

**Designing for Demographics: Optimizing the Usability of Patient Portals**

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## Structured Abstract

**Purpose:** The overall objective of this grant was to identify and characterize the factors differentiating patient portal users from non-users within population subgroups, and to develop clear design guidelines to represent their needs.

**Scope:** This study focused on characteristics of users and non-users of patient portal platforms.

**Methods:** The research team used a quantitative approach, including an online survey and electronic health record (EHR) data analysis to gain a deeper understanding of patient portal user subpopulations, and characterize users and non-users of patient portals.

**Results:** Study findings indicated differences in patient portal usage by patient demographics, health status, patient self-efficacy levels, and comfort level with technology. These findings confirm previous studies and although patient portal usage increased during the COVID-19 pandemic gaps persist in usage among specific patient subpopulations. Recommendations based on study findings include patient outreach and education guidelines, and increasing the inclusive design of patient portal platforms.

**Key Words:** health literacy, technology usage and attitudes, minority patient populations

## Section I: Purpose

### **Objectives of the Study**

The overall objective of this grant was to identify and characterize the factors differentiating patient portal users from non-users within population subgroups, and to develop clear design guidelines to represent their needs.

**Specific Aim 1:** To survey population subgroups (differing by demographic characteristics and health status) with varying levels of patient portal use to characterize engagement and identify preferences.

**Specific Aim 2:** To develop patient portal user personas to meet the needs of diverse patients.

**Specific Aim 3:** To disseminate standard design and development documents and lessons learned.

## Section II: Scope

### **Background**

Patient portals potentially serve as a platform for patients to easily access their health information and more easily communicate with their provider, if designed and developed appropriately for the user. When patients use portals, it also affords the opportunity to have their health information preserved over time. Despite these benefits, the majority of the U.S. population does not ever access or engage with patient portals. There are also differences in patient portal engagement among groups such as: the elderly, racial/ethnic minorities, low-literate, and safety-net populations. Differences in patient portal usage as a result of suboptimal design may contribute to disparities in care quality, safety, and health outcomes. The Office of the National Coordinator for Health Information Technology is now mandating open application programming interfaces (APIs), which will allow for the development of patient portals that can receive data from any EHR vendor product, likely increasing their prevalence and usage. Increasing patient portal prevalence coupled with their current disparities in use highlight the critical need for more effective design of portals for all users and user subgroups. Many patient portals suffer from poor usability and do not provide patients with the information they need in an intuitive format. Further, patient needs vary by demographics or health status and have not been clearly identified. The objective of the proposed research was to identify and characterize factors differentiating patient portal users from non-users both within and across population subgroups, and to develop clear design guidelines to represent their needs. We hypothesize patient portal preferences vary by subgroup between non-users and users but also may vary between subgroups of users such as frequent or infrequent users. Identifying these needs will lead to better patient portal design to help overcome current usage gaps.

### **Context**

To identify and characterize patient portal users and non-users, the MedStar Center for Health Equity Research leveraged patient data from across the MedStar Health system and national data using Amazon Mechanical Turk's (MTurk) online platform. This approach allowed the study team to obtain a system- and national-level perspective of users and non-users, which was then be used to develop inclusive and expansive design guidelines for patient portal platforms.

### **Setting**

Our team is embedded in a large 10-hospital, 280 outpatient site academic healthcare delivery system with a diverse range of clinical expertise, and nearly every type of patient demographic represented. The study team is multidisciplinary composed of industrial engineers, usability specialists, clinical informatics experts, clinicians, and health disparity researchers with expertise in conducting applied research to improve healthcare quality, efficiency, and safety.

### **Participants**

This study focused on patients at MedStar Health with patient portal accounts, and users and non-users of patient portal platforms across the U.S. Participation was restricted to patients 18 years of age and older, and currently residing in the U.S.

### Incidence

Not applicable.

### Prevalence

Not applicable.

## Section III: Methods

We conducted a large cross-sectional survey of diverse patient portal users and non-users, by sampling from novel crowd-sourcing platforms (for broad reach) and examining patient portal usage among MedStar Health patients for Specific Aim 1. Results from these data and a review of the peer-reviewed and grey literature will inform the development of user personas for patient portal platforms (Specific Aim 2).

- 1) **MedStar Patient Portal Activity:** We extracted MedStar patient portal data from March 2019 to March 2021 to assess portal usage from pre- to post-onset of COVID-19 pandemic (N=153,628). As part of the data extracted, we examined patient demographics (age, sex, race, ethnicity, health insurance type), health-related variables (has primary care provider, comorbid disorder), and portal activities (total clicks in portal platform, health profile views, medication renewal requests). Time periods for the analysis were pre-onset (March 1, 2019-February 29, 2020) and post-onset (March 1, 2020-February 28, 2021) of the COVID-19 pandemic. Data were analyzed using descriptive statistics, bivariate analysis, and mixed effects models. Limitations of these data include the patients not being representative of the U.S. population and no data on why some patients do not have patient portal accounts.
- 2) **Amazon Mechanical Turk Patient Portal Users and Non-Users:** We surveyed Amazon Mechanical Turk workers about patient portal usage (N=489). The online survey asked demographic questions of participants (age, sex, educational level, income level, type of neighborhood, health insurance status, disability status, comorbid disorders), whether they had a patient portal account or not, Short Form Patient Activation Measure (SPAM), BRIEF Health Literacy Screening Tool (BRIEF), Media and Technology Usage and Attitudes Scale (MTUAS), and patient portal usage among users. Data were collected from December 2021 to January 2022. The analysis plan included descriptive statistics, latent class analysis, and multivariate logistic regression models. Limitations of these data included self-reported data and the sample not being representative of the U.S. population.
- 3) **Patient Portal User Personas:** Patient portal user personas will be developed based on a synthesis of findings from Specific Aims 1 and 2, a review of peer-reviewed and grey-literature, and input from healthcare providers. Although there is no additional analysis planned, the synthesis of findings across these data sources helps to address some of the limitations of each to better inform development of patient portal user personas.

## Section IV: Results

Results from our study are detailed below by data source.

- 1) **MedStar Patient Portal Activity:** The results from our analysis of MedStar patient portal data showed increased portal usage from pre- to post-onset of the COVID-19 pandemic. We found an increase in total clicks and for views of specific pages (health profile, health record). There was an increase in patients requesting prescription renewals through the patient portal platform. Other notable findings include increased portal usage among patients with a primary care provider or a comorbid disorder. Increases and decreases in portal usage were also seen by patient race and ethnicity. These findings reflect greater usage of patient portal platforms from pre- to post-onset of the pandemic, and perhaps greater reliance on electronic communication with providers during the pandemic. Although usage increased overall, not all racial or ethnic groups engaged with patient portal platforms, which indicate the need for greater outreach to specific patient populations. For the three specific click types (Immunizations, Health Records, and Medications) which had statistically significant associations between pre/post COVID-19 Pandemic onset and outcome on bivariate models (Table 1), we ran multivariable mixed effects regression models with patient demographic variables (age, race, ethnicity), health insurance type, comorbid conditions, and primary care provider status.

Immunizations view model: Adjusting for all other covariates, there was a 0.43 unit increase in this click type post-onset compared to pre-onset (95% CI: 0.39, 0.46; p-value<0.001; Table 1). Compared to patients who identified as White, patients that identified as Black were associated with a decrease in the number of clicks of this type, whereas patients who identified as Asian or in the 'multiple' or 'other' category were associated with an increase in clicks (p<0.05). Compared to patients who had commercial insurance, patients that had government, Medicare, Medicaid, Self-pay or other insurance were all associated with an increase in clicks (p<0.05). Similarly, patients who had a PCP provider or patients that had comorbidities were associated with an increase in clicks compared to those who did not (p<0.05).

Health records view model: Adjusting for all other covariates, there was a 0.43 unit increase in this click type post-onset compared to pre-onset (95% CI: 0.40, 0.46; p <0.001). Compared to patients who identified as White, patients that identified as Black were associated with a decrease in the number of clicks of this type, whereas patients who identified as Asian or in the 'multiple' or 'other' category were associated with an increase in clicks (p<0.05). Compared to patients who had commercial insurance, patients that had Medicare, Medicaid, private or other insurance were all associated with an increase in clicks (p<0.05). Older patients, patients who had a PCP provider, and patients that had comorbidities were associated with an increase in clicks compared to those who did not (p<0.05).

Medications view model: Adjusting for all other covariates, there was a 0.07 unit decrease in this click type post-onset compared to pre-onset (95% CI-0.09, -0.05; p-value<0.001). Older patients and patients who identified as female were associated with a decrease in clicks (p<0.05). Compared to patients who identified as White or Non-Hispanic, patients that identified

as Black, Asian or in the 'multiple' or 'other' category and Hispanic patients were associated with an increase in clicks ( $p < 0.05$ ). Compared to patients who had commercial insurance, patients that had government insurance, Medicare or Medicaid were all associated with an increase in clicks ( $p < 0.05$ ). Patients who had a PCP provider or patients that had comorbidities were associated with an increase in clicks compared to those who did not ( $p < 0.05$ ).

- 2) **Amazon Mechanical Turk Patient Portal Users and Non-Users:** The results from our analysis of Amazon Mechanical Turk data indicate significant differences between patient portal users and non-users in education, geographic location, insurance, presence or absence of primary care providers, and having a disability or comorbidity of any type (see Table 2). The latent class analysis (LCA) models revealed similar differences between patient portal users and non-users based on neighborhood type, education, income, people reporting disability of any type, people reporting comorbidity of any type, insurance type, and presence or absence of primary care providers. The BRIEF LCA model revealed differences between users and non-users in relation to health literacy levels. SPAM LCA model results showed that users had higher endorsement of their self-efficacy as patients. The last LCA model, MTUAS, indicated differences between users and non-users in attitudes toward technology and technology-related anxiety. Finally, the regression models indicated that patients with a primary care provider (Portal User = Yes Odds Ratio (OR) 5.48 (95% CI 3.34, 9.12,  $p = 0.000$ )), disability of any type (OR = 1.72 (95% CI 1.05, 2.82,  $p = 0.032$ )), or comorbid disorder of any type (OR = 1.72 (95% CI 1.04, 2.85,  $p = 0.036$ )) were more likely to have a patient portal account (see Table 3). Data on patient portal users are still being analyzed. These findings have implications for outreach efforts to patient populations that show low patient portal usage.
- 3) **Patient Portal User Personas:** The development of these user personas is ongoing and data from the study are still being analyzed and drafted for dissemination in peer-reviewed journals and conferences.

## Conclusions

These findings demonstrate that gaps in patient portal usage by patient subpopulations persisted during the COVID-19 pandemic, which is troubling given challenges with accessing care during the pandemic and data showing that patient portal usage is associated with improved patient outcomes. Our study results confirm that having a primary care provider, a chronic disorder, or a disability are associated with having a patient portal account. Ongoing analysis of patient portal users will provide further insight into facilitators and barriers with using patient portal platforms. Given the current COVID-19 pandemic and healthcare system shifting to telehealth appointments, there is an urgent need to ensure awareness and accessibility of patient portal platforms for all patient populations. Findings from this study will provide critical guidance for healthcare systems, providers, and patient portal designers to increase patient usage of patient portal platforms. Additionally, findings from this work will support future grants from other Medstar personnel in areas such as telehealth, patient engagement, and patient portal usage.

## Significance

The literature on patient portal usage has shown there are significant differences by patient subpopulations. Our study confirms some of these findings and provides insights into patient portal

usage during the COVID-19 pandemic. These results show that although patient portal usage has increased during the pandemic, there are still gaps among patient subpopulations. Specifically, patients with low patient self-efficacy, reduced comfort with technology, and among minority racial/ethnic populations. These findings speak to the need for greater outreach, education, and increased accessibility of patient portal platforms, so all patients feel comfortable accessing and using this critical communication and health management platform. We are using findings from our study, a review of the peer-reviewed and grey-literature, and input from healthcare providers to inform the development of user personas, so healthcare providers have guidelines to inform interactions with patients to encourage adoption of patient portals, and patient portal designers have information to enhance the accessibility of these platforms.

### **Implications**

There are key study implications for healthcare systems, healthcare providers, and patient portal designers. Study findings will provide healthcare systems with crucial information guidelines to ensure patient portal platforms are designed with accessibility in mind, and patient outreach to encourage patient portal uptake. Recommendations for providers will provide information on which patient subpopulations to focus on and health education talking points to encourage patients to enroll and use their patient portal accounts. Key design recommendations will assist patient portal designers with ensuring patient platforms are accessible to all patient populations



## Section V: List of Publications and Products

The study team is currently working on manuscripts and conference abstract submissions. The “in progress” status of the manuscripts reflects the PI (Naheed Ahmed) leaving the MedStar Health Research Institute, which requires the submission of this final study report. Dissemination of study results will continue after the study is closed.

### Manuscripts

Ahmed N, Brown J, Parau C, McCullers A, Sanghavi K, Littlejohn R, Wesley D. Characterizing Patient Portal Users and Non-Users in the U.S. *Journal of Informatics in Health and Biomedicine*. (In Progress).

Ahmed N, Sanghavi K, Mathur S, McCullers A, Littlejohn R, Wesley D. Patient Portal Usage Patterns from Pre- to Post-Onset of the COVID-19 Pandemic. *American Journal of Preventive Medicine*. (In Progress).

Brown J, McCullers A, Ahmed N. Patient Portal Users in the U.S. (In Progress).

Littlejohn R, McCullers A, Ahmed N. Development of User Personas to Inform Inclusive Patient Portal Designs. (In Progress).

### Abstract Presentations

Mathur S, Sanghavi K, McCullers A, Wesley D, Ahmed N. Impact of COVID-19 on Patient Portal Usage across Population Subgroups. *AMIA 2022 Clinical Informatics Conference*; May 24-26, 2022; Houston, TX.

## Section VI: Supplemental Tables

**Table 1: Multivariable mixed effects regression model results for specific click types**

Fixed Effects	Adjusted $\beta$ estimates for 'Health Profile (immunization views)' (n=181,524)			Adjusted $\beta$ estimates for 'Health Record (clinical summary of last visit)'			Adjusted $\beta$ estimates for 'Prescription Renewal (medication views)'		
	Coefficient	95% CI	p-value	Coefficient	95% CI	p-value	Coefficient	95% CI	p-value
<b>Time Period</b>									
Pre-Onset	Ref	--	--	Ref	--	--	Ref	--	--
Post-Onset	0.43	[0.39, 0.46]	<0.001	0.43	[0.40, 0.46]	<0.000	-0.07	[-0.09,-0.05]	<0.000
<b>Age</b>	-0.01	[-0.01,-0.01]	<0.001	-0.01	[-0.01,-0.01]	<0.000	-0.00	[-0.00,-0.00]	<0.000
<b>Sex</b>									
Male	Ref	--	--	Ref	--	--	Ref	--	--
Female	0.02	[-0.02, 0.05]	0.367	0.02	[-0.02, 0.05]	<0.365	-0.04	[-0.06,-0.02]	<0.000
Other	0.55	[-0.59, 1.69]	0.341	0.57	[-0.56, 1.71]	<0.322	-0.16	[-0.84, 0.52]	<0.642
<b>Race</b>									
White	Ref	--	--	Ref	--	--	Ref	--	--
Black or African American	-0.07	[-0.11,-0.03]	0.001	-0.07	[-0.11,-0.03]	<0.000	0.07	[0.04, 0.09]	<0.000
American Indian or Alaska Native				-0.13	[-0.45, 0.19]	<0.430	0.08	[-0.12, 0.27]	<0.453
Asian	0.31	[0.22, 0.40]	<0.001	0.31	[0.22, 0.40]	<0.000	0.19	[0.14, 0.24]	<0.000
Native Hawaiian or Pacific Islander	0.38	[-0.33, 1.10]	0.294	0.38	[-0.33, 1.10]	<0.292	-0.17	[-0.60, 0.26]	<0.426
Multiple	0.24	[0.03, 0.45]	0.027	0.24	[0.03, 0.45]	<0.027	0.28	[0.15, 0.41]	<0.000
Other	0.15	[0.07, 0.23]	<0.001	0.15	[0.07, 0.22]	<0.000	0.09	[0.04, 0.13]	<0.000
Unknown or Declined	-0.02	[-0.10, 0.06]	0.642	-0.02	[-0.10, 0.06]	<0.644	0.00	[-0.04, 0.05]	<0.877
<b>Ethnicity</b>									
Non-Hispanic	Ref	--	--	Ref	--	--	Ref	--	--
Hispanic	0.08	[-0.04, 0.19]	0.210	0.07	[-0.04, 0.19]	<0.220	0.08	[0.01, 0.15]	<0.022
Other or Unknown	-0.06	[-0.13, 0.01]	0.117	-0.06	[-0.13, 0.01]	<0.117	0.00	[-0.04, 0.05]	<0.877
<b>Insurance Type</b>									
Commercial	Ref	--	--	Ref	--	--	Ref	--	--
Government	0.26	[0.05, 0.46]	0.015	0.26	[0.05, 0.47]	<0.013	0.14	[0.01, 0.26]	<0.031
Medicaid	0.50	[0.32, 0.67]	<0.001	0.50	[0.32, 0.67]	<0.002	0.18	[0.07, 0.28]	<0.000
Medicare	0.41	[0.24, 0.59]	<0.001	0.41	[0.24, 0.58]	<0.000	0.21	[0.11, 0.32]	<0.000
Private	0.19	[0.03, 0.35]	0.022	0.19	[0.03, 0.35]	<0.021	0.08	[-0.02, 0.18]	<0.110
Self-Pay	0.09	[-0.11, 0.29]	0.371	0.09	[-0.11, 0.29]	<0.372	0.07	[-0.05, 0.19]	<0.258
Other or Unknown	0.39	[0.14, 0.64]	0.002	0.39	[0.14, 0.64]	<0.002	0.13	[-0.02, 0.28]	<0.081
<b>Primary Care Provider</b>									
No	Ref	--	--	Ref	--	--	Ref	--	--
Yes	0.36	[0.31, 0.41]	<0.001	0.36	[0.31, 0.41]	<0.000	0.23	[0.20, 0.26]	<0.000
Unknown	-0.30	[-0.44,-0.16]	<0.001	-0.30	[-0.44,-0.16]	<0.000	-0.13	[-0.21,-0.05]	<0.002
<b>Any comorbidity</b>									
No	Ref	--	--	Ref	--	--	Ref	--	--
Yes	0.40	[0.36, 0.44]	<0.001	0.40	[0.36, 0.44]	<0.000	0.41	[0.38, 0.43]	<0.000
<b>Random Effects</b>									
Constant Variance (Estimate, SE)	2.26 (0.05)			2.24 (0.04)			1.42 (0.01)		
Residual Variance (Estimate, SE)	11.04 (0.06)			11.01 (0.50)			3.27 (0.17)		

**Table 2: Comparison of Patient Portal Users and Non-Users from MTurk Study**

Variable	Non-Users	Users	p-value	Test
<b>N</b>	226	263		
<b>Age in years (mean (SD))</b>	36.96 (10.89)	36.94 (9.97)	0.979	
<b>Age group (n (%))</b>				
18-29	58 (25.7)	58 (22.1)	0.399	
30-39	92 (40.7)	113 (43.0)		
40-49	38 (16.8)	58 (22.1)		
50-59	30 (13.3)	25 (9.5)		
60-69	8 (3.5)	9 (3.4)		
<b>Gender</b>				
Male	127 (56.2)	145 (55.1)	0.555	
Female	98 (43.4)	117 (44.5)		
Transgender Woman	0 (0.0)	1 (0.4)		
Prefer not to say	1 (0.4)	0 (0.0)		
<b>Race/Ethnicity (n (%))</b>				
White or Caucasian	191 (84.5)	209 (79.5)	0.194	Fisher's Exact
Black or African-American	17 (7.5)	31 (11.8)		
Asian or Pacific Islander	7 (3.1)	5 (1.9)		
Hispanic or Latino	7 (3.1)	11 (4.2)		
Native American or Alaskan Native	2 (0.9)	7 (2.7)		
Other:(Mixed)	1 (0.4)	0 (0.0)		
Prefer not to answer	1 (0.4)	0 (0.0)		
<b>Education (n (%))</b>				
Some high school or less, no diploma	4 (1.8)	1 (0.4)	<0.001*	Fisher's Exact
High school graduate	18 (8.0)	10 (3.8)		
Associate degree	17 (7.5)	9 (3.4)		
Bachelor's degree	147 (65.0)	167 (63.5)		
Graduate degree or higher	39 (17.3)	76 (28.9)		
Prefer not to answer	1 (0.4)	0 (0.0)		
<b>Income (n (%))</b>				
< \$35,000	32 (14.2)	22 (8.4)	0.179	
\$35,000 < \$54,999	63 (27.9)	72 (27.4)		
\$55,000 - \$74,999	58 (25.7)	67 (25.5)		
\$75,000 - \$94,999	40 (17.7)	57 (21.7)		
\$95,000 - \$114,999	21 (9.3)	21 (8.0)		
\$115,000 - \$134,999	4 (1.8)	10 (3.8)		
\$135,000 - \$154,999	2 (0.9)	8 (3.0)		
\$155,000 - \$174,999	1 (0.4)	3 (1.1)		
\$175,000+	1 (0.4)	2 (0.8)		
Prefer not to answer	4 (1.8)	1 (0.4)		

Variable	Non-Users	Users	p-value	Test
<b>Geographic Location (n (%))</b>				
Urban	125 (55.3)	165 (62.7)	0.033*	Fisher's Exact
Suburban	64 (28.3)	67 (25.5)		
Large Rural	23 (10.2)	27 (10.3)		
Small Rural (population < 2500)	14 (6.2)	4 (1.5)		
<b>Region (n (%))</b>				
Midwest	53 (23.5)	45 (17.1)	0.194	Fisher's Exact
Northeast	25 (11.1)	44 (16.7)		
South	96 (42.5)	111 (42.2)		
U.S. Territory	2 (0.9)	1 (0.4)		
West	50 (22.1)	62 (23.6)		
<b>Primary Care Physician (n (%))</b>				
No	123 (54.4)	41 (15.6)	<0.001*	Fisher's Exact
Not Sure	16 (7.1)	5 (1.9)		
Yes	87 (38.5)	217 (82.5)		
<b>Insurance Type (n (%))</b>				
Uninsured or Self-Pay	45 (19.8)	5 (1.9)	<0.001*	Fisher's Exact
Exclusive Public or Military	90 (39.6)	130 (49.4)		
Exclusive Private	44 (19.4)	56 (21.3)		
Multiple Plans	48 (21.1)	72 (27.4)		
<b>Disability any type = Yes (n (%))</b>	83 (36.7)	161 (61.2)	<0.001*	
<b>Comorbidity any type = Yes (n (%))</b>	111 (49.1)	200 (76.0)	<0.001*	
<b>Reason for no portal account (n (%))</b>				
Unsure if healthcare provider has a patient portal system	85 (37.6)	--		
Portal account took too long to set-up	71 (31.4)	--		
Portal account was confusing to set-up	49 (21.6)	--		
Does not have a device (e.g., computer, smart phone, tablet) to access a patient portal system	23 (10.1)	--		
Personal device (e.g. computer, smart phone, tablet) does not work with the patient portal system	29 (12.8)	--		
Other reason	10 (4.4)	--		
<b>MTUAS Overall Score Sum (mean (SD))</b>	170.46 (40.71)	175.47 (44.19)	0.195	
<b>MTUAS Attitude Subscale Sum (median [IQR])</b>	55.00 [50.00, 61.00]	57.00 [52.00, 62.00]	0.002*	Kruskal-Wallis
<b>PAM Score Calibrated (median [IQR])</b>	65.50 [55.60, 70.20]	67.80 [60.60, 72.50]	<0.001*	Kruskal-Wallis

Variable	Non-Users	Users	p-value	Test
<b>PAM Level (n (%))</b>				
Believes active role is important (1)	14 (6.2)	7 (2.7)	<0.001*	Fisher's Exact
Confidence to take action (2)	41 (18.1)	30 (11.4)		
Begins to take action (3)	122 (54.0)	129 (49.0)		
Stays course under stress (4)	49 (21.7)	97 (36.9)		
<b>BRIEF Score Category (n (%))</b>				
Adequate Health Literacy	9 (4.0)	4 (1.5)	0.053	Fisher's Exact
Inadequate health literacy	138 (61.1)	184 (70.0)		
Marginal health literacy	79 (35.0)	75 (28.5)		

\*significant at  $p < 0.05$  level

Chi-square test were used for categorical variables (with continuity correction) and one-way test for continuous variables (with equal variance assumption, i.e., regular ANOVA) unless otherwise noted.

**Table 3: Odds Ratio of Having a Patient Portal Account from MTurk Logistic Regression Full Model (n=489)**

Variable	Odds Ratio	Lower 95% CI	Upper 95% CI	p-value
<b>Age (reference group = 30-39 years old)</b>				
18-29	1.13	0.61	2.09	0.693
40-49	1.07	0.56	2.03	0.840
50-59	0.69	0.32	1.48	0.343
60-69	0.98	0.28	3.43	0.969
<b>Sex (reference group = Male)</b>				
Female	0.98	0.62	1.55	0.927
<b>Race/Ethnicity (reference group = White)</b>				
Black or African-American	0.91	0.41	2.09	0.826
Asian or Pacific Islander	0.52	0.10	2.63	0.428
Hispanic or Latino	1.22	0.37	4.41	0.750
Native American or Alaskan Native	4.61	0.73	42.07	0.130
<b>Education (reference group = Bachelor's degree)</b>				
Some high school or less, no diploma	0.17	0.01	2.17	0.195
High school graduate	0.49	0.17	1.44	0.192
Associate degree	0.50	0.16	1.51	0.223
Graduate degree or higher	1.56	0.88	2.78	0.128

Variable	Odds Ratio	Lower 95% CI	Upper 95% CI	p-value
<b>Income (reference group = \$35,000 - \$54,999)</b>				
< \$35,000	0.85	0.37	1.93	0.689
\$55,000 - \$74,999	0.99	0.54	1.84	0.979
\$75,000 - \$94,999	1.15	0.59	2.23	0.686
\$95,000 - \$114,999	0.62	0.26	1.46	0.275
\$115,000 - \$134,999	1.45	0.37	7.09	0.613
\$135,000 - \$154,999	2.64	0.45	23.16	0.320
\$155,000 - \$174,999	3.97	0.27	141.20	0.368
\$175,000+	1.24	0.08	35.00	0.883
Prefer not to answer	1.10	0.03	22.53	0.953
<b>Geographic Location (reference group = Urban)</b>				
Suburban	1.02	0.60	1.75	0.945
Large Rural	0.70	0.34	1.44	0.332
Small Rural (population < 2500)	0.36	0.08	1.31	0.138
<b>Primary Care Physician (reference group = No)</b>				
Not sure	1.18	0.33	3.74	0.784
Yes	5.48	3.34	9.12	0.000*
<b>Insurance exclusively uninsured/self-pay</b>	0.17	0.05	0.47	0.001*
<b>Disability any type = Yes</b>	1.72	1.05	2.82	0.032*
<b>Comorbidity any type = Yes</b>	1.72	1.04	2.85	0.036*
<b>MTUAS Attitude Subscale Score</b>	1.03	1.00	1.06	0.058
<b>PAM Level (reference group = Believes active role is important (1))</b>				
Confidence to take action (2)	1.37	0.39	5.06	0.628
Begins to take action (3)	1.20	0.38	4.00	0.757
Stays course under stress (4)	2.43	0.73	8.62	0.154
<b>BRIEF Score Category (reference group = Adequate health literacy)</b>				
Inadequate health literacy	0.74	0.12	4.54	0.738
Marginal health literacy	0.86	0.14	5.29	0.865

\*significant at  $p < 0.05$  level

Null deviance: 670.76 on 485 degrees of freedom

Residual deviance: 494.90 on 449 df

AIC: 568.9