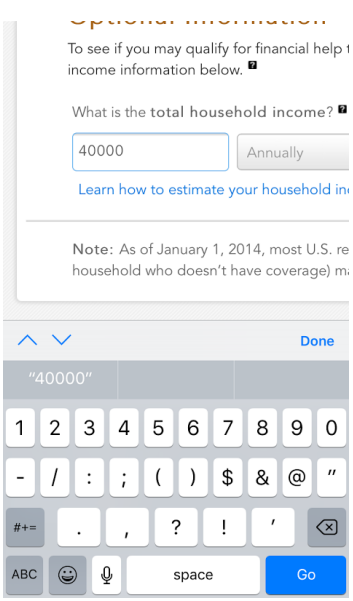


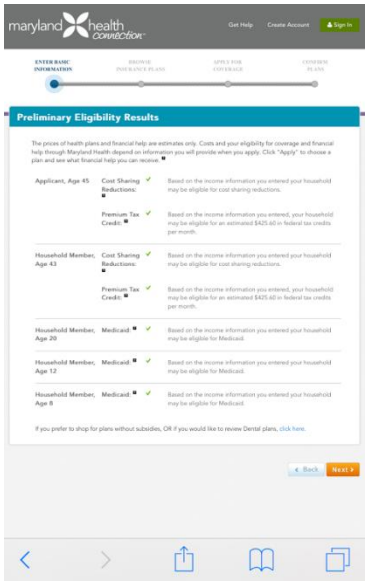


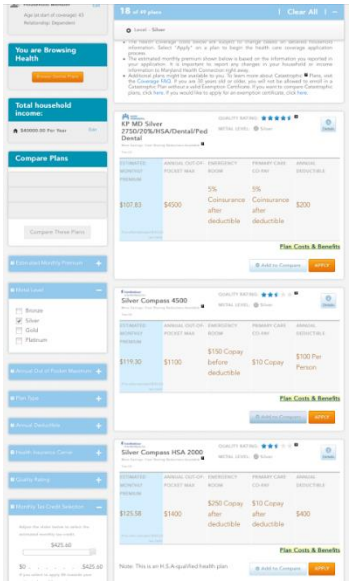








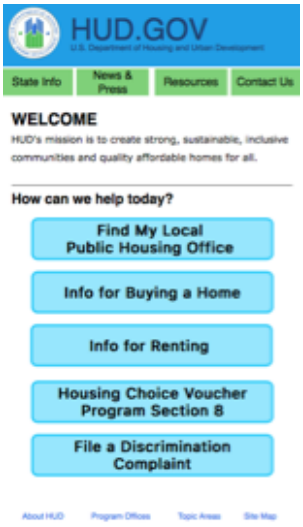


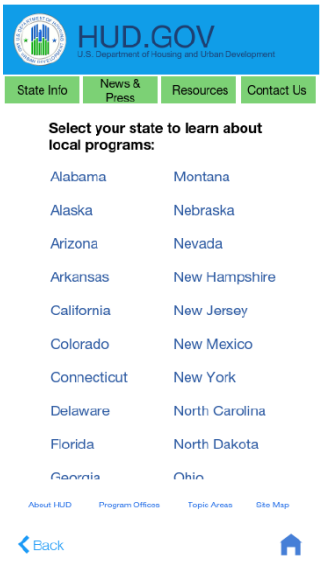


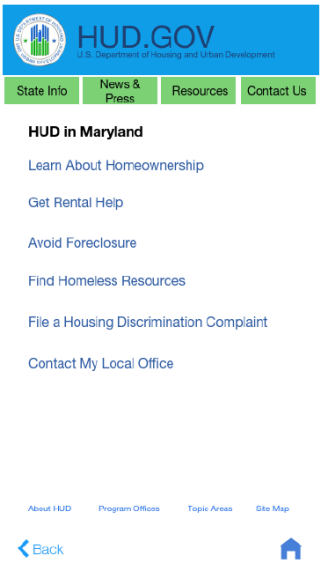
Contact Your State With Questions

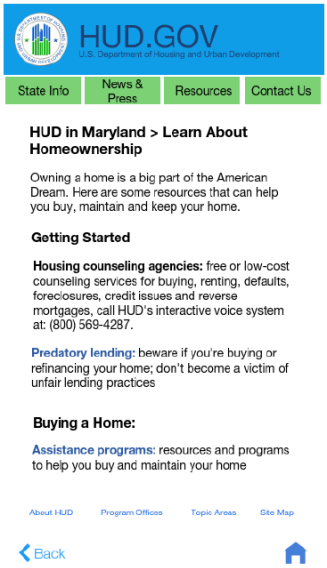
State	State Contacts
Alabama	http://www.medicaid.alabar
Alaska	http://dhss.alaska.gov/Com
Arizona	https://azahcccs.gov/share
Arkansas	https://www.medicaid.state
California	http://www.dhcs.ca.gov/pag
Colorado	https://www.colorado.gov/h
Connecticut	http://www.huskyhealth.cor
Delaware	http://www.dmap.state.de.u
District of Columbia	http://doh.dc.gov/page/doh
Florida	http://ahca.myflorida.com/c
Georgia	http://dch.georgia.gov/cont
Hawaii	http://www.med-quest.us/c

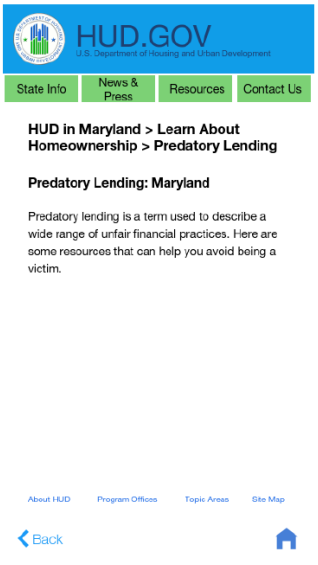
Appendix G: Prototype Screenshots

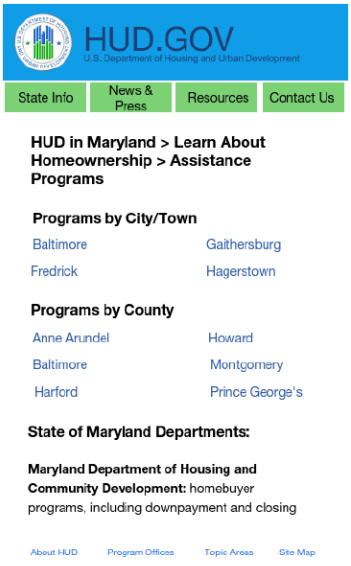


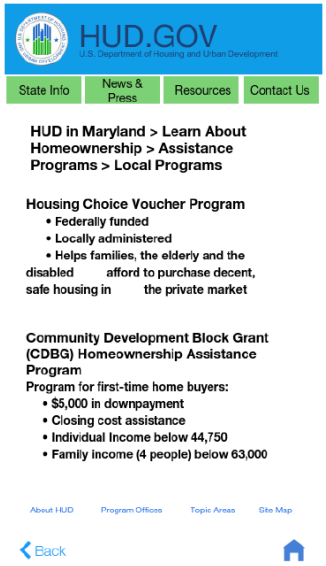


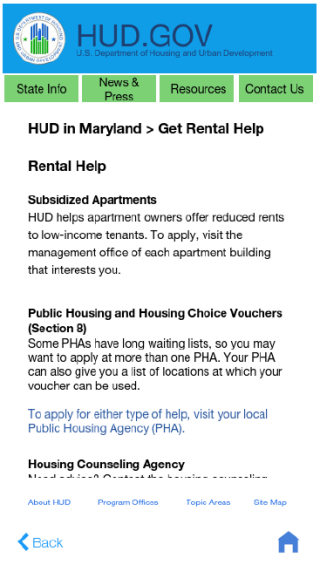


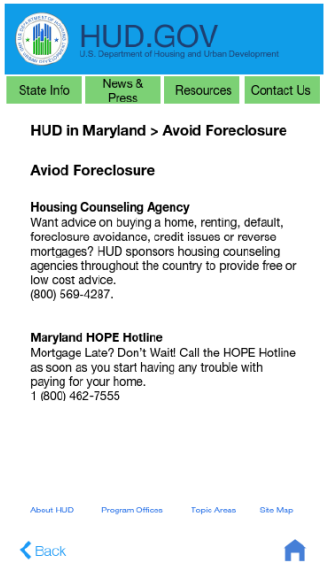


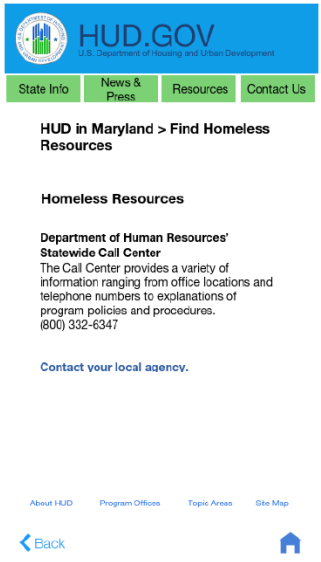












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Buying a home or avoiding foreclosure

Call the FHA Resource Center at (800) 225-5342

Rental assistance

Find your local public housing agency

Call the Public Housing Customer Service Center at (800) 955-2232

Required Information When Contacting Customer Service:

- *Name*
- *Email Address*
- *Phone Number*
- *Organization Name*
- *Clear Description of Question or Issue*

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Buying a Home

Thinking about buying a home? We have information that can help!

Got questions? Call our interactive voice system at (800) 569-4287.

Learn about homebuying programs in your state

Learn your rights as a homeowner

Learn about loans

Learn about FHA (Federal Housing Administration)

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I want to buy > Learn your rights as a homeowner

Housing Acts

The Fair Housing Act

The Fair Housing Act prohibits discrimination in housing because of:

- Race or color
- National Origin
- Religion
- Sex
- Familial status
- Disability

Real Estate Settlement Procedures Act

The Act requires lenders, mortgage brokers, or servicers of home loans to provide borrowers with pertinent and timely disclosures regarding the nature and costs of the real estate settlement process

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I want to buy > Learn about loans

Looking for the Best Mortgage?

Shopping around for a home loan or mortgage will help you to get the best financing deal.

Be sure to get information about mortgages from several lenders or brokers. **Know how much of a down payment you can afford, and find out all the costs involved in the loan.** Knowing just the amount of the monthly payment or the interest rate is not enough.

Ask for information about the same loan amount, loan term, and type of loan so that you can compare the information. The following information is important to go get from each lender and broker:

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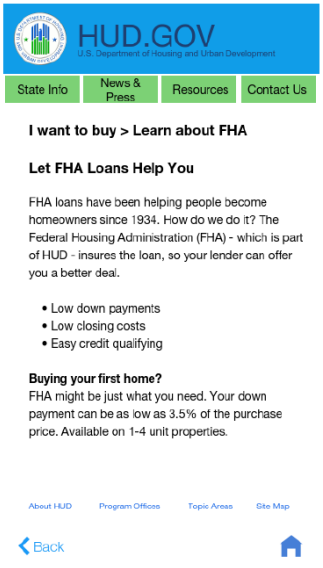

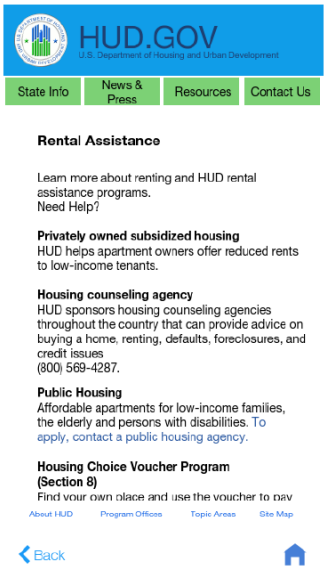

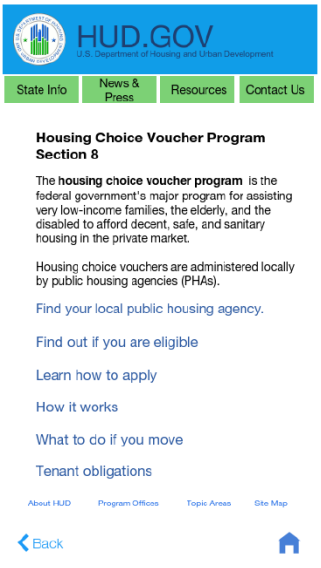

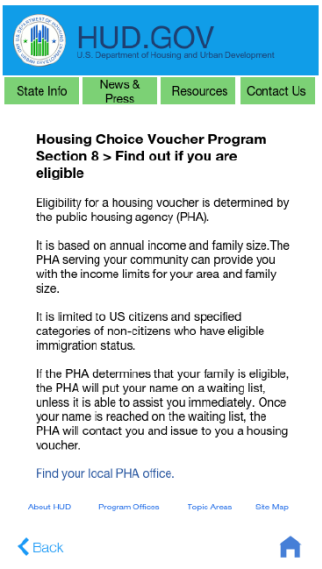

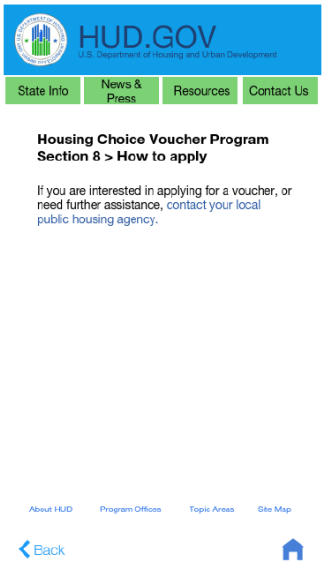

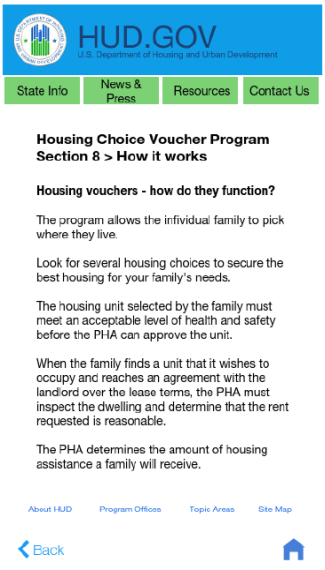

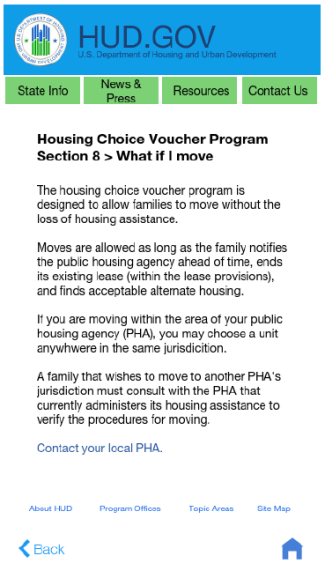

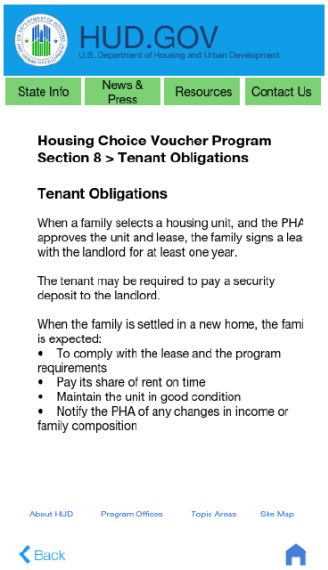

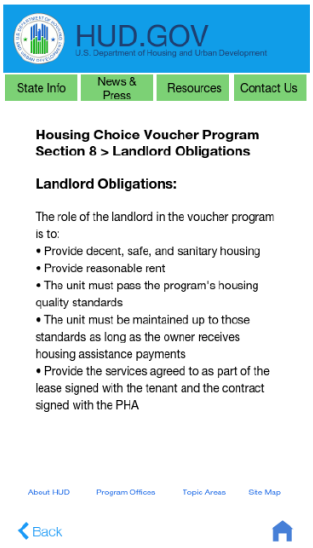

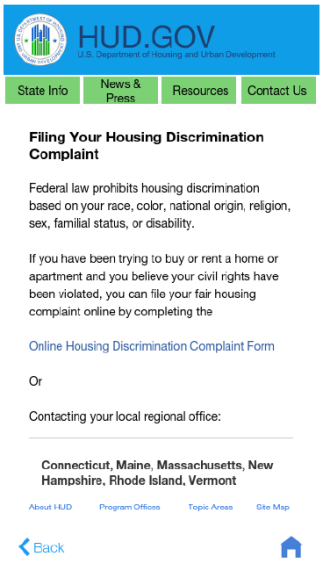

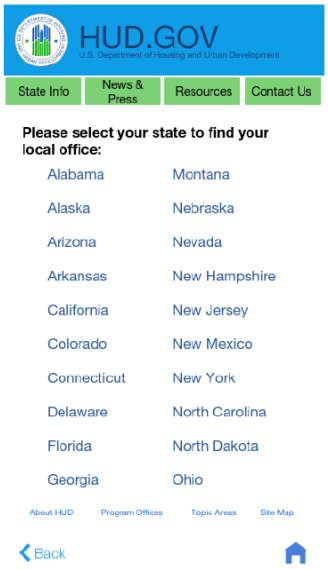

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Find your local PHA office > Not Maryland

Not MD Housing Authority [MD001]
Phone: (555) 555-555
Fax: (555) 555-555
125 Main Street
Anywhere, ST 21403
Section 8 & Low-Rent

Not MD Housing Authority [MD001]
Phone: (555) 555-555
Fax: (555) 555-555
125 Main Street
Section 8

Not MD Housing Authority [MD001]
Phone: (555) 555-555

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HUD's mission is to create strong, sustainable, inclusive communities and quality affordable homes for all. HUD is working to strengthen the housing market to bolster the economy and protect consumers; meet the need for quality affordable rental homes; utilize housing as a platform for improving quality of life; build inclusive and sustainable communities free from discrimination, and transform the way HUD does business.

Secretary Julián Castro
Julián Castro was sworn in as the 16th Secretary of the U.S. Department of Housing and Urban Development on July 28, 2014. In this role, Castro oversees 8,000 employees and a budget of $46 billion, using a performance-driven

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Chief Human Capital Officer

Chief Information Officer

Chief Procurement Officer

Community Planning and Development

Office of Administration

Office of Economic Resilience

Office of Hearings and Appeals

Office of the Inspector General

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Buying a Home

Fair Lending

Homelessness

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