Trends in the Adoption of Digital Health Technology

Author: Bennie Lopez, Faculty Advisors: Tomas Dvorak & Nick Webb

BACKGROUND

Digital health is the technology used to empower individuals to improve their health & wellness. It provides tailored medicine to meet individual needs, lowers the cost of healthcare and helps patients monitor and manage chronic conditions. As Covid-19 has stretched healthcare resources thin, digital health has sped up innovation to offer more efficient mechanisms to deliver care. Despite its potential, divisions exist between who adopts the technology. To better understand how to engage patient groups who have the most to gain, we seek to identify what demographic features contribute to these divisions.

PREVIOUS RESEARCH

DETERMINANT	FINDING
Threatened Clinical Autonomy	↓ adoption
Poor Training & Support Services	↓ adoption
High Cost	↓ adoption
Low Trust	↓ adoption
Minority Demographics	↓ adoption
> 2 Medical Conditions	↑ adoption
Low Health Literacy	↓ adoption
Perceived Usefulness & Visibility	↑ adoption
Robust Infrastructure	↑ adoption
Rural Location	↓ adoption

My thesis asks:
1. What's happening to digital health adoption over time?
2. How does adoption vary across demographics?
3. What similarities do groups of digital health customers share?

DATA

ROCK HEAL+H

Data comes from Rock Health's consumer adoption surveys, which include questions about demographics, health status, attitudes and preferences around digital health technology & adoption of digital health tools.

ADOPTION OVER TIME

To measure an individual's overall adoption level, I created a composite adoption score. For a set of questions, an individual receives one 'point' if they answer yes.

1. Are you willing to share your health data?
2. Have you downloaded / used a health app?
3. Have you received care / medical advice digitally?
4. Do you own a wearable?
5. Have you searched online for health related info?
6. Are you digitally tracking health metrics?

Average Composte Adoption Over Time
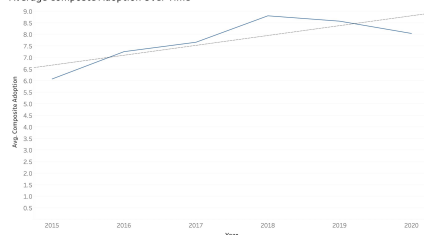
WHAT'S HAPPENING IN 2020?

While the average composite adoption score is declining in 2020, there's more under the surface. The number of people digitally tracking health metrics, owning a wearable and downloading / using health apps is increasing. On the other hand, the number of people searching for in-person services or searching for / receiving care electronically is declining. The one exception is receiving care via live video (which is increasing in 2020), implying it is the most effective method to receive care virtually. So, it seems the pandemic has made individuals more decisive about when & how to receive care. That being said, more people are adopting digital health tools that enhance their understanding of their own health.

DEMOGRAPHIC ANALYSIS

LOGISTIC REGRESSION RESULTS

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                        Logit Regression Results
=================================================================
Dep. Variable:               y       No. Observations:     18766
Model:                   Logit       Df Residuals:         18760
Method:                    MLE       Df Model:                 5
Date:          Fri, 26 Feb 2021      Pseudo R-squ.:      -0.1217
Time:                 22:46:58       Log-Likelihood:     -11064.
converged:                True       LL-Null:            -9863.1
Covariance Type:      nonrobust      LLR p-value:          1.000
=================================================================
              coef    std err      z     P>|z|    [0.025   0.975]
-----------------------------------------------------------------
x1 AGE      -1.1574    0.045   -25.836   0.000   -1.245   -1.070
x2 INCOME    0.8551    0.076    11.254   0.000    0.706    1.004
x3 EDUCATION 0.3467    0.084     4.118   0.000    0.182    0.512
x4 RURAL    -0.0484    0.043    -1.119   0.263   -0.133    0.036
x5 FEMALE   -0.2148    0.030    -7.222   0.000   -0.273   -0.156
x6 HEALTH   -0.4636    0.059    -7.887   0.000   -0.579   -0.348
=================================================================
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As expected, age, income, education, gender, and health status significantly impact an individual's likelihood to adopt. Higher income and education levels lead to increased adoption. Characteristics that decrease adoption include older age, being a female and having a low health rating. To visualize these results, I used a decision tree to predict whether an individual owns a wearable.

DECISION TREE RESULTS
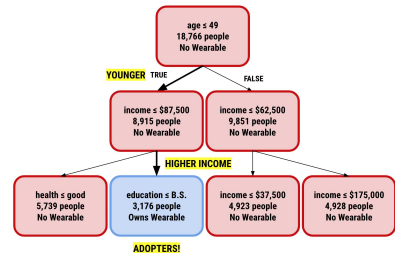
The most important feature of the decision tree (the root node) is age. If an individual is younger and has a higher education, we predict that the individual owns a wearable. For all other combinations of features, we predict that they do not own a wearable.

CUSTOMER SEGMENTATION

To understand what the defining features of adoption are, we use K-Means Clustering to group respondents into segments. We find three distinct clusters:

CLUSTER 1: Young, wealthy & healthy

CLUSTER 2: Middle-aged, moderate income & fair health

CLUSTER 3: Old, lower-income & unhealthy

Avg. Composite Adoption by Customer Segments
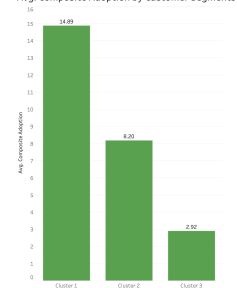
FUTURE WORK

Going forward, we need to grow our understanding of what defines an individual's likelihood to adopt digital health. This will require asking new questions, to create more nuanced customer segments.

1. What is your technical proficiency?
2. Would your current cell phone support an advanced app?
3. How comfortable are you sharing your health data?
4. Do you know how digital health could benefit you?

This will lead to more effective, tailored marketing campaigns that increase engagement in vulnerable populations.

Thank you, Professor Dvorak & Professor Webb & Sean Day at Rock Health