

# **Effectiveness of Health Insurance Enrollment Decision Aids**

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## **Abstract**

Health insurance enrollment is a critical decision that can have large financial and health-related impacts. Low health insurance literacy and lack of knowledge about how to choose a plan are the main challenges during enrollment decision-making. This has led to the development of many digital sources of health insurance information, including Virtual Benefits Counselors (VBCs) that mimic the intervention of human resources counselors. However, we still do not understand how the enrollment decision process is impacted by these decision aids. Therefore, the overall goal of this pilot research project is to understand the effectiveness of digital information and VBCs in helping individuals make informed health insurance enrollment decisions. For this preliminary work, we first discuss the results of a survey to understand the main sources of health insurance information for University of Florida (UF) employees. Then, we explain the design a user study that aims to evaluate mock enrollment decisions made using VBCs versus official benefits websites and show preliminary results of 6 participants. From the survey, we learned that the main source of information accessed by employees during the enrollment process were the official UF and state of Florida websites and secondly, UF's VBC and friends or family. From the user study, participants were overall frustrated with the VBC system but those with more experience with health insurance had a clear strategy of the information they were seeking.

## **Keywords**

Health insurance; enrollment; decision aids; virtual benefits counselors; literacy

## **1 Introduction**

Health insurance enrollment is a difficult financial decision that has large health impacts. It directly affects subsequent healthcare decisions such as choice of provider, choice of treatment, etc. Studies have shown that only 4% of the U.S. population accurately understands basic health insurance terminology (e.g., deductible, premium, co-pay, etc.) [1], and this lack of knowledge is the main barrier to financially efficient health insurance enrollment [2]. Another barrier to effective enrollment decisions is the lack of knowledge about how to choose a plan. Informed health insurance decision making requires access to accurate information about the available plans, health insurance literacy, and guidance about how to choose plans based on the individuals' needs. There are a variety of different sources of information available including consulting with friends and family, consultations with benefits counselors provided by employers, material provided by health insurance providers, and websites. However, these sources of information rarely provide all the information required by decision makers or are difficult to access. Digital decision-aids are one method that may better support informed decision-making by providing knowledge of health insurance terminology and by guiding the decision process through the differentiation of health plans. One example is the use of decision aids known as Virtual Benefits Counselors (VBCs) that mimic one-on-one conversations with a human resources

benefits counselor using a conversational digital interface, to help individuals make informed decisions about their healthcare. However, little research has been done to investigate how different methods of presenting health insurance information changes the decision-making process of end-users, especially compared to traditional digital health insurance information sources such as websites.

Approximately 56% of Americans receive health insurance through their employers [3], therefore, employee provided health insurance plans are an ideal starting point for this line of research. In 2017, the University of Florida (UF) released Alex, a UF customized VBC produced by Jellyvision Labs Inc, to help support employee insurance enrollment decisions. Full-time employees at UF have access to similar health insurance plans, thus differences in usage of Alex and the subsequent enrollment decisions made are more likely to be attributed to the decision-maker rather than the plans available. The development of decision aids such as Alex can benefit users by providing increased access to health insurance literacy and decision guidance. However, user-interactions with these technologies are likely to differ between users due to differences in their health insurance knowledge, goals and preferences [4,5], as well as attitudes towards technology [6,7]. These individual differences between individuals may also change the sources of health insurance information that they draw on to support their decision making. Therefore, the goal of this pilot research project is to understand the sources of information used by employees in making health insurance decisions, and examine the effectiveness of two types of digital health insurance information, websites and VBCs, in helping individuals make informed health insurance enrollment decisions. Specifically, we compare the user's decision-making process and information-seeking behavior when using guided decision-making tools such as the VBC versus self-directed traditional information support provided on HR benefits websites. The end result of this research is to improve the design of decision-aids for supporting informed health insurance enrollment decisions.

Since this research project is ongoing, the two main objectives of this paper are 1) to show the results of a survey that indicate the main sources of health insurance information used by UF employees during enrollment decision-making process and 2) to explain the design of a user study that exposes participants to a mock enrollment decision-making process using either UF's VBC called Alex or official UF and state of Florida websites along with some preliminary results.

## **2 Health Insurance Information Sources Survey**

The Health Insurance Information Sources Survey has two purposes: to recruit participants for the user study (detailed in section 3) and to gain insight about the current sources of information used by UF employees to support their health insurance decision making process. The survey consisted of four sections: 1) demographics and employment status, 2) health insurance enrollment behavior and sources of health insurance information used, 3) health insurance literacy using a subset of the Health Insurance Literacy Measure (HILM; [8]), and 4) technology acceptance and experience with virtual chatbots and agents. In total, the survey contained 27 questions and took approximately 5 minutes to complete. Participants were also asked about their willingness to participate in the user study. All collected information was confidential, and participants were asked to provide their consent before answering any questions.

Links to the survey were distributed through physical flyers and recruitment distributed throughout the UF campus to academic and service departments. Digital recruitment materials were also distributed through an employee newsletter (UF at Work) in order to achieve a comprehensive reach across UF employees from different backgrounds. A total of 117 responses were received, with only a subset qualifying for the final user study. The responses to this survey provide insights about where employees currently looked for information about health insurance plans and the demographics and individual characteristics of these participants with respect to their health insurance literacy, technology acceptance and overall trust in technology. Preliminary results of this survey are shown in Section 4.1.

## **3 User Study Overview**

The user study is composed of participants navigating through the assigned health insurance information system (VBC or an official UF benefits website and state of Florida websites) and making a mock enrollment selection of a health insurance plan. In this section, we dive into the details of the user study's recruitment, design, procedure, analysis and hypothesis.

### 3.1 Participant recruitment and selection

Participants for the user study were recruited from the respondents of the health insurance sources survey. Respondents were considered eligible if they met three criteria: 1) full-time employment at the UF, 2) primary healthcare decision-makers within their households or shared decision-making responsibility, and 3) willingness to participate in the study. Of the 117 respondents described in this paper, 79 were considered eligible participants for the user study. The dataset of this preliminary user study analysis is based on n=7 participants who completed the study.

### 3.2 Experimental Design and Procedure

From the eligible participants identified from the survey, the goal is to perform 20 user study sessions. The main independent variable of interest is the decision-aid used to support the participants' mock health insurance enrollment decision: the guided, VBC system, Alex, and the unguided but more comprehensive website, consisting of the official UF benefits website and state of Florida website. The study uses a between-subjects design with half of the participants assigned to the VBC condition (n=10), and the other half assigned to the website condition (n=10). Data collection is facilitated by two members of the research team. A session of the user study consists of the following five phases: 1) Introduction and training, 2) Pre-experiment questionnaire, 3) Interaction behavior data collection as participants use a system to choose a health insurance plan, 4) Post-experiment questionnaire, and 5) Retrospective think-aloud session using eye-tracking data as a cue. Each session lasts approximately 1.5 hours and participants are compensated with \$50 for their time.

1) *Introduction and training*: At the beginning of the experiment, the participant is introduced to the purpose and procedure of the study and consent is obtained. During this time, they are also introduced to the eye-tracking equipment and the think-aloud procedure. Eye-tracking data is collected using the Tobii Pro Nano, a screen-based eye-tracker, and the Tobii Pro Labs software is used to help facilitate the retrospective think-aloud interviews. The think-aloud methodology is a procedure often used in usability testing to understand the user's goals and intentions and has been effectively used to understand decision-making in healthcare applications [9,10]. In this study, rather than asking participants to verbalize during interaction with the system, the user's eye gaze data is used to guide think-aloud interviews retrospectively. This also allows for the collection of user-interaction behaviors (e.g., mouse clicks, time spent on pages, etc.) that would normally be affected by the think-aloud procedure. The interview data is then used to understand the user's decision strategies. Participants go through a training session by making a cellphone plan selection decision using information provided through the UF benefits website, and after making their decision they go through the retrospective think-aloud process using their eye-tracking data.

2) *Pre-experiment questionnaire*: After the training, they fill out a pre-experiment questionnaire. This questionnaire assesses health insurance literacy, health insurance knowledge and risk taking using the Health Insurance Literacy Measure (HILM) [8], variations of the Health Insurance Knowledge Test used in [11] and the Domain Specific Risk Taking (DOSPERT) Scale, respectively.

3) *Interaction behavior data-collection*: During the experimental trial, participants are told to imagine that they have just been hired as a full-time staff employee at the University of Florida and are now in the process of selecting a health insurance plan that best fits their needs. Participants then proceed to browse the assigned system (VBC or website) to make an enrollment decision while eye-tracking and user interaction behavior is recorded. Additionally, during this phase, the researchers take written notes of the participants' behavior, such as participant expressions of confusion and frustration.

4) *Post-experiment questionnaire*: Upon completion of the system interaction, participants are asked to complete a follow-up questionnaire asking about the plan that they select and their confidence in their choice using the SURE Scale [12], and questions about the ease of use and usefulness of the system they interacted with using the System Usability Scale [13]. Participants are also evaluated on the same scales for health insurance literacy and knowledge asked during the pre-experiment questionnaire. Finally, participants are tested on their understanding of their plan by answering questions about whether their plan provides coverage under specific situations. These questions are referred to as hypothetical scenarios and were developed by the team specifically for this user study.

5) *Retrospective think-aloud session*: Finally, the participants complete the retrospective think-aloud study using the gaze data collected during their interactions with the decision-aid system. As described previously, participants are shown their gaze position video as guidance and are asked to narrate and verbalize what they were doing or thinking as they interacted with the system. For example, researchers asked participants, "Please describe what you were

thinking and searching for”. Participants are allowed to pause or slow down the video to assist with this process. The researchers remind the participant to verbalize their thought process and ask for clarification when required. Audio data is recorded during this interview, and the researchers ask follow-up questions at the conclusion of the session about the participants’ strategies for information seeking and health insurance enrollment decision making. Quantitative data collected includes the time spent using the source of information, eye-tracking data and the number/duration of the pages visited, and the pre- and post-experiment questionnaires. Qualitative data about the user’s interaction is drawn from the retrospective think-aloud interviews to understand the participant’s thought process.

### 3.4 Data Transcription and Analysis

The audio data from the user study was transcribed, and will be coded, and analyzed. An initial review of the transcript data was conducted by the research team to understand the major themes that emerged during the interviews and served as the basis of the data analysis for this paper. Data analysis from the pre-questionnaire and the post-questionnaire focused on whether the assigned system helped improve the participant’s confidence, knowledge and understanding about health insurance. The quantitative data from the eye-tracking was used to identify the pages that participants visited, and the length of time spent on these pages. The data collected in the think-aloud sessions will be used to identify the participant’s thought process and information-seeking strategies for the enrollment decision and the participant’s attitude towards the system he/she used.

### 3.5 Hypothesis

Our hypothesis is that participants using the VBC will have higher post-usage health insurance literacy and will have a better understanding of the implications and coverage of their enrollment decision compared to those using the official HR benefits website. We also expect participants with higher health insurance literacy prior to the study to have a more organized strategy in their search for information and their decision-making process.

## 4 Results

### 4.1 Health Insurance Information Sources Survey Results

#### *Respondent Demographics and Characteristics*

From the current 117 responses on the Health Insurance Information Sources Survey, 79 qualified for participation in the user study. The demographics of these 79 people are shown in Table 1 and 2 below. Our sample had a high number of female respondents (85%), and the majority were married or in a domestic partnership (62%). However, most of our sample consisted of small households of either 1 or 2 individuals (68%).

**Table 1:** Age and gender demographics of 79 eligible participants

Gender	Age	Count
Female	18-24 years old	3
	25-34 years old	17
	35-44 years old	18
	45-54 years old	11
	55-66 years old	18
	67 plus years old	0
	<b>Female Total</b>	<b>67</b>
Male	18-24 years old	0
	25-34 years old	6
	35-44 years old	2
	45-54 years old	0
	55-66 years old	3
	67 plus years old	1
	<b>Male Total</b>	<b>12</b>
<b>Total</b>	<b>79</b>	

**Table 2:** Marital status and household size of 79 eligible participants

Marital Status	Household Size	Count
Married or Domestic Partnership (DP)	1- 2	26
	3 - 5	23
	<b>Married/DP Total</b>	<b>49</b>
Single	1- 2	28
	3 - 5	2
	<b>Single Total</b>	<b>30</b>
	<b>Total</b>	<b>79</b>

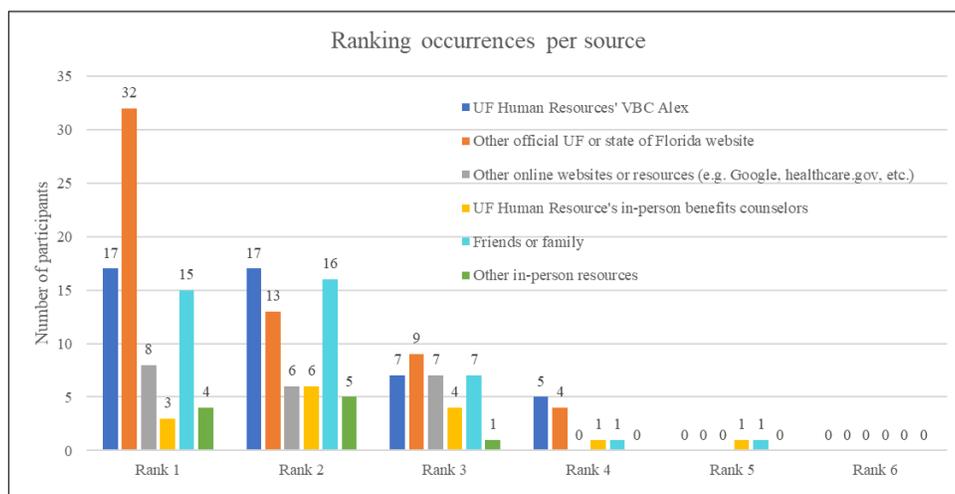
*Sources of Health Insurance Information*

In addition to recruiting and identifying eligible participants for the user study, this survey also seeks to understand where individuals seek information to support their enrollment decision making. The questionnaire asked participants to indicate the sources of information they have used in the past to help with their health insurance decision making. The options provided were geared towards those that are available to UF employees, and included: 1) UF Human Resources, 2) VBC Alex, 3) other official UF or state of Florida website, 4) other online websites or resources (e.g. Google, healthcare.gov, etc.), 5) UF Human Resource's in-person benefits counselors, and 6) friends or family and other in-person resources. Table 3 below shows the number of times a source was selected by the 79 eligible participants when asked to select all the sources where they currently find information. On average participants selected 2 or 3 sources of information. The top source was other official UF or state of Florida website with 73.4% of eligible participants selecting it. UF Human Resources' VBC Alex and Friends and family come in second, close to each other, with more than half of participants selecting these. As expected, digital sources of health insurance information were widely used compared to in-person sources, and participants tended to favor official information sources that were relevant to UF rather third-party or other online resources. In contrast, most individuals used informal in-person sources (i.e., friends and family) rather than official resources, likely due to accessibility issues.

**Table 3:** Number of eligible participants that selected the source as one of their information sources of health insurance plans

Source	Count	Percent
Other official UF or state of Florida website	58	73.4%
UF Human Resources' VBC Alex	46	58.2%
Friends and family	40	50.6%
Other online websites or resources (e.g. Google, healthcare.gov, etc.)	21	26.6%
UF Human Resource's in-person benefits counselors	15	19.0%
Other in-person resources	10	12.7%
<b>Total</b>	<b>79</b>	

Participants were also asked to rank their selected sources of information from most important (rank 1) to least important. The ranking occurrences by source is shown above in Figure 1. For example, official UF or state of Florida website, shown by the orange bars, was ranked 1<sup>st</sup> by 32 participants, resulting in the highest occurrence. These results show that the website is the primary source used by individuals. It can also be seen that VBC Alex (shown by dark blue bar) and Friends and family (shown by light blue bar) are strong sources consistently ranked 1 and 2. We can also observe that no one selected all 6 sources, only two participants selected 5 sources.



**Figure 1:** Ranking occurrences per source

## 4.2 User Study Results

At the time of this publication, approximately 7 of 20 participants have engaged in the user study. A full analysis of these results are beyond the scope of this paper, however, preliminary results show that knowledgeable participants were satisfied with the websites because they had a strategy and knew exactly what to look for, but they were frustrated with the VBC because it didn't show the key differences among plans nor other basic information needed to make their decision. On the other hand, participants with low health insurance literacy were overall confused and had no decision-seeking strategy across both systems. These participants were willing to make enrollment decisions with whatever information was provided upfront regardless of the system. However, some of these participants reported feeling frustrated since they were expecting clear and concise information that they did not feel was being provided to them.

## 5 Conclusion:

Due to the large health and financial impacts of health insurance enrollment, it is important for individuals to be well informed at the time of making this decision. Therefore, this project focuses on understanding the current main sources of information of the UF employee population, studying the effectiveness of digital decision aids and eventually seek to improve health insurance decision-making and patient care through improvements in the communication of employee health benefits. The methodology used in this project can be extended to other types of health insurance. Understanding how different demographics use and adopt VBCs will help facilitate the design of tailored decision aids that help individuals become more informed and empowered for managing their health insurance. This paper details the design of a user study and discusses preliminary results for this ongoing research project. Our recruitment survey resulted in 79 eligible participants of which 73.8% selected official UF or state of Florida website as a source of information and more than half selected UF's VBC Alex and friends and family (58.2% and 50.6%, respectively). From these 79 eligible participants, 6 have engaged in the user study. Preliminary results show that knowledgeable participants were overall frustrated with Alex but had a strategy to browse for the information they needed to decide. Those with lower knowledge, were confused and had little to no strategy, regardless of the system used. Going further, the team will deep dive into the survey responses and analyze the correlations of the health insurance literacy measures and technology acceptance with the sources of information selected. We will also be focusing on completing the remaining 16 user study sessions as well as analyzing pre- and post-questionnaire responses. The retrospective think-aloud recordings are to be transcribed and analyzed to identify key browsed pages, clear information seeking strategies and decision-making key points.

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