# Using Social Media to Engage Veterans in Health Care: Summary of Analysis

|  |  |
| --- | --- |
| Attribute | Value |
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| eIRB # | IRB15797 |
| BDP project # | BDP-25 |

## Objectives

The overall objective of this study is to determine the feasibility of using Facebook for identifying military veterans at risk for psychiatric problems, then determine the appropriateness of multiple social media platforms for engaging, supporting, and assisting these at-risk veterans. In this contract, we will explore the following aim:

**Aim 1a:** Determine the feasibility of reaching recently deployed military veterans through Facebook advertising. We will use Facebook ads to recruit 1000 self-reported veterans who have been deployed to Iraq or Afghanistan to participate in a national online survey. Ad recruitment metrics and level of social media use will determine feasibility of identifying and engaging veterans.

## Summary of Facebook Ad Metrics Analysis

* Use negative binomial model
* Factors: ad image, ad text
* Include full factorial interaction

**Model**

Define the linear predictor as , where

The model for impressions and reach is

Clicks, unique clicks, total link clicks, unique link clicks are bounded by and related to the number of impressions. The model for these dependent variables uses impressions as an offset and is specified as

Reactions, comments, and shares are bounded by and related to the number of clicks. The model for these dependent variables uses all clicks as an offset and is specified as

### Impressions

## impressions ~ image + text + image \* text

Predicted values.

|  |  |  |  |  |
| --- | --- | --- | --- | --- |
| image | text | pred | predLower | predUpper |
| Veteran | Sharing | 1757.73 | 1559.21 | 1981.54 |
| Veteran | Incentive | 1602.71 | 1421.67 | 1806.81 |
| Veteran | Altruism | 1312.31 | 1164.01 | 1479.50 |
| Veteran | Empowerment | 1275.38 | 1131.25 | 1437.87 |
| Computer | Sharing | 1256.49 | 1114.49 | 1416.58 |
| Veteran | SocialNorms | 1250.96 | 1109.58 | 1410.35 |
| Family | Empowerment | 1194.50 | 1060.88 | 1344.95 |
| Family | Sharing | 1193.04 | 1058.20 | 1345.08 |
| Family | Altruism | 1125.38 | 998.16 | 1268.81 |
| Computer | SocialNorms | 1099.00 | 974.76 | 1239.08 |
| Computer | Altruism | 1097.71 | 973.61 | 1237.63 |
| Family | SocialNorms | 1093.20 | 969.61 | 1232.54 |
| Family | Incentive | 1080.02 | 957.92 | 1217.69 |
| Computer | Incentive | 1056.07 | 936.66 | 1190.69 |
| Computer | Empowerment | 977.13 | 866.63 | 1101.72 |

P-values comparing main effects.

|  |  |  |  |
| --- | --- | --- | --- |
|  | Computer | Family | Veteran |
| Computer | NA | 0.796 | 0 |
| Family | NA | NA | 0 |
| Veteran | NA | NA | NA |

|  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- |
|  | Incentive | Altruism | Empowerment | Sharing | SocialNorms |
| Incentive | NA | 0.655 | 0.370 | 0.045 | 0.645 |
| Altruism | NA | NA | 0.179 | 0.119 | 0.989 |
| Empowerment | NA | NA | NA | 0.004 | 0.175 |
| Sharing | NA | NA | NA | NA | 0.122 |
| SocialNorms | NA | NA | NA | NA | NA |

### Clicks, all

## clicksAll ~ image + text + image \* text + offset(log(impressions))

Predicted values.

|  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- |
| image | text | impressions | pred | predLower | predUpper |
| Veteran | SocialNorms | 1000 | 18.14 | 16.74 | 19.65 |
| Veteran | Sharing | 1000 | 16.68 | 15.47 | 17.97 |
| Veteran | Altruism | 1000 | 14.34 | 13.17 | 15.61 |
| Veteran | Incentive | 1000 | 12.66 | 11.64 | 13.77 |
| Veteran | Empowerment | 1000 | 11.29 | 10.28 | 12.39 |
| Family | Altruism | 1000 | 11.25 | 10.21 | 12.40 |
| Computer | SocialNorms | 1000 | 11.09 | 10.04 | 12.24 |
| Family | Sharing | 1000 | 10.68 | 9.69 | 11.77 |
| Family | Empowerment | 1000 | 10.21 | 9.23 | 11.30 |
| Family | SocialNorms | 1000 | 9.85 | 8.89 | 10.93 |
| Computer | Sharing | 1000 | 9.71 | 8.79 | 10.72 |
| Computer | Empowerment | 1000 | 8.64 | 7.71 | 9.68 |
| Family | Incentive | 1000 | 8.52 | 7.63 | 9.50 |
| Computer | Altruism | 1000 | 8.25 | 7.39 | 9.21 |
| Computer | Incentive | 1000 | 7.33 | 6.52 | 8.25 |

P-values comparing main effects.

|  |  |  |  |
| --- | --- | --- | --- |
|  | Computer | Family | Veteran |
| Computer | NA | 0.069 | 0 |
| Family | NA | NA | 0 |
| Veteran | NA | NA | NA |

|  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- |
|  | Incentive | Altruism | Empowerment | Sharing | SocialNorms |
| Incentive | NA | 0.154 | 0.049 | 0.000 | 0.000 |
| Altruism | NA | NA | 0.566 | 0.032 | 0.000 |
| Empowerment | NA | NA | NA | 0.129 | 0.001 |
| Sharing | NA | NA | NA | NA | 0.062 |
| SocialNorms | NA | NA | NA | NA | NA |

### Total link clicks

## linkClicks ~ image + text + image \* text + offset(log(impressions))

Predicted values.

|  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- |
| image | text | impressions | pred | predLower | predUpper |
| Veteran | SocialNorms | 1000 | 11.48 | 10.49 | 12.56 |
| Veteran | Incentive | 1000 | 8.58 | 7.82 | 9.41 |
| Veteran | Sharing | 1000 | 7.89 | 7.20 | 8.64 |
| Computer | SocialNorms | 1000 | 6.31 | 5.59 | 7.12 |
| Family | SocialNorms | 1000 | 5.21 | 4.57 | 5.94 |
| Veteran | Empowerment | 1000 | 5.19 | 4.59 | 5.88 |
| Computer | Sharing | 1000 | 5.01 | 4.42 | 5.68 |
| Computer | Incentive | 1000 | 5.00 | 4.35 | 5.73 |
| Family | Sharing | 1000 | 4.92 | 4.32 | 5.60 |
| Computer | Empowerment | 1000 | 4.77 | 4.13 | 5.51 |
| Family | Empowerment | 1000 | 4.57 | 4.00 | 5.23 |
| Family | Altruism | 1000 | 4.56 | 3.98 | 5.23 |
| Computer | Altruism | 1000 | 4.52 | 3.91 | 5.21 |
| Family | Incentive | 1000 | 4.43 | 3.84 | 5.10 |
| Veteran | Altruism | 1000 | 4.24 | 3.71 | 4.84 |

P-values comparing main effects.

|  |  |  |  |
| --- | --- | --- | --- |
|  | Computer | Family | Veteran |
| Computer | NA | 0.233 | 0 |
| Family | NA | NA | 0 |
| Veteran | NA | NA | NA |

|  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- |
|  | Incentive | Altruism | Empowerment | Sharing | SocialNorms |
| Incentive | NA | 0.32 | 0.651 | 0.974 | 0.013 |
| Altruism | NA | NA | 0.594 | 0.284 | 0.000 |
| Empowerment | NA | NA | NA | 0.614 | 0.003 |
| Sharing | NA | NA | NA | NA | 0.010 |
| SocialNorms | NA | NA | NA | NA | NA |

### Reactions

## Warning in theta.ml(Y, mu, sum(w), w, limit = control$maxit, trace =  
## control$trace > : iteration limit reached  
  
## Warning in theta.ml(Y, mu, sum(w), w, limit = control$maxit, trace =  
## control$trace > : iteration limit reached

## reactions ~ image + text + image \* text + offset(log(clicksAll))

Predicted values.

|  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- |
| image | text | clicksAll | pred | predLower | predUpper |
| Veteran | Altruism | 10 | 4.51 | 4.08 | 4.99 |
| Family | Altruism | 10 | 3.87 | 3.38 | 4.43 |
| Family | Empowerment | 10 | 2.44 | 2.04 | 2.91 |
| Computer | Altruism | 10 | 2.27 | 1.83 | 2.82 |
| Family | Incentive | 10 | 2.20 | 1.75 | 2.77 |
| Computer | Empowerment | 10 | 2.20 | 1.69 | 2.85 |
| Veteran | Empowerment | 10 | 2.16 | 1.82 | 2.56 |
| Family | Sharing | 10 | 1.99 | 1.63 | 2.43 |
| Computer | Incentive | 10 | 1.88 | 1.41 | 2.52 |
| Family | SocialNorms | 10 | 1.85 | 1.49 | 2.31 |
| Computer | SocialNorms | 10 | 1.68 | 1.33 | 2.11 |
| Computer | Sharing | 10 | 1.40 | 1.10 | 1.79 |
| Veteran | Sharing | 10 | 1.36 | 1.17 | 1.57 |
| Veteran | SocialNorms | 10 | 1.27 | 1.06 | 1.52 |
| Veteran | Incentive | 10 | 1.00 | 0.80 | 1.24 |

P-values comparing main effects.

|  |  |  |  |
| --- | --- | --- | --- |
|  | Computer | Family | Veteran |
| Computer | NA | 0.413 | 0.001 |
| Family | NA | NA | 0.000 |
| Veteran | NA | NA | NA |

|  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- |
|  | Incentive | Altruism | Empowerment | Sharing | SocialNorms |
| Incentive | NA | 0.308 | 0.442 | 0.128 | 0.545 |
| Altruism | NA | NA | 0.840 | 0.004 | 0.059 |
| Empowerment | NA | NA | NA | 0.014 | 0.131 |
| Sharing | NA | NA | NA | NA | 0.292 |
| SocialNorms | NA | NA | NA | NA | NA |

## Summary of REDCap Survey Analysis

Inclusion criteria

* Respondents who consented
* Eligible, ineligible, or missing eligibility indicator

**Number included: n = 1329**

**Model**

* Use logistic regression model
* Factors: ad image, ad text
* Include full factorial interaction

Define the linear predictor as , where

The model for survey and screener participation is

### Survey participation

## indSurveyParticipation ~ image + text + image \* text

Predicted values.

|  |  |  |  |  |
| --- | --- | --- | --- | --- |
| image | text | pred | predLower | predUpper |
| Veteran | Sharing | 0.59 | 0.53 | 0.66 |
| Family | Sharing | 0.57 | 0.42 | 0.70 |
| Family | Incentive | 0.56 | 0.39 | 0.71 |
| Veteran | Incentive | 0.55 | 0.49 | 0.61 |
| Computer | Sharing | 0.54 | 0.43 | 0.65 |
| Computer | Incentive | 0.49 | 0.34 | 0.64 |
| Veteran | Altruism | 0.46 | 0.33 | 0.59 |
| Family | Altruism | 0.45 | 0.25 | 0.66 |
| Family | Empowerment | 0.44 | 0.29 | 0.61 |
| Computer | Altruism | 0.40 | 0.27 | 0.55 |
| Veteran | Empowerment | 0.40 | 0.28 | 0.52 |
| Computer | Empowerment | 0.33 | 0.13 | 0.62 |
| Family | SocialNorms | 0.28 | 0.17 | 0.42 |
| Computer | SocialNorms | 0.25 | 0.17 | 0.35 |
| Veteran | SocialNorms | 0.23 | 0.18 | 0.28 |

P-values comparing main effects.

|  |  |  |  |
| --- | --- | --- | --- |
|  | Computer | Family | Veteran |
| Computer | NA | 0.553 | 0.447 |
| Family | NA | NA | 0.961 |
| Veteran | NA | NA | NA |

|  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- |
|  | Incentive | Altruism | Empowerment | Sharing | SocialNorms |
| Incentive | NA | 0.413 | 0.349 | 0.563 | 0.008 |
| Altruism | NA | NA | 0.674 | 0.125 | 0.077 |
| Empowerment | NA | NA | NA | 0.184 | 0.539 |
| Sharing | NA | NA | NA | NA | 0.000 |
| SocialNorms | NA | NA | NA | NA | NA |

### Screener participation

## indScreenerParticipation ~ image + text + image \* text

Predicted values.

|  |  |  |  |  |
| --- | --- | --- | --- | --- |
| image | text | pred | predLower | predUpper |
| Family | Incentive | 0.72 | 0.56 | 0.84 |
| Computer | Sharing | 0.70 | 0.60 | 0.79 |
| Veteran | Sharing | 0.69 | 0.62 | 0.74 |
| Veteran | Incentive | 0.64 | 0.58 | 0.69 |
| Family | Sharing | 0.63 | 0.48 | 0.76 |
| Computer | Incentive | 0.59 | 0.43 | 0.72 |
| Computer | Empowerment | 0.58 | 0.31 | 0.82 |
| Veteran | Altruism | 0.58 | 0.45 | 0.70 |
| Veteran | Empowerment | 0.57 | 0.45 | 0.69 |
| Family | Empowerment | 0.56 | 0.39 | 0.71 |
| Family | Altruism | 0.55 | 0.34 | 0.75 |
| Computer | Altruism | 0.42 | 0.29 | 0.57 |
| Computer | SocialNorms | 0.33 | 0.24 | 0.43 |
| Family | SocialNorms | 0.32 | 0.20 | 0.46 |
| Veteran | SocialNorms | 0.29 | 0.24 | 0.35 |

P-values comparing main effects.

|  |  |  |  |
| --- | --- | --- | --- |
|  | Computer | Family | Veteran |
| Computer | NA | 0.212 | 0.531 |
| Family | NA | NA | 0.311 |
| Veteran | NA | NA | NA |

|  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- |
|  | Incentive | Altruism | Empowerment | Sharing | SocialNorms |
| Incentive | NA | 0.132 | 0.990 | 0.193 | 0.007 |
| Altruism | NA | NA | 0.324 | 0.002 | 0.293 |
| Empowerment | NA | NA | NA | 0.405 | 0.096 |
| Sharing | NA | NA | NA | NA | 0.000 |
| SocialNorms | NA | NA | NA | NA | NA |

### Suicidality

## indDSISS ~ image + text + image \* text

Predicted values.

|  |  |  |  |  |
| --- | --- | --- | --- | --- |
| image | text | pred | predLower | predUpper |
| Family | Empowerment | 0.47 | 0.26 | 0.70 |
| Computer | Incentive | 0.43 | 0.24 | 0.64 |
| Computer | Sharing | 0.29 | 0.18 | 0.43 |
| Computer | Altruism | 0.28 | 0.12 | 0.52 |
| Veteran | SocialNorms | 0.25 | 0.15 | 0.37 |
| Family | SocialNorms | 0.23 | 0.08 | 0.52 |
| Family | Altruism | 0.22 | 0.06 | 0.58 |
| Veteran | Sharing | 0.21 | 0.15 | 0.29 |
| Computer | Empowerment | 0.20 | 0.03 | 0.69 |
| Family | Incentive | 0.20 | 0.08 | 0.43 |
| Veteran | Altruism | 0.19 | 0.08 | 0.39 |
| Computer | SocialNorms | 0.19 | 0.07 | 0.41 |
| Veteran | Incentive | 0.17 | 0.12 | 0.23 |
| Family | Sharing | 0.15 | 0.06 | 0.35 |
| Veteran | Empowerment | 0.15 | 0.06 | 0.33 |

P-values comparing main effects.

|  |  |  |  |
| --- | --- | --- | --- |
|  | Computer | Family | Veteran |
| Computer | NA | 0.123 | 0.007 |
| Family | NA | NA | 0.717 |
| Veteran | NA | NA | NA |

|  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- |
|  | Incentive | Altruism | Empowerment | Sharing | SocialNorms |
| Incentive | NA | 0.331 | 0.361 | 0.247 | 0.102 |
| Altruism | NA | NA | 0.727 | 0.949 | 0.521 |
| Empowerment | NA | NA | NA | 0.686 | 0.961 |
| Sharing | NA | NA | NA | NA | 0.407 |
| SocialNorms | NA | NA | NA | NA | NA |

### VA enrollment

## indVANeverEnrolled ~ image + text + image \* text

Predicted values.

|  |  |  |  |  |
| --- | --- | --- | --- | --- |
| image | text | pred | predLower | predUpper |
| Computer | Incentive | 0.45 | 0.26 | 0.66 |
| Family | SocialNorms | 0.38 | 0.17 | 0.66 |
| Family | Sharing | 0.38 | 0.22 | 0.58 |
| Veteran | Incentive | 0.37 | 0.30 | 0.44 |
| Family | Altruism | 0.33 | 0.11 | 0.67 |
| Veteran | SocialNorms | 0.33 | 0.22 | 0.45 |
| Veteran | Sharing | 0.31 | 0.24 | 0.40 |
| Family | Incentive | 0.30 | 0.14 | 0.53 |
| Veteran | Empowerment | 0.29 | 0.15 | 0.48 |
| Computer | Sharing | 0.29 | 0.18 | 0.43 |
| Computer | Altruism | 0.28 | 0.12 | 0.52 |
| Veteran | Altruism | 0.23 | 0.11 | 0.43 |
| Family | Empowerment | 0.22 | 0.09 | 0.46 |
| Computer | Empowerment | 0.20 | 0.03 | 0.69 |
| Computer | SocialNorms | 0.17 | 0.07 | 0.38 |

P-values comparing main effects.

|  |  |  |  |
| --- | --- | --- | --- |
|  | Computer | Family | Veteran |
| Computer | NA | 0.306 | 0.426 |
| Family | NA | NA | 0.557 |
| Veteran | NA | NA | NA |

|  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- |
|  | Incentive | Altruism | Empowerment | Sharing | SocialNorms |
| Incentive | NA | 0.254 | 0.315 | 0.168 | 0.048 |
| Altruism | NA | NA | 0.727 | 0.949 | 0.429 |
| Empowerment | NA | NA | NA | 0.686 | 0.890 |
| Sharing | NA | NA | NA | NA | 0.312 |
| SocialNorms | NA | NA | NA | NA | NA |

### Use of VA health services

## indVANotUse12mo ~ image + text + image \* text

Predicted values.

|  |  |  |  |  |
| --- | --- | --- | --- | --- |
| image | text | pred | predLower | predUpper |
| Family | Altruism | 0.78 | 0.42 | 0.94 |
| Veteran | Incentive | 0.64 | 0.57 | 0.71 |
| Computer | Incentive | 0.59 | 0.38 | 0.77 |
| Veteran | SocialNorms | 0.57 | 0.45 | 0.69 |
| Computer | Sharing | 0.57 | 0.43 | 0.70 |
| Veteran | Sharing | 0.54 | 0.46 | 0.62 |
| Veteran | Empowerment | 0.50 | 0.32 | 0.68 |
| Computer | Altruism | 0.50 | 0.28 | 0.72 |
| Family | SocialNorms | 0.46 | 0.22 | 0.72 |
| Veteran | Altruism | 0.46 | 0.28 | 0.65 |
| Family | Incentive | 0.45 | 0.25 | 0.66 |
| Computer | SocialNorms | 0.39 | 0.22 | 0.60 |
| Family | Empowerment | 0.39 | 0.20 | 0.62 |
| Family | Sharing | 0.38 | 0.22 | 0.58 |
| Computer | Empowerment | 0.20 | 0.03 | 0.69 |

P-values comparing main effects.

|  |  |  |  |
| --- | --- | --- | --- |
|  | Computer | Family | Veteran |
| Computer | NA | 0.363 | 0.634 |
| Family | NA | NA | 0.099 |
| Veteran | NA | NA | NA |

|  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- |
|  | Incentive | Altruism | Empowerment | Sharing | SocialNorms |
| Incentive | NA | 0.566 | 0.144 | 0.878 | 0.184 |
| Altruism | NA | NA | 0.253 | 0.603 | 0.487 |
| Empowerment | NA | NA | NA | 0.147 | 0.430 |
| Sharing | NA | NA | NA | NA | 0.157 |
| SocialNorms | NA | NA | NA | NA | NA |