

Purdue University

# **Usability Test of the National Weather Service Website**

ENGL 421: Technical Writing

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## **Executive Summary:**

This report outlines the usability of the National Weather Service (NWS) website and recommendations for its improvement. We conclude that the fundamental changes to the maps and search bar outlined in this report on the NWS website will improve user satisfaction, effectiveness, and efficiency.

Data for this report was collected through user completion of task scenarios and a post-scenario questionnaire. Both of these methods were aimed at testing the five aspects of usability: effectiveness, efficiency, engaging, error tolerant, and easy to learn. The data analysis of these five aspects has led to recommendations that will improve user navigation and effectiveness of the website.

The success rate and user errors highlight the difficulties users encountered while completing the task scenarios. These task scenarios were designed to direct users to some of the problematic pages of the website, specifically the pages with interactive maps. Many users had issues with finding the location they were looking for on the maps and did not realize that aspects of the maps were able to be clicked on. The rivers, lakes, and rainfall map from task scenario two proved to be the most difficult. The overwhelming amount of river data that is initially presented on the map is laborious for users to file through. Better search and location filtering options for this map would heighten the users' experience for this task and task like it.

The post-scenario survey revealed that the majority of users did not feel the website interface was engaging or effective at information delivery. Only 28% of users said they were likely to return to the website based on the interface alone. Users also reported experiencing what they felt were errors, which may not be what the test facilitators described as errors. Of the users that reported errors, the majority felt that they were not easy to correct.

Conclusively, this usability report details some of the more problematic pages within the NWS website. Following the basic recommendations below will enhance the effectiveness and error tolerance of this website. Furthermore, this would give users a better experience and they would be more likely to return to the NWS as their weather information source versus its competitors.

## **Recommendations**

- The search field should be made a primary feature of the homepage.
- For the water map, add a search field or additional filtering options based on city, state or the name of the body of water that allows users to find more specific locations.
- A city, state search field or region/state drop down menu for the past weather map that allows users to filter through locations.
- Better utilization of the white space on the past weather map page
  - This space could be used to increase map size or to add the search/filter options.

## **Introduction:**

Most people get their weather from a weather app on their phones, when they watch the news or listen to the radio. The only time that anyone hears about the National Weather Service (NWS) is when they interrupt our favorite shows on TV or our favorite song on the radio. The NWS website has anything from

the high and low temperature for the day all over the US to space weather. Not many people know all that the NWS has to offer besides warning us when bad weather is near. This is because the NWS website is not as usable as it could be. The purpose of this report is to find out how usable the NWS website is and how easy it is to navigate. Being that everyone is affected by the weather, it is important that the authority on weather tracking be a resource that is engaging and easy to use.

Through the use of three task scenarios and user satisfaction surveys, we have collected quantitative and qualitative data that allows us to analyze the usability of the website. This data showed us how easily the users are able to navigate the website. In order to test whether the interface was engaging to the user we collected qualitative data with the survey that the user took after they had completed the task scenarios. After analyzing the data, we recommend that the National Weather Service make some revisions to their user interface so that important information is more readily accessible to everyone. This report outlines the methodology of the usability test as well as the results and the discussion of those results to show that the authority on weather is not as easy to use as it should be.

## **Methods:**

The two approaches to usability testing chosen for this study were completion of task scenarios and post-scenario completion surveys. Through this we have collected data metrics, such as time on task and click count, as well as user satisfaction reports. Quesenbery<sup>5</sup> models usability with five E's: effectiveness, efficiency, engaging, error tolerant, and easy to learn. These five E's were used as a model to develop the task scenarios and survey questions. Because usability is more than ease of use, we cannot simply measure the opinions of users on how easy it is to use the website and call it usability. However, the scope of this report and the limitations on data collection made it improbable to accurately collect data on the ease of learning aspect of usability. Being that this is a website that most people would use for quick information on the weather, we were more interested in the ability of the user to find the information efficiently, effectively and without many errors so that they could find what they need to know and hopefully come back to the website in the future. Therefore, we focused on effectiveness, efficiency, error tolerance, and whether or not users felt the website was engaging.

Users were recruited at random from the Purdue Memorial Union and the student lounge in Wetherill and were asked to signed an informed consent form. The post-scenario survey allowed us to collect demographic information about the participants to better develop an understanding of the general public that might use the NWS website.

## **Task Scenarios**

The task scenarios were the first test the users were asked to complete (exact copies of the task scenarios that the users were given are detailed in the appendix). Through these scenarios we collected data metrics on efficiency: time on task and clicks per task. If errors are encountered, the users were asked to "think aloud" to see if they could work around the error. The test facilitators determined if the user error was a critical error or non-critical error.

We separated the types of user errors as defined by usability.gov<sup>4</sup>. A user could have been presented with a critical error that completely deviated from the target of the task scenario. Critical errors may or may not have kept the user from completing the task and the user may or may not have been aware that it was

a critical error. Users could have also been presented with a non-critical error that could have been recovered and did not result in their inability to complete the task; these errors made completion of the task less efficient but not less effective.

The first task users completed was to find the weather forecast for West Lafayette for the day and any emergency alerts or weather advisories. The second task was designed to show users one of the more problematic pages on the website. Users were asked to find the height of a given river and if there was any flooding. The third task users attempted was to find the weather report for Lafayette, IN on June 1, 2016. The testing date was July 25, 2016 therefore the third task asked users to find an archived weather report that was over a month old.

We predict that users would complete task one efficiently and with optimal clicks. Further, we predicted that for task two users would likely have more clicks than optimal and that not all users would finish this task. Lastly, for task three we predicted that users would complete this task but with more clicks than optimal and less efficiently.

### **Data Metrics**

The data metrics collected, measured, and calculated in this report include time on task, average clicks to complete each task, task success rate, and average time per task. Time on task was measured by timing how long it took users to complete the task. These times were then averaged for each task. The task success rate was calculated as the percent of users who fully completed the task.

Clicks to complete the task was measured by monitoring how many clicks it took the users to complete the task. This was then compared to the optimal number of clicks for each task. A proposed general rule<sup>3</sup> is that a user should find the information they seek in no more than three clicks. However, there are challenges to this rule that argue that as long as users are “following the scent of information along the path”<sup>2</sup> extra clicks are acceptable. Therefore, we determined for ourselves the optimal number of clicks per our specific tasks by counting the minimum clicks it took us to complete our own tasks.

### **Survey**

The post-scenario survey asked the users questions that report on whether or not the website interface was engaging and error tolerant. The survey also aimed to determine what types of errors were encountered, if any. The test facilitators noted during the task scenarios if users encountered errors and if they were critical or non-critical. By combining error information from the survey and the task scenarios we could better make recommendations on how to correct any encountered errors. (The questions from the survey can be found in the appendix.)

### **Data Analysis**

Two forms of data were collected from these methods: qualitative and quantitative. The qualitative data came from the test facilitator’s notes while the users completed the task scenarios, and the quantitative data came from the measured and calculated metrics. The qualitative data was coded based on a modified version of the grounded method as described by Brizee<sup>1</sup>. This allowed the qualitative data to be

interpreted in a quantitative manner and allowed recommendations on the website's usability to be more insightful.

Once the qualitative data was coded and analyzed, it was combined with the quantitative data metrics to report the status of the four E's of the website we tested for. The data then allowed us to make recommendations about the NWS website with the needs and expectations of the user in mind<sup>1</sup>.

## Results and Discussion:

### Task Scenarios

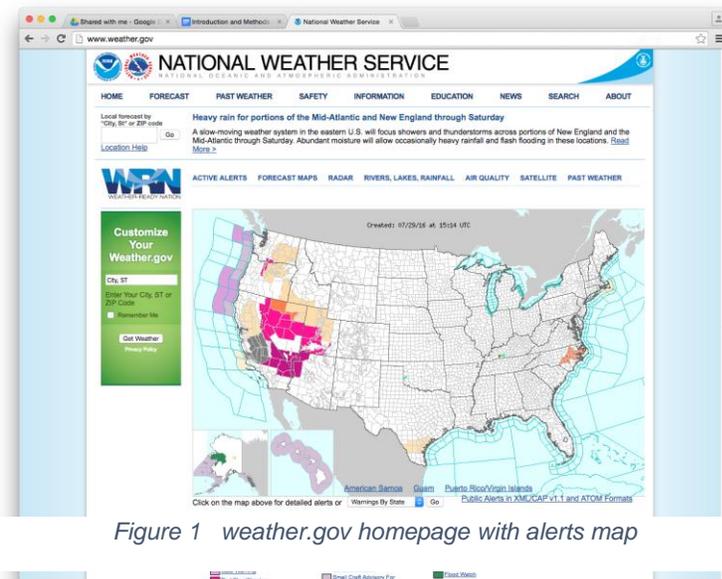


Figure 1 weather.gov homepage with alerts map

We predicted that task one was going to be completed most efficiently and with an optimal number of clicks. All users completed task one and in less time than tasks two or three. The search bar on the homepage of the website proved to be fundamental to this success. Figure 1 shows the homepage the users see when they first come to the website.

On first glance at the NWS homepage, the user's eye is drawn to the map and the green box on the left of the page. This box gives users the option to 'customize their weather.gov' but does not elaborate on what that might mean. The search

bar is located directly above the WRN logo. This box is small and not the focus of the page.

Many of the issues users had while completing the task scenarios were related to the maps on the website. There are multiple ways to complete each task, but tasks two and three involve directly interacting with a map.

Completion of task one does not require the use of this map. In fact, less than 15% of users used it to complete the task. As mentioned previously, most users instead used the search bar visible in the upper left of Figure 1. Using the map requires additional clicks and greater geographical knowledge than the search bar.

Visible on the homepage of the website, the figure 1 map is used to display active alerts for all states. A legend explains the colored sections of the map. It is unclear if this legend is suitable for color blind persons. Based on the results of task one, no changes are recommended for this map however the search field should be made a primary feature of the homepage.

Task two requires interaction with the rivers, lakes, and rainfall map, as shown in Figure 2. Each of the dots on the map represents a water data station. Color codes, shown on the right, indicate if a station is at a dangerous level. Completion of task two required locating the White River data station near Noblesville, IN. Many users struggled with this task, unable to locate the specific station. Ultimately, only 57% of users were able to complete the task.

The rivers, lakes, and rainfall map is an area that we feel is prime for improvement. Unlike task one, there is no search field or other direct way to locate a specific station. The only form of useful filtering available is a drop down menu on the right side to sort by state. Even after selecting Indiana, users are still faced with hundreds of dots and no way to locate information for a specific body of water or location. Users found the hovering feature of the map to be a useful way to present the station information. Based on observations of user interactions with the map, the primary way to improve usability of this map would be to add a search field or additional filtering options based on city, state or the name of the body of water.



Figure 2 Rivers, lakes and rainfall map

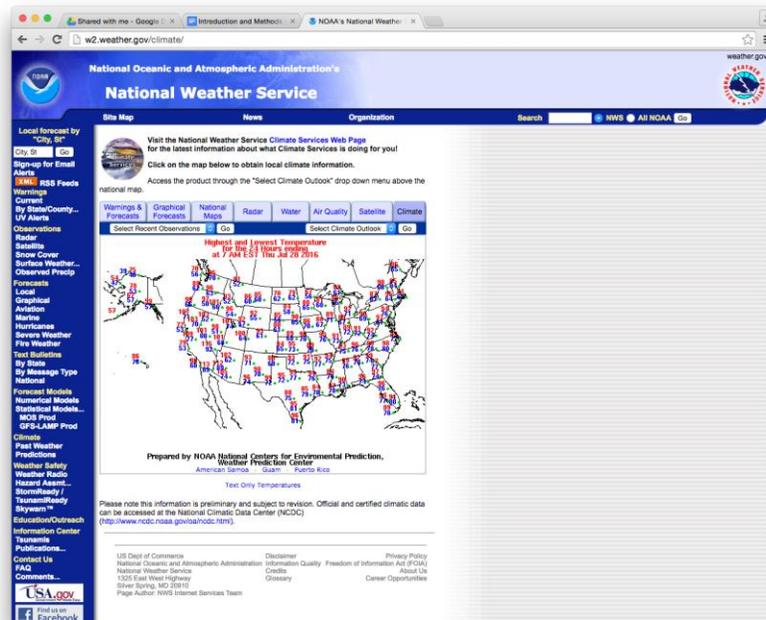


Figure 3 Past weather map

Completion of task three again required interaction with a map. The 'Past Weather' map, shown in Figure 3, displays the 24 hour high/lows for the country.

Locating the Lafayette weather records, required for task three, involves clicking on the central Indiana region. Only 14% of users completed the task on the first attempt, with 70% completion after trying again or with assistance from the test facilitators. The map gave users issues, with multiple people not immediately understanding that it was clickable. Other users clicked too far north in Indiana

and were taken to the Fort Wayne/South Bend section. Over 60% of users attempted to use the drop down menus at the top of the map to no avail.

The past weather map suffers from similar problems to the water map (Figure 2) in that there are no search or filtering options. Completion of the task absolutely requires clicking the correct forecast region on the map. A city, state search field or region/state drop down menu should greatly accelerate completion time.

An additional issue with the Past Weather map is that it does not fully utilize the available screen space. Each of the Figures (1,2,3) were all screen captures of the same size browser window. Comparing the three, there is visibly more unused space in Figure 3. This space could be used to increase the map size, thereby requiring less precise clicking, or to add the search/filter options.

## Data Metrics

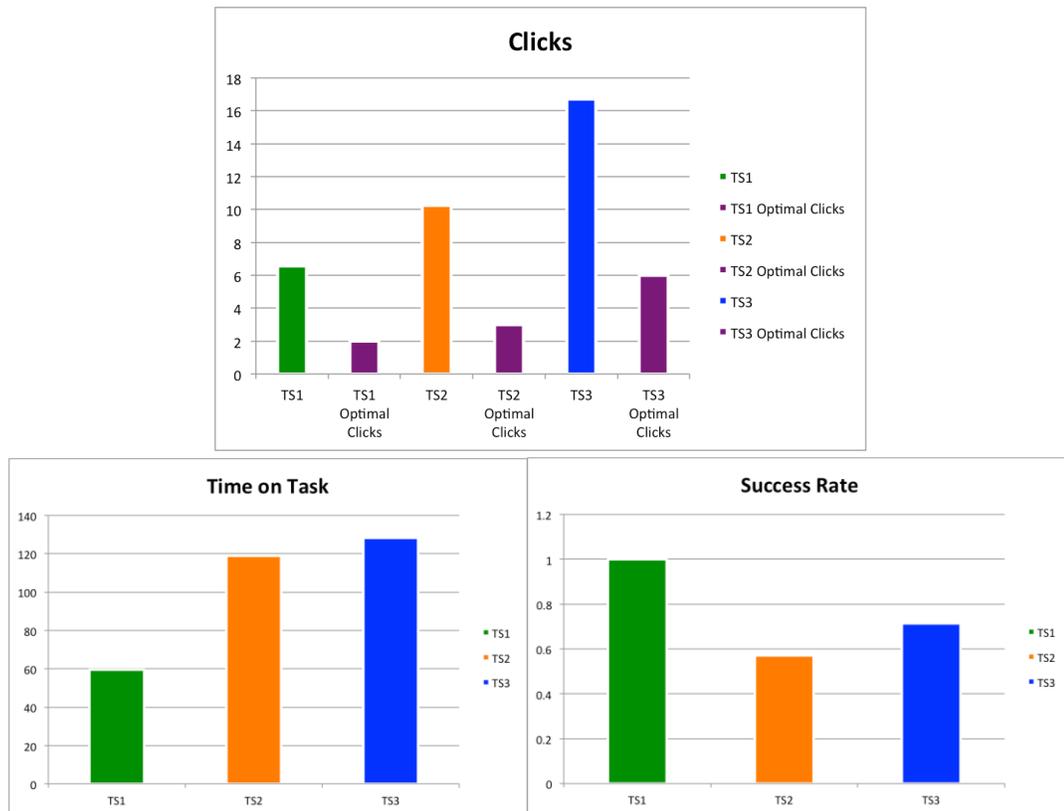


Figure 4 Bar graphs showing average clicks, time on task and success rate for each task scenario

The number of clicks it took for each user to complete each task was compared to the optimal, or minimal, click count. The observed clicks for each task follows the same increasing trend as the optimal. However, the average click count is about three times larger or more than the optimal for each case. Click count results show that the users encountered some problems while they were completing the tasks, or that the optimal path to completion was not obviously presented.

The average time to complete the tasks follows a similar increasing trend. Users spent the most time per click on task two. This is likely due to the mentioned errors and usability issues with the required map, shown in Figure 2. Even with the additional time, the success rate for task two was only 57%. Both of the tasks requiring the use of a map showed success rates less than 100%. A closer look at completion rates shows 100% of users that completed task two also completed task three, whereas only 33% that failed task two went on to complete task three. These results confirm some of the mentioned usability issues with the maps that only some users were able to work around.

## Survey

One of E's of Quesenbery<sup>5</sup> that was measured was the error tolerance of the website. Survey questions 7, 8, and 9 address whether or not users felt information was not easily found or in the wrong place or if they

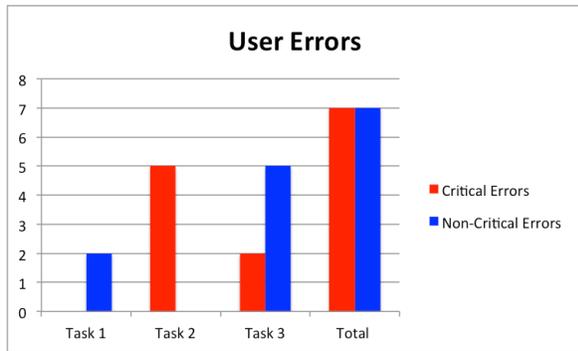


Figure 5 User error graph

encountered any errors. When asked, four out of seven users said they encountered an error. Of those four users, three said they felt the errors were not easy to correct and one said the error was somewhat easy to correct. Users were not given the definitions of errors used in this report and were self-reporting errors. In relation to error, four out of seven users reported that information was not where they looked or felt it was out of place. Not being able to find information where they looked, i.e. wrong navigation, was considered a non-critical error. Figure 5 compares the types of errors for each task as reported by the test facilitators.

All of the errors from task one were described as non-critical errors, whereas all the errors from task two were described as critical errors. There was a total of seven critical errors and seven non-critical errors among the users. Some users had multiple errors for the same task where others had none.

Two of the questions on the survey, 10 and 11, asked users to report about the accessibility of the website. Users were asked if they thought the overall text on the website was readable. The majority said the text was readable, but three out of seven reported the text was only somewhat readable. Of those who said the text was only somewhat readable, all three said the issue was due to text size.

With the wide network or resources available to users, one could easily choose another website to provide the same information. If a user doesn't like how the website looks or feels, with a few clicks they could be on another website that gives them the same information but with a better feel. It is essential for a website to be engaging to users to keep them coming back. The best means of measuring how engaging the website is was to have users self-report through the survey questions.

*Question 14: Based on the interface only, how likely are you to use the NWS website again versus another source?*

This question was asked as a means to assess whether or not the website was viewed as engaging. The following graph (Figure 6 on next page) shows that only 2 out of 7 users would come back to this website based on the interface alone.

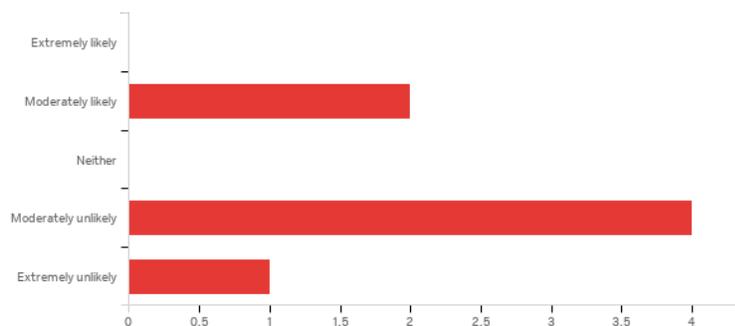
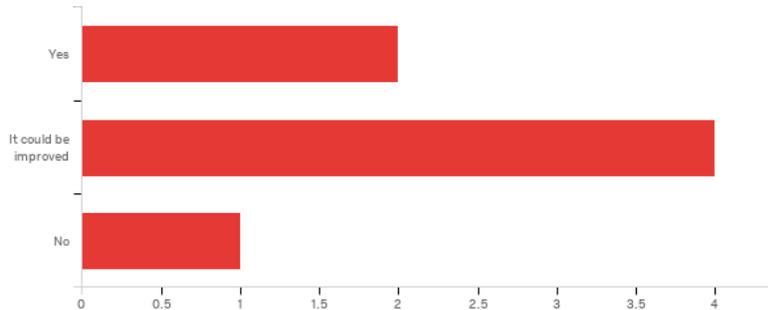


Figure 6 Data for question 14. Ratings of users likely to return to the NWS website

*Question 16: Do you feel this style of interface is effective for delivering its information?*

The purpose of this survey question was another means of reporting on whether or not users felt this website was viewed as engaging. This graph shows that the majority of users felt that the website interface could be improved or that it was just not effective. Only 2 users felt that the website's interface had effective delivery.



*Figure 7 Data on question 16. Ratings of interface effectiveness.*

When users were asked directly if they felt the website was pleasant to use, three had a positive opinion while two were neutral and two had a negative opinion. (All of the survey questions are included in the appendix.)

## **Conclusion:**

Overall, the NWS website is not as usable as one would expect. The number of clicks and the amount of time on the task scenarios was measured for each user. This showed us that many of the users were not able to complete tasks two and three because the maps that they had to use for those scenarios were too confusing and did not provide an easy gateway to the information that they needed. There are some recommendations for the NWS website that would help to fix these user errors and make the website more usable. The maps need a search bar specific to each map or they need a way to filter the map so that it is not overwhelming to look at. Also, the website leaves a lot of unnecessary white space on pages with interactive maps. This space could be filled in with bigger maps or more searching and filtering options. Based on the findings above and the recommendations provided, the National Weather Service website needs some revision if users are going to effectively and efficiently find the information they need or if the NWS expects users to come back to their website in the future.

## Citations:

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# Appendix:

## Task Scenarios

1. You are wanting to spend the day biking around West Lafayette, but are not sure of the weather. Find the forecast for the day and determine the weather alerts for the area (if any). (2 Clicks minimum)
2. Some friends and you are taking a kayaking trip on the White River in Noblesville, IN. You will be in Hamilton County (north of Indianapolis, IN). Find the current river height and indicate if there is flooding. (3 Clicks minimum)
3. A class requires you to find the weather history for Lafayette on June 1, 2016. Locate the weather report for that date. (6 clicks minimum)

## Survey Questions

1. Gender? a. Male b. Female	8a. Do you feel you encountered any errors? a. Yes b. No
2. Age? _____	If 8a = b 8b. Do you feel the errors you encountered were easy to correct? a. Definitely Yes b. Somewhat c. Not Really d. Definitely No
3. Status? a. Undergraduate b. Graduate c. Faculty/Staff d. Other	If 8b = b,c, or d 8c. Overall do you feel the text on this website was readable? a. Yes b. Somewhat c. No
4. Usual weather info. source? a. Local news channel b. Weather mobile app c. Internet d. Don't check the weather	If 8c = b or c 8d. Would you classify the issue as...? a. Text Size b. Font/Typeface c. Color
5. How many times per week do you check the weather? a. 0-3 b. 4-6 c. 7+	If 8d = c 8e. Was the color issue due to color blindness? a. Yes b. No c. Prefer not to answer
6. Would you consider yourself to be 'tech savy'? a. Yes b. Somewhat c. No	9. Based on the interface only, how likely are you to use the NWS website again vs. another source? a. Extremely likely b. Moderately likely c. Neither d. Moderately unlikely e. Extremely unlikely
7. Did you encounter situations where information was not where you felt it should be or was out of place? a. Yes b. No	10. Do you feel that this website was pleasant to use? Rate scale 1-5 (5 being strongly agree)
	11. Do you feel this style of interface is effective for communicating its information? a. Yes b. It could be improved c. No
	12. What improvements or suggestions do you have for this site?

## User Demographics

<b>Participant</b>	<b>Gender</b>	<b>Age</b>	<b>Status</b>	<b>Usual Weather Source</b>	<b>Times per Week Check Weather</b>	<b>Tech Savvy</b>
<b>1</b>	Male	18	Undergrad	Internet	0-3	No
<b>2</b>	Female	27	Grad	App	0-3	Somewhat
<b>3</b>	Female	21	Undergrad	App	0-3	Somewhat
<b>4</b>	Female	21	Undergrad	App	4-6	Somewhat
<b>5</b>	Male	31	Grad	Internet	4-6	No
<b>6</b>	Male	25	Other	Don't Check	0-3	No
<b>7</b>	Male	27	Undergrad	App	4-6	Yes