Online Interaction, Social Support, and Health

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Glossary
Profile The user's personal page. Contains basic information and social activities. **Wall** A message board on the user's profile that is visible to friends. **Facebook friend** A connected person who can contact the user and see the user's profile and updates.
Friend request A request to become Facebook friends. **Wall post** A message written to a friend's wall that can be seen by other friends. **Message** A message sent to a friend or friends that can be seen only by the sender and recipient(s). **Photo** An uploaded photo, usually visible to all friends. **Photo tag** An added label associating a person with an uploaded photo. **Status** A broadcasted post on the user's own profile, usually visible to all friends. May contain a photo.
News feed A stream of updates of friends' activities.

Table 1

A. About Facebook

Facebook (*www.facebook.com*) is an online social networking website founded in 2004 and is used by about 71% of Americans [1]. The website offers a number of online tools to keep in touch with friends, including 'messages' (private directed communications seen only by the sender and recipient(s)), 'wall posts' (quasi-public directed communications posted to the recipient's Facebook 'wall' and visible to the recipient's friends), and 'status updates' (quasi-public undirected communications that are visible to the sender's friends who see them in a continuous stream of all their friends' updates called a 'news feed'). The website also offers tools to post photos in which one can 'tag' (label) friends (usually because they appear in the photos).

Each user maintains a 'profile' on the site. These profiles contain basic information such as name, education, friends, status updates, and location, as well as 'liked' 'pages' (usually interests, such as music and news sites). These profiles are further associated on the website with a 'timeline' history of all online activity and social interactions that have occurred since the user joined the site.

B. Data linking and controls

Once we identified the eligible population, we compared user information (first name or nickname, last name, and date of birth) to California Department of Public Health vital records for 2012 and 2013 to ascertain mortality status and cause of mortality. We then linked users who were living in January 2012 to their aggregated Facebook usage for the six-month period January 2011 through June 2011, as well as basic demographic information: year of birth, gender, date signed up on Facebook, highest education listed on profile, marital status listed on profile, and type of device used to access Facebook, along with the same information for all Facebook friends of the subjects. We excluded the six months prior to the impanel date (July to December 2011) so that the observation period was less likely to include acute periods of illness and disability. To be clear: we are testing associations between 1) social media usage over a six month period and 2) mortality over a subsequent 24 month period, with a 6 month gap between these two measurement periods.

Prior analyses of social media usage have typically restricted their focus to relatively active users (e.g. active on a specific day [2]) and/or self-reports of activity [3, 4]. The reason for this is that Facebook and other social media websites do not routinely verify that users have only one profile or are using their real names, except when necessary for operational reasons (e.g. spam or advertising audience estimates). However, low frequency use is an important variable of interest in the present analysis, so we do not select users based on minimal activity criteria.

Instead, we require only that individuals 1) had at least one Facebook friend as of January 2011 so that use of the website is at least minimally social; and 2) listed a first name (or, based on a publicly available database, associated nickname) and last name present in the California voter record (e.g. we included users named 'Jenny' if anyone in the California voter record was named 'Jenny' or 'Jennifer'). To further confirm that users listed real names, we segmented our analyses based on whether individuals listed a first name (or nickname), last name, and date of birth on Facebook that was also present in the California voter record, and we omitted users who listed a January 1st birthday because this is the default value when signing up for the site. 12,689,047 profiles fit these criteria (the 'full' population), of whom 4,011,852 were present in the California voter record (the 'voter' subpopulation). This match rate of 32% is similar to the match rate reported in previous analyses of California Facebook users [2] and is consistent with the observations that 1) younger people are less likely to be registered to vote, and 2) California has the 2nd lowest voter registration rate in the United States because of its large non-citizen population.

Cause of death categorizations differ from standard categorizations seen in prior works [5] only in that there are fewer old age categories (e.g. no dedicated prostate cancer category) and more young age categories (e.g. distinguishing between drug overdoses and unintentional injuries).

In Figure 4 we compare mortality rates on Facebook vs. in the general population by cause of mortality. Mortality due to sexually transmitted diseases, several types of cancer, unintentional injuries, drug overdoses, and suicides did not significantly differ between Facebook users and nonusers in the voter record. However, mortality due to infections (relative risk 0.72, 95% CI 0.63 to 0.82), diabetes (0.62, CI 0.56 to 0.70), mental illness or dementia (0.75, CI 0.67 to 0.83), ischemic heart disease (0.81, CI 0.76 to 0.86), stroke (0.71, CI 0.63 to 0.80), other cardiovascular diseases (0.88, CI 0.82 to 0.94), liver disease (0.65, CI 0.59 to 0.72), and homicide (0.55, CI 0.46 to 0.67) were all significantly lower for Facebook users than nonusers.

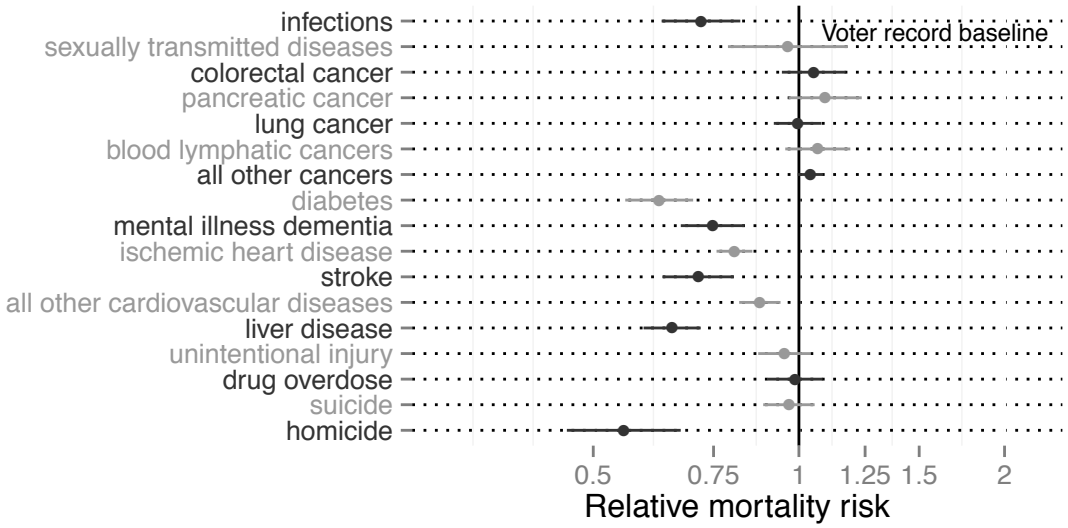

Fig. 4. *Facebook, California voter record mortality rate by cause comparison.* This figure shows relative cause-specific mortality risk among Facebook users whose first name, last name, and date of birth are listed in the California voter record compared to all California registered voters. The y-axis (on bottom) is the relative mortality risk estimated in a Cox proportional hazard model, and the x-axis is the cause of death. The all registered voter comparison group was exactly matched on age and gender so that the comparisons groups are, by-design, perfectly balanced on these covariates.

C. Sampling rates

For the period of study, the Facebook and California voter record populations differed substantially in their age, and to some extent gender, distributions, as many Facebook users were relatively young and many voters were relatively old. For Facebook activity models, we sampled California Facebook users at 10 times the age- and gender-specific California mortality rate (mortality rate interpolation shown in Figure 5).

The average age as of January 2011 was 49.6 (sd 12.4) and 42% listed female gender. Of those who made any social action on the website for January 2011 through June 2011, 22% used smartphone applications on iOS, Android, or Blackberry operating systems (for comparison, others have reported that 35% of Americans owned a smartphone in 2011 [6]). The median number of Facebook friends was 48 (25th percentile 18, 75th percentile 114; mean 108, sd 220) and the median number of individuals with whom a user interacted at least once during the study period was 26 (25th percentile 5, 75th percentile 79; mean 68, sd 137). These numbers are lower than those for all Facebook users, but note that social connections and social media activity are typically lower in older populations.

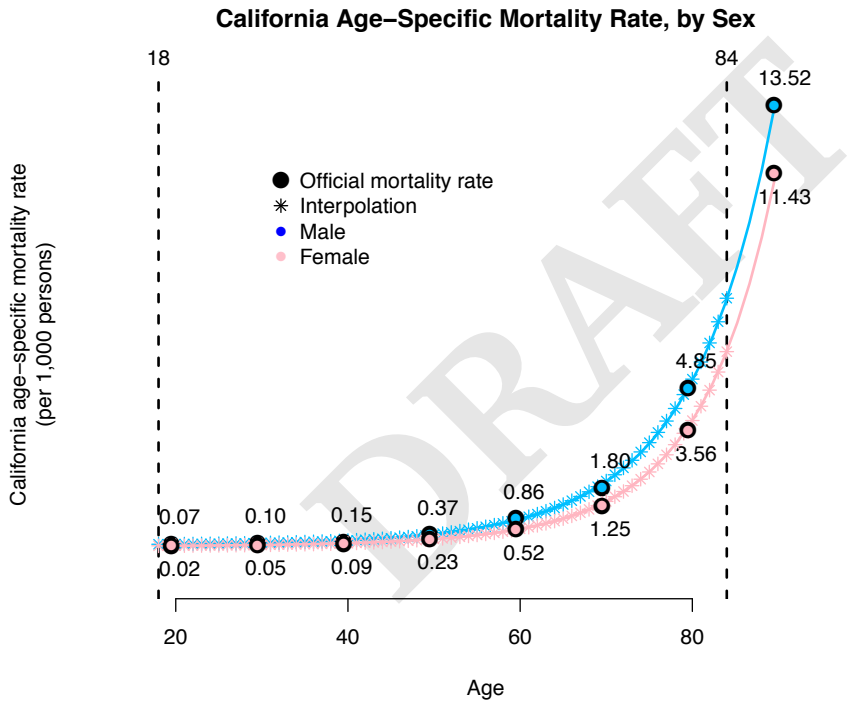

Fig. 5. *Sampling rates by age and gender.* This figure shows the sampling rates (interpolated mortality rates) used to construct an age and gender balanced sample for the Facebook-only analyses. California-based Facebook users were randomly sampled at a rate 10 times the California age and gender-specific mortality rate and included in a de-identified analysis file that included all decedents.

D. Activity categories

All Facebook activities were correlated because people who signed in more often were more likely to interact with each other using a variety of different methods. Correlations between activities ranged from 0.85 for sent versus received messages to 0.33 for posting statuses versus being tagged in photos. The full correlation matrix for major Facebook activities is in Supplementary Figure 6.

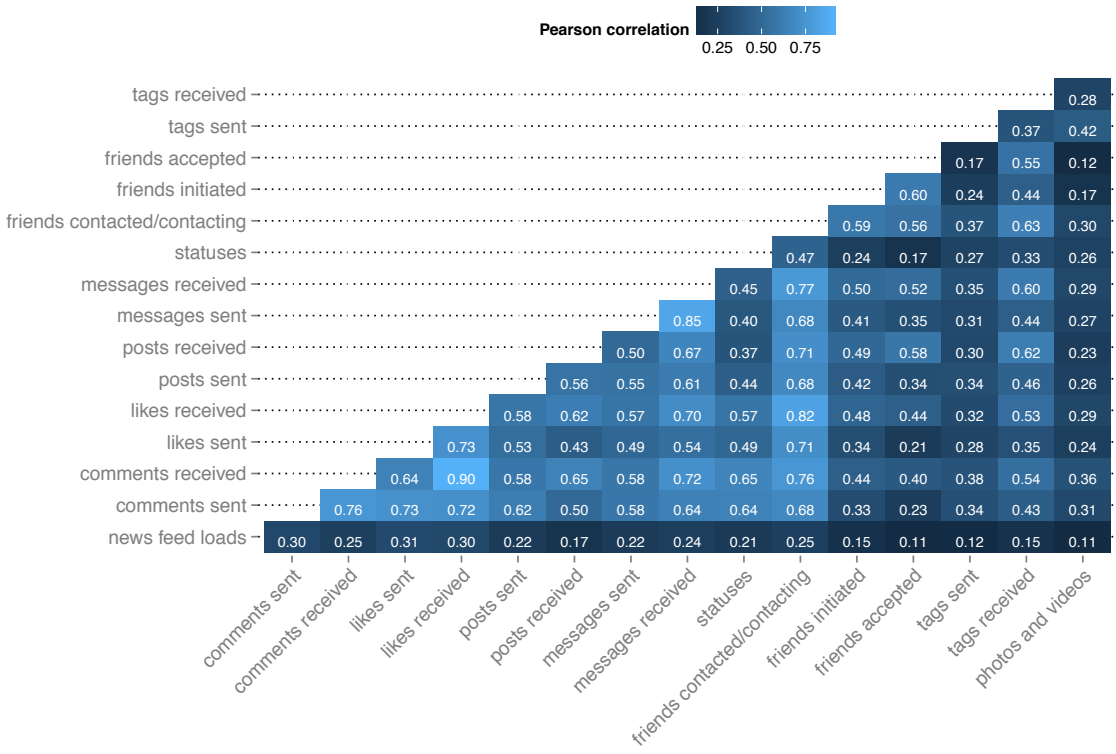

Fig. 6. *Correlations of common Facebook activities.* This figures shows the Pearson correlations of major Facebook activities. These variables are ordered by the 3rd component (online versus offline) in the principal component analysis shown in Figure 7.

In our longitudinal statistical analyses, we distinguished out-going (i.e. sent) from incoming (i.e. received) updates, communications, and requests for 'friendship' status on the website, as well as text-only (i.e. primarily online) and photo-based (i.e. more likely originally offline) social interactions. Because low levels of online social activity might reflect social isolation, while very high levels might replace physical, offline social activity or reflect a social network's provision of social support following news of terminal illness, we also compared low, moderate, and high usage associations.

These activity categories correspond to loadings on major variance dimensions in a principal component analysis [7], where overall activity is the first dimension, sent versus received messages is the second dimension, and text versus photo activity is the third dimension. Loadings (i.e. transformation coefficients) in Figure 7 are the eigenvectors of our sample's Facebook activity covariance matrix and they can be multiplied by the original activity counts to produce a transformation of the data which preserves correlated information in a smaller number of composite, orthogonal variables. The eigenvector corresponding to the leading eigenvalue contains each variable's contribution to the matrix's largest variance component (and the eigenvector correponding to the *n*th largest eigenvalue is each variable's contribution to the *n*th largest variance component). In the principal component analysis here, we $log(x+1)$ and scale each variable by its standard deviation and then center at zero.

The first component (i.e. the largest variance component, accounting for 70% of the proportion of variance explained) in this principal component analysis is overall activity (not shown because it is similar for all activity variables), the second is undirected/outgoing activity versus incoming activity (including network size – this component explains 7% of the variance), and the third is text-based versus photo-based activity (5% of the variance). In other words, it appears that users vary primarily in their level of activity, the extent to which the send or receive interactions, and the extent to which they use photos or text to interact with others on the site.

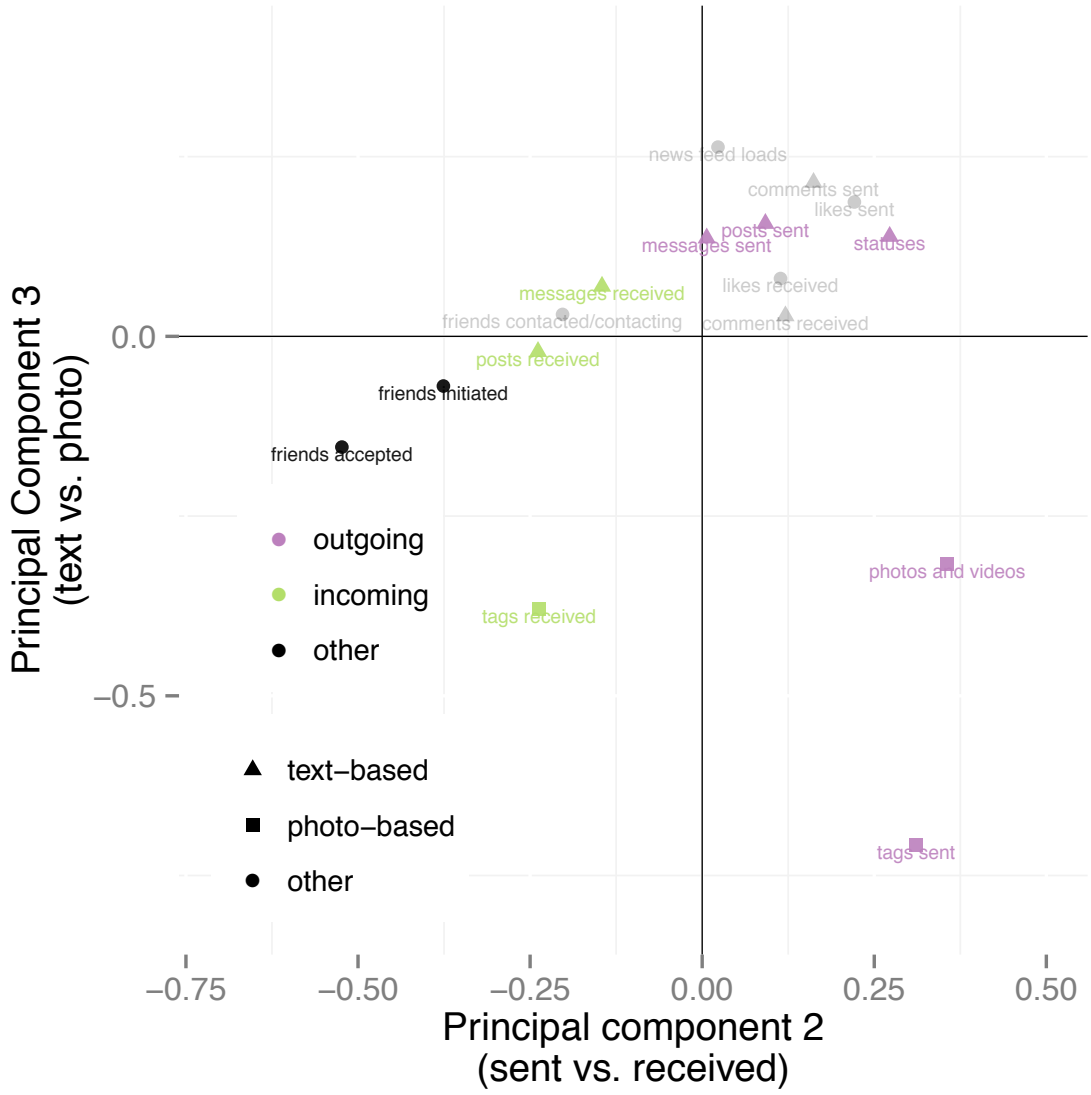

Fig. 7. *Principal component analysis of common Facebook activities.* This figure shows the second and third components of a principal component analysis on major Facebook activities. The first component (not shown) is the overall level of activity, and the activities of interest do not clearly differ on it. The second component corresponds to sent versus received messages, and the third component corresponds to text versus photo activities.

E. Models included in Figure 4

For Facebook population comparisons to the California voter record comparison populations, we matched Facebook and the voter record population by age and gender. We summed the number of individuals in each age-gender combination stratum on Facebook, and weighted the individuals in the California voter record to match the same age and gender distribution using the formula $m_t^s/m_c^s \times m_c/m_t$, where m_t^s is the number of observations in the Facebook strata and m_c^s is the number of observations in the voter record strata (m^s and m^c are the overall numbers of observations in each data set).

For the by-cause estimates in Figure 4, we use the Cox proportional hazard model, with added weights so that the datasets are matched exactly, and plot the estimate for an indicator variable signifying presence on Facebook. Because not all voters list their gender on voter registraton forms (and this is not an option on many forms), we relied on gendered first names in place of reported gender in this analysis (using the same last name gender proportion cutoffs for both Facebook and the voter record), and excluded ambiguous names (where less than 95% of reporting registrants listed a specific gender).

Table 2. Infections risk, voter record.

	Dependent variable:
	Deceased
Has social media account	0.719
	(0.630, 0.821)
Male	1.660
	(1.486, 1.855)
Observations	11,834,575
Note:	95% confidence intervals in parentheses.

Table 3. Sexually transmitted diseases risk, voter record.

	Dependent variable:
	Deceased
Has social media account	0.963
	(0.787, 1.178)
Male	9.074
	(6.826, 12.062)
Observations	11,834,575
Note:	95% confidence intervals in parentheses.

Table 4. Colorectal cancer risk, voter record.

	Dependent variable:
	Deceased
Has social media account	1.051
	(0.944, 1.170)
Male	1.274
	(1.156, 1.404)
Observations	11,834,575
Note:	95% confidence intervals in parentheses.

Table 5. Pancreatic cancer risk, voter record.

	Dependent variable:
	Deceased
Has social media account	1.092
	(0.965, 1.236)
Male	1.475
	(1.317, 1.652)
Observations	11,834,575
Note:	95% confidence intervals in parentheses.

Table 6. Lung cancer risk, voter record.

	Dependent variable:
	Deceased
Has social media account	0.996
	(0.919, 1.079)
Male	1.138
	(1.059, 1.223)
Observations	11,834,575
Note:	95% confidence intervals in parentheses.

Table 7. Blood lymphatic cancers risk, voter record.

	Dependent variable:
	Deceased
Has social media account	1.066
	(0.955, 1.189)
Male	1.552
	(1.403, 1.716)
Observations	11,834,575
Note:	95% confidence intervals in parentheses.

Table 8. All other cancers risk, voter record.

	Dependent variable:
	Deceased
Has social media account	1.040
	(0.996, 1.085)
Male	0.919
	(0.884, 0.956)
Observations	11,834,575
Note:	95% confidence intervals in parentheses.

Table 9. Diabetes risk, voter record.

	Dependent variable:
	Deceased
Has social media account	0.624
	(0.557, 0.700)
Male	1.685
	(1.537, 1.847)
Observations	11,834,575
Note:	95% confidence intervals in parentheses.

Table 10. Mental illness dementia risk, voter record.

	Dependent variable:
	Deceased
Has social media account	0.748
	(0.672, 0.833)
Male	1.437
	(1.313, 1.572)
Observations	11,834,575
Note:	95% confidence intervals in parentheses.

Table 11. Ischemic heart disease risk, voter record.

	Dependent variable:
	Deceased
Has social media account	0.805
	(0.758, 0.855)
Male	3.019
	(2.853, 3.195)
Observations	11,834,575
Note:	95% confidence intervals in parentheses.

Table 12. Stroke risk, voter record.

	Dependent variable:
	Deceased
Has social media account	0.713
	(0.632, 0.803)
Male	1.274
	(1.154, 1.406)
Observations	11,834,575
Note:	95% confidence intervals in parentheses.

Table 13. all other CVDs risk, voter record.

	Dependent variable:
	Deceased
Has social media account	0.877
	(0.818, 0.940)
Male	1.984
	(1.864, 2.112)
Observations	11,834,575
Note:	95% confidence intervals in parentheses.

Table 14. Liver disease risk, voter record.

	Dependent variable:
	Deceased
Has social media account	0.652
	(0.592, 0.718)
Male	1.847
	(1.707, 2.000)
Observations	11,834,575
Note:	95% confidence intervals in parentheses.

Table 15. Unintentional injury risk, voter record.

	Dependent variable:
	Deceased
Has social media account	0.952
	(0.872, 1.040)
Male	3.190
	(2.918, 3.488)
Observations	11,834,575
Note:	95% confidence intervals in parentheses.

Table 16. Drug overdose risk, voter record.

	Dependent variable:
	Deceased
Has social media account	0.987
	(0.900, 1.083)
Male	1.642
	(1.509, 1.787)
Observations	11,834,575
Note:	95% confidence intervals in parentheses.

Table 17. Suicide risk, voter record.

	Dependent variable:
	Deceased
Has social media account	0.967
	(0.887, 1.054)
Male	3.089
	(2.831, 3.371)
Observations	11,834,575
Note:	95% confidence intervals in parentheses.

Table 18. Homicide risk, voter record.

	Dependent variable:
	Deceased
Has social media account	0.554
	(0.457, 0.671)
Male	3.343
	(2.819, 3.965)
Observations	11,834,575
Note:	95% confidence intervals in parentheses.

F. Models included in Figure 1

Controls here included relationship status (baseline category: “not listed”) and application type used to access Facebook (baseline category: “desktop browser” or “no activity”).

Table 19. Friendships initiated

	Dependent variable:
	Deceased
Confirmation date	1.174 (1.150, 1.200)
Single	1.571 (1.487, 1.658)
In a relationship	1.165 (1.073, 1.265)
In an open relationship	1.793 (1.106, 2.908)
Married	0.758 (0.723, 0.794)
Engaged	1.031 (0.838, 1.269)
It’s complicated	1.959 (1.689, 2.271)
Widowed	1.941 (1.607, 2.344)
Separated	1.206 (0.751, 1.935)
Divorced	1.459 (1.046, 2.036)
Mobile browser	1.156 (1.013, 1.320)
Android	1.127 (0.974, 1.304)
iOS	1.034 (0.920, 1.163)
Blackberry	1.157 (0.968, 1.383)
Any smartphone	0.737 (0.695, 0.782)
Friendships initiated 0 [0-2]	1.156 (1.065, 1.255)
Friendships initiated 3 [2-6]	1.050 (0.972, 1.134)
Friendships initiated 7 [6-10]	1.041 (0.962, 1.127)
Friendships initiated 11 [10-14]	1.049 (0.967, 1.139)
Friendships initiated 24 [20-29]	0.995 (0.919, 1.078)
Friendships initiated 35 [29-43]	0.970 (0.895, 1.052)
Friendships initiated 53 [43-67]	1.023 (0.942, 1.110)
Friendships initiated 87 [67-122]	1.049 (0.965, 1.141)
Friendships initiated 195 [122-3414]	1.104 (1.013, 1.204)
Observations	89,597
Note:	95% confidence intervals estimated using robust standard errors.

Table 20. Friendships accepted

	Dependent variable:
	Deceased
Confirmation date	1.118 (1.093, 1.143)
Single	1.659 (1.572, 1.751)
In a relationship	1.242 (1.143, 1.349)
In an open relationship	1.844 (1.142, 2.978)
Married	0.804 (0.768, 0.842)
Engaged	1.095 (0.890, 1.347)
It's complicated	2.044 (1.763, 2.370)
Widowed	2.062 (1.708, 2.489)
Separated	1.269 (0.790, 2.037)
Divorced	1.485 (1.065, 2.071)
Mobile browser	1.169 (1.024, 1.335)
Android	1.101 (0.952, 1.274)
iOS	1.014 (0.902, 1.140)
Blackberry	1.142 (0.956, 1.365)
Any smartphone	0.778 (0.734, 0.825)
Friendships accepted 1 [0-4]	1.383 (1.280, 1.493)
Friendships accepted 6 [4-10]	1.211 (1.123, 1.307)
Friendships accepted 12 [10-16]	1.146 (1.061, 1.237)
Friendships accepted 18 [16-22]	1.091 (1.007, 1.182)
Friendships accepted 35 [31-41]	1.028 (0.948, 1.114)
Friendships accepted 47 [41-56]	0.962 (0.888, 1.043)
Friendships accepted 65 [56-79]	0.904 (0.831, 0.983)
Friendships accepted 98 [79-129]	0.852 (0.781, 0.929)
Friendships accepted 194 [129-4812]	0.915 (0.834, 1.003)
Observations	89,597
Note:	95% confidence intervals estimated using robust standard errors.

G. Models included in Figure 2

In models with two usage variables (heat maps shown in Figure 2), we interacted all deciles and included them as indicator variables. To present similar relative hazard scales (where a hazard of 1 corresponds to an average risk), we used the [0,0] interaction quantile as the reference category in the undirected analysis (no photos, no statuses) and the [1,1] interaction quantile as the reference category in the directed analysis (one sent post or message, one received photo tag).

Table 21. Statuses and photos (two-way decile estimates)

	Dependent variable:
	Deceased
Confirmation date	1.170
	(1.146, 1.195)
Single	1.522
	(1.441, 1.607)
In a relationship	1.153
	(1.062, 1.252)
In an open relationship	1.787
	(1.105, 2.889)
Married	0.745
	(0.712, 0.780)
Engaged	1.022
	(0.831, 1.257)
It's complicated	1.892
	(1.632, 2.194)
Widowed	1.878
	(1.554, 2.269)
Separated	1.198
	(0.746, 1.925)
Divorced	1.451
	(1.041, 2.024)
Mobile browser	1.073
	(0.939, 1.225)
Android	1.085
	(0.938, 1.254)
iOS	1.006
	(0.894, 1.131)
Blackberry	1.091
	(0.912, 1.304)
Any smartphone	0.768
	(0.723, 0.817)
Statuses/photos 0 1	0.803
	(0.735, 0.878)
Statuses/photos 0 11	0.702
	(0.601, 0.820)
Statuses/photos 0 124	0.673
	(0.519, 0.873)
Statuses/photos 0 33	0.599
	(0.478, 0.749)
Statuses/photos 0 4	0.751
	(0.659, 0.856)
Statuses/photos 1 0	1.011
	(0.927, 1.102)
Statuses/photos 1 1	0.983
	(0.855, 1.131)
Statuses/photos 1 11	0.753
	(0.615, 0.920)
Statuses/photos 1 124	0.549
	(0.386, 0.781)
Statuses/photos 1 33	0.672
	(0.519, 0.870)
Statuses/photos 1 4	0.938
	(0.791, 1.114)
Continued	
Statuses/photos 20 0	1.283
	(1.095, 1.504)
Statuses/photos 20 1	1.040
	(0.869, 1.245)
Statuses/photos 20 11	0.946
	(0.834, 1.073)
Statuses/photos 20 124	0.771
	(0.670, 0.886)
Statuses/photos 20 33	0.894
	(0.788, 1.014)
Statuses/photos 20 4	1.083
	(0.925, 1.268)
Statuses/photos 3 0	1.068
	(0.972, 1.173)
Statuses/photos 3 1	1.001
	(0.878, 1.140)
Statuses/photos 3 11	0.835
	(0.719, 0.969)
Statuses/photos 3 124	0.674
	(0.531, 0.856)
Statuses/photos 3 33	0.711
	(0.588, 0.859)
Statuses/photos 3 4	0.927
	(0.802, 1.072)
Statuses/photos 7 0	1.147
	(1.009, 1.304)
Statuses/photos 7 1	1.019
	(0.874, 1.189)
Statuses/photos 7 11	0.973
	(0.852, 1.110)
Statuses/photos 7 124	0.788
	(0.656, 0.946)
Statuses/photos 7 33	0.892
	(0.769, 1.035)
Statuses/photos 7 4	0.972
	(0.834, 1.132)
Statuses/photos 72 0	1.630
	(1.276, 2.081)
Statuses/photos 72 1	1.485
	(1.174, 1.879)
Statuses/photos 72 11	1.195
	(1.045, 1.366)
Statuses/photos 72 124	0.959
	(0.866, 1.061)
Statuses/photos 72 33	1.060
	(0.944, 1.190)
Statuses/photos 72 4	1.154
	(0.938, 1.419)
Observations	89,597
Note:	95% confidence intervals estimated using robust standard errors.

Table 22. Posts/messages sent and photo tags received (two-way decile estimates)

	Dependent variable:
	Deceased
Confirmation date	1.162
	(1.138, 1.186)
Single	1.604
	(1.519, 1.694)
In a relationship	1.209
	(1.113, 1.313)
In an open relationship	1.838
	(1.137, 2.971)
Married	0.783
	(0.748, 0.820)
Engaged	1.078
	(0.876, 1.327)
It's complicated	2.005
	(1.730, 2.325)
Widowed	2.015
	(1.669, 2.433)
Separated	1.204
	(0.749, 1.936)
Divorced	1.497
	(1.075, 2.085)
Mobile browser	1.163
	(1.019, 1.328)
Android	1.127
	(0.973, 1.305)
iOS	1.030
	(0.915, 1.159)
Blackberry	1.146
	(0.959, 1.370)
Any smartphone	0.775
	(0.730, 0.823)
Posts messages out/tags in 0 0	1.147
	(1.012, 1.301)
Posts messages out/tags in 0 1	1.017
	(0.882, 1.173)
Posts messages out/tags in 0 14	0.668
	(0.426, 1.046)
Posts messages out/tags in 0 2	0.941
	(0.808, 1.096)
Posts messages out/tags in 0 4	0.810
	(0.649, 1.010)
Posts messages out/tags in 0 7	0.870
	(0.669, 1.130)
Posts messages out/tags in 10 0	1.095
	(0.935, 1.283)
Posts messages out/tags in 10 1	0.905
	(0.760, 1.078)
Posts messages out/tags in 10 14	0.738
	(0.548, 0.992)
Posts messages out/tags in 10 2	0.843
	(0.711, 0.998)
Posts messages out/tags in 10 4	0.825
	(0.667, 1.019)
Posts messages out/tags in 10 7	0.806
	(0.641, 1.014)
Posts messages out/tags in 150 0	0.965
	(0.663, 1.404)
Posts messages out/tags in 150 1	1.140
	(0.875, 1.484)
Posts messages out/tags in 150 14	0.866
	(0.741, 1.011)
Posts messages out/tags in 150 2	1.038
	(0.855, 1.261)
Posts messages out/tags in 150 4	0.941
	(0.774, 1.145)
Posts messages out/tags in 150 7	0.989
	(0.833, 1.174)
Posts messages out/tags in 18 0	0.992
	(0.837, 1.176)
Posts messages out/tags in 18 1	1.012
	(0.851, 1.203)
Posts messages out/tags in 18 14	0.838
	(0.664, 1.058)
Posts messages out/tags in 18 2	0.896
	(0.759, 1.058)
Posts messages out/tags in 18 4	0.794
	(0.648, 0.972)
Posts messages out/tags in 18 7	0.802
	(0.651, 0.988)
Posts messages out/tags in 2 0	1.065
	(0.920, 1.232)
Posts messages out/tags in 2 14	0.740
	(0.464, 1.180)
Posts messages out/tags in 2 2	0.811
	(0.675, 0.973)
Posts messages out/tags in 2 4	0.917
	(0.711, 1.183)
Posts messages out/tags in 2 7	0.789
	(0.579, 1.074)
Posts messages out/tags in 33 0	0.943
	(0.778, 1.143)
Posts messages out/tags in 33 1	1.020
	(0.848, 1.226)
Posts messages out/tags in 33 14	0.802
	(0.651, 0.989)
Posts messages out/tags in 33 2	1.043
	(0.887, 1.227)
Posts messages out/tags in 33 4	0.825
	(0.682, 0.999)
Posts messages out/tags in 33 7	0.815
	(0.669, 0.992)
Posts messages out/tags in 5 0	1.011
	(0.871, 1.174)
Posts messages out/tags in 5 1	0.950
	(0.807, 1.119)
Posts messages out/tags in 5 14	0.985
	(0.723, 1.343)
Posts messages out/tags in 5 2	0.751
	(0.632, 0.893)
Posts messages out/tags in 5 4	0.783
	(0.626, 0.979)
Posts messages out/tags in 5 7	0.773
	(0.601, 0.993)
Posts messages out/tags in 62 0	1.008
	(0.803, 1.265)
Posts messages out/tags in 62 1	0.853
	(0.687, 1.059)
Posts messages out/tags in 62 14	0.854
	(0.715, 1.021)
Posts messages out/tags in 62 2	1.060
	(0.897, 1.253)
Posts messages out/tags in 62 4	0.864
	(0.717, 1.041)
Posts messages out/tags in 62 7	0.770
	(0.639, 0.928)
Observations	89,597

Note: 95% confidence intervals estimated using robust standard errors.

H. Continuous estimates for relationships in Figure 2

Table 23. Statuses and photos (same model)

	Dependent variable:
	Deceased
Confirmation date	1.170
	(1.146, 1.195)
Single	1.507
	(1.427, 1.591)
In a relationship	1.143
	(1.053, 1.241)
In an open relationship	1.772
	(1.094, 2.870)
Married	0.739
	(0.706, 0.773)
Engaged	1.014
	(0.824, 1.248)
It's complicated	1.882
	(1.623, 2.181)
Widowed	1.851
	(1.532, 2.236)
Separated	1.186
	(0.738, 1.904)
Divorced	1.427
	(1.024, 1.989)
Mobile browser	1.058
	(0.926, 1.208)
Android	1.067
	(0.923, 1.234)
iOS	0.997
	(0.886, 1.121)
Blackberry	1.078
	(0.901, 1.288)
Any smartphone	0.766
	(0.721, 0.814)
Statuses	1.167
	(1.137, 1.197)
Photos	0.836
	(0.814, 0.858)
Observations	89,597
Note:	95% confidence intervals estimated using robust standard errors.

Table 24. Posts/messages sent (non-linear estimate)

	Dependent variable:
	Deceased
Confirmation date	1.167
	(1.143, 1.191)
Single	1.599
	(1.514, 1.688)
In a relationship	1.189
	(1.095, 1.291)
In an open relationship	1.815
	(1.122, 2.936)
Married	0.767
	(0.733, 0.803)
Engaged	1.048
	(0.852, 1.290)
It's complicated	1.986
	(1.713, 2.303)
Widowed	1.988
	(1.647, 2.400)
Separated	1.222
	(0.761, 1.962)
Divorced	1.488
	(1.066, 2.076)
Mobile browser	1.166
	(1.021, 1.331)
Android	1.107
	(0.957, 1.282)
iOS	1.024
	(0.910, 1.152)
Blackberry	1.152
	(0.964, 1.377)
Any smartphone	0.762
	(0.718, 0.809)
Posts/messages sent	0.804
	(0.761, 0.849)
Posts/messages sent^2	1.196
	(1.133, 1.263)
Observations	89,597
Note:	95% confidence intervals estimated using robust standard errors.

Table 25. Photo tags received (non-linear estimate)

	Dependent variable:
	Deceased
Confirmation date	1.160
	(1.136, 1.184)
Single	1.598
	(1.515, 1.685)
In a relationship	1.201
	(1.107, 1.304)
In an open relationship	1.843
	(1.140, 2.979)
Married	0.776
	(0.742, 0.812)
Engaged	1.066
	(0.867, 1.311)
It's complicated	1.992
	(1.718, 2.309)
Widowed	2.001
	(1.658, 2.416)
Separated	1.214
	(0.756, 1.951)
Divorced	1.479
	(1.062, 2.059)
Mobile browser	1.161
	(1.017, 1.325)
Android	1.100
	(0.951, 1.272)
iOS	1.005
	(0.894, 1.130)
Blackberry	1.134
	(0.949, 1.355)
Any smartphone	0.778
	(0.734, 0.825)
Tags received	0.830
	(0.790, 0.872)
Tags received^2	1.100
	(1.046, 1.157)
Observations	89,597
Note:	95% confidence intervals estimated using robust standard errors.

I. Models included in Figure 3

Table 26. Facebook friend count

	Dependent variable:			
	Cancer	CVD	Drug overdose	Suicide
	(1)	(2)	(3)	(4)
Confirmation date	1.045 (1.008, 1.083)	1.220 (1.159, 1.285)	1.249 (1.143, 1.365)	0.981 (0.911, 1.057)
Single	1.205 (1.094, 1.327)	1.884 (1.678, 2.114)	2.418 (1.921, 3.043)	1.790 (1.414, 2.267)
In a relationship	1.003 (0.861, 1.169)	1.187 (0.979, 1.441)	2.242 (1.680, 2.993)	1.262 (0.920, 1.733)
In an open relationship	1.270 (0.471, 3.423)	1.483 (0.472, 4.658)		1.680 (0.241, 11.730)
Married	0.899 (0.838, 0.965)	0.719 (0.648, 0.797)	0.673 (0.522, 0.867)	0.709 (0.569, 0.883)
Engaged	0.741 (0.464, 1.181)	1.239 (0.782, 1.965)	1.381 (0.701, 2.719)	1.181 (0.601, 2.322)
It's complicated	1.689 (1.306, 2.184)	2.061 (1.493, 2.845)	4.181 (2.564, 6.817)	2.175 (1.156, 4.091)
Widowed	1.397 (1.009, 1.934)	3.189 (2.284, 4.454)	4.103 (1.683, 10.005)	2.087 (0.666, 6.543)
Separated	1.193 (0.537, 2.647)	1.040 (0.335, 3.227)	1.501 (0.210, 10.711)	1.321 (0.183, 9.533)
Divorced	0.732 (0.349, 1.536)	0.766 (0.288, 2.036)	2.164 (0.532, 8.803)	4.654 (1.916, 11.306)
Mobile browser	1.035 (0.804, 1.333)	1.249 (0.931, 1.677)	0.680 (0.382, 1.209)	1.094 (0.664, 1.803)
Android	1.290 (1.015, 1.638)	0.843 (0.578, 1.229)	1.071 (0.612, 1.873)	1.139 (0.708, 1.833)
iOS	1.164 (0.972, 1.394)	0.939 (0.716, 1.232)	1.173 (0.726, 1.895)	0.837 (0.533, 1.314)
Blackberry	1.176 (0.881, 1.569)	1.132 (0.763, 1.680)	1.121 (0.511, 2.456)	0.540 (0.221, 1.320)
Any smartphone	0.869 (0.791, 0.954)	0.803 (0.705, 0.915)	0.512 (0.394, 0.665)	0.903 (0.720, 1.132)
Friend count	0.991 (0.955, 1.029)	0.910 (0.866, 0.957)	0.779 (0.701, 0.866)	0.731 (0.663, 0.805)
Observations	89,597	89,597	89,597	89,597
Note:	95% confidence intervals estimated using robust standard errors.			

Table 27. Friendships initiated

	Dependent variable:			
	Cancer	CVD	Drug overdose	Suicide
	(1)	(2)	(3)	(4)
Confirmation date	1.050	1.254	1.313	1.036
	(1.014, 1.088)	(1.193, 1.317)	(1.205, 1.430)	(0.964, 1.114)
Single	1.188	1.795	2.233	1.661
	(1.078, 1.309)	(1.600, 2.015)	(1.774, 2.810)	(1.314, 2.100)
In a relationship	0.988	1.124	2.045	1.155
	(0.848, 1.151)	(0.927, 1.364)	(1.536, 2.723)	(0.846, 1.578)
In an open relationship	1.251	1.431		1.585
	(0.464, 3.374)	(0.456, 4.494)		(0.224, 11.211)
Married	0.887	0.683	0.616	0.648
	(0.826, 0.951)	(0.616, 0.756)	(0.480, 0.792)	(0.523, 0.803)
Engaged	0.730	1.174	1.255	1.079
	(0.457, 1.164)	(0.740, 1.861)	(0.637, 2.472)	(0.550, 2.119)
It's complicated	1.666	1.971	3.940	2.050
	(1.288, 2.155)	(1.428, 2.721)	(2.418, 6.420)	(1.091, 3.850)
Widowed	1.373	3.016	3.769	1.925
	(0.991, 1.901)	(2.159, 4.213)	(1.546, 9.191)	(0.614, 6.038)
Separated	1.173	0.987	1.383	1.222
	(0.528, 2.606)	(0.318, 3.066)	(0.193, 9.887)	(0.169, 8.833)
Divorced	0.723	0.742	2.087	4.546
	(0.345, 1.518)	(0.279, 1.972)	(0.514, 8.480)	(1.872, 11.042)
Mobile browser	1.034	1.239	0.667	1.075
	(0.803, 1.332)	(0.923, 1.663)	(0.375, 1.186)	(0.653, 1.770)
Android	1.300	0.861	1.091	1.158
	(1.023, 1.651)	(0.590, 1.256)	(0.624, 1.907)	(0.719, 1.864)
iOS	1.172	0.956	1.192	0.845
	(0.979, 1.404)	(0.729, 1.255)	(0.737, 1.929)	(0.538, 1.328)
Blackberry	1.182	1.145	1.128	0.542
	(0.886, 1.578)	(0.771, 1.700)	(0.514, 2.472)	(0.222, 1.326)
Any smartphone	0.858	0.769	0.480	0.846
	(0.781, 0.942)	(0.675, 0.877)	(0.370, 0.623)	(0.677, 1.057)
Friendships initiated	1.016	0.990	0.894	0.840
	(0.981, 1.053)	(0.944, 1.039)	(0.805, 0.993)	(0.764, 0.923)
Observations	89,597	89,597	89,597	89,597

Note: 95% confidence intervals estimated using robust standard errors.

Table 28. Friendships accepted

	Dependent variable:			
	Cancer	CVD	Drug overdose	Suicide
	(1)	(2)	(3)	(4)
Confirmation date	1.042	1.188	1.203	0.948
	(1.004, 1.082)	(1.128, 1.252)	(1.100, 1.315)	(0.879, 1.022)
Single	1.207	1.910	2.452	1.790
	(1.096, 1.328)	(1.703, 2.142)	(1.953, 3.079)	(1.415, 2.264)
In a relationship	1.005	1.210	2.302	1.278
	(0.863, 1.170)	(0.997, 1.467)	(1.728, 3.066)	(0.931, 1.754)
In an open relationship	1.270	1.480		1.657
	(0.471, 3.424)	(0.471, 4.651)		(0.243, 11.325)
Married	0.901	0.732	0.688	0.716
	(0.840, 0.966)	(0.661, 0.810)	(0.535, 0.886)	(0.574, 0.892)
Engaged	0.742	1.258	1.409	1.192
	(0.465, 1.183)	(0.794, 1.994)	(0.717, 2.770)	(0.607, 2.341)
It's complicated	1.691	2.078	4.187	2.160
	(1.308, 2.186)	(1.506, 2.868)	(2.564, 6.837)	(1.148, 4.064)
Widowed	1.399	3.229	4.104	2.053
	(1.010, 1.937)	(2.314, 4.507)	(1.685, 9.997)	(0.655, 6.435)
Separated	1.194	1.051	1.525	1.315
	(0.538, 2.650)	(0.339, 3.259)	(0.214, 10.875)	(0.182, 9.485)
Divorced	0.732	0.767	2.157	4.517
	(0.349, 1.537)	(0.289, 2.037)	(0.530, 8.778)	(1.863, 10.951)
Mobile browser	1.036	1.257	0.685	1.101
	(0.804, 1.334)	(0.936, 1.687)	(0.385, 1.217)	(0.668, 1.814)
Android	1.289	0.843	1.082	1.158
	(1.015, 1.637)	(0.578, 1.230)	(0.618, 1.893)	(0.720, 1.864)
iOS	1.164	0.940	1.186	0.853
	(0.972, 1.393)	(0.716, 1.232)	(0.735, 1.914)	(0.544, 1.338)
Blackberry	1.176	1.137	1.130	0.547
	(0.881, 1.569)	(0.766, 1.687)	(0.515, 2.477)	(0.224, 1.337)
Any smartphone	0.870	0.813	0.520	0.906
	(0.793, 0.955)	(0.714, 0.925)	(0.401, 0.675)	(0.722, 1.136)
Friendships accepted	0.986	0.869	0.733	0.696
	(0.951, 1.023)	(0.829, 0.912)	(0.664, 0.808)	(0.634, 0.765)
Observations	89,597	89,597	89,597	89,597

Note: 95% confidence intervals estimated using robust standard errors.

Table 29. Statuses

	Dependent variable:			
	Cancer	CVD	Drug overdose	Suicide
	(1)	(2)	(3)	(4)
Confirmation date	1.054 (1.018, 1.091)	1.263 (1.202, 1.326)	1.336 (1.228, 1.453)	1.069 (0.994, 1.149)
Single	1.159 (1.052, 1.277)	1.722 (1.533, 1.934)	2.145 (1.704, 2.701)	1.449 (1.146, 1.831)
In a relationship	0.968 (0.832, 1.127)	1.083 (0.894, 1.313)	1.954 (1.477, 2.586)	1.017 (0.748, 1.381)
In an open relationship	1.232 (0.457, 3.317)	1.392 (0.444, 4.363)		1.481 (0.209, 10.476)
Married	0.872 (0.814, 0.935)	0.663 (0.600, 0.733)	0.588 (0.460, 0.750)	0.574 (0.465, 0.708)
Engaged	0.717 (0.450, 1.143)	1.133 (0.716, 1.795)	1.189 (0.606, 2.334)	0.950 (0.484, 1.866)
It's complicated	1.627 (1.259, 2.104)	1.895 (1.373, 2.616)	3.824 (2.343, 6.240)	1.796 (0.952, 3.389)
Widowed	1.334 (0.964, 1.847)	2.873 (2.057, 4.014)	3.601 (1.475, 8.792)	1.630 (0.519, 5.116)
Separated	1.154 (0.520, 2.560)	0.953 (0.307, 2.961)	1.311 (0.183, 9.376)	1.067 (0.148, 7.713)
Divorced	0.703 (0.335, 1.475)	0.713 (0.268, 1.895)	2.043 (0.504, 8.292)	4.121 (1.699, 9.993)
Mobile browser	1.020 (0.792, 1.314)	1.217 (0.906, 1.635)	0.675 (0.378, 1.204)	1.035 (0.627, 1.708)
Android	1.292 (1.018, 1.641)	0.865 (0.593, 1.260)	1.129 (0.645, 1.974)	1.216 (0.756, 1.957)
iOS	1.186 (0.990, 1.421)	0.976 (0.744, 1.281)	1.217 (0.752, 1.968)	0.904 (0.576, 1.417)
Blackberry	1.182 (0.885, 1.577)	1.155 (0.778, 1.714)	1.154 (0.527, 2.527)	0.569 (0.233, 1.392)
Any smartphone	0.826 (0.751, 0.909)	0.727 (0.637, 0.830)	0.470 (0.362, 0.611)	0.726 (0.578, 0.913)
Statuses	1.064 (1.028, 1.101)	1.068 (1.018, 1.121)	0.956 (0.875, 1.045)	1.066 (0.972, 1.169)
Observations	89,597	89,597	89,597	89,597

Note: 95% confidence intervals estimated using robust standard errors.

Table 30. Photos

	Dependent variable:			
	Cancer	CVD	Drug overdose	Suicide
	(1)	(2)	(3)	(4)
Confirmation date	1.043	1.246	1.326	1.065
	(1.008, 1.080)	(1.186, 1.308)	(1.219, 1.443)	(0.990, 1.145)
Single	1.218	1.853	2.228	1.522
	(1.108, 1.340)	(1.655, 2.075)	(1.779, 2.792)	(1.210, 1.913)
In a relationship	1.016	1.169	2.055	1.058
	(0.873, 1.183)	(0.964, 1.417)	(1.554, 2.718)	(0.779, 1.436)
In an open relationship	1.286	1.471		1.529
	(0.477, 3.468)	(0.468, 4.626)		(0.216, 10.817)
Married	0.909	0.701	0.612	0.592
	(0.849, 0.973)	(0.635, 0.774)	(0.480, 0.781)	(0.480, 0.730)
Engaged	0.751	1.219	1.249	0.987
	(0.471, 1.196)	(0.769, 1.930)	(0.636, 2.452)	(0.504, 1.932)
It's complicated	1.710	2.033	3.972	1.888
	(1.322, 2.210)	(1.474, 2.805)	(2.444, 6.454)	(1.003, 3.554)
Widowed	1.415	3.137	3.777	1.731
	(1.023, 1.959)	(2.248, 4.377)	(1.549, 9.207)	(0.554, 5.413)
Separated	1.208	1.024	1.400	1.109
	(0.544, 2.682)	(0.330, 3.175)	(0.196, 9.987)	(0.154, 7.989)
Divorced	0.745	0.777	2.140	4.301
	(0.355, 1.564)	(0.293, 2.065)	(0.526, 8.701)	(1.776, 10.420)
Mobile browser	1.023	1.210	0.649	1.058
	(0.794, 1.318)	(0.901, 1.624)	(0.365, 1.153)	(0.642, 1.742)
Android	1.281	0.846	1.080	1.213
	(1.008, 1.626)	(0.580, 1.233)	(0.617, 1.893)	(0.753, 1.955)
iOS	1.145	0.919	1.141	0.878
	(0.955, 1.371)	(0.700, 1.206)	(0.704, 1.850)	(0.560, 1.377)
Blackberry	1.155	1.092	1.082	0.559
	(0.865, 1.542)	(0.735, 1.623)	(0.493, 2.377)	(0.229, 1.367)
Any smartphone	0.902	0.848	0.541	0.789
	(0.820, 0.993)	(0.740, 0.971)	(0.414, 0.707)	(0.626, 0.993)
Photos	0.954	0.893	0.821	0.968
	(0.921, 0.987)	(0.849, 0.938)	(0.748, 0.901)	(0.885, 1.059)
Observations	89,597	89,597	89,597	89,597

Note: 95% confidence intervals estimated using robust standard errors.

Table 31. Posts/messages sent

	Dependent variable:			
	Cancer	CVD	Drug overdose	Suicide
	(1)	(2)	(3)	(4)
Confirmation date	1.044	1.251	1.324	1.054
	(1.008, 1.081)	(1.191, 1.314)	(1.215, 1.441)	(0.979, 1.134)
Single	1.214	1.816	2.204	1.596
	(1.103, 1.338)	(1.617, 2.039)	(1.755, 2.769)	(1.264, 2.016)
In a relationship	1.010	1.136	2.004	1.095
	(0.867, 1.176)	(0.936, 1.378)	(1.514, 2.652)	(0.806, 1.488)
In an open relationship	1.276	1.441		1.569
	(0.473, 3.442)	(0.459, 4.526)		(0.222, 11.082)
Married	0.904	0.687	0.599	0.607
	(0.843, 0.968)	(0.621, 0.759)	(0.470, 0.763)	(0.493, 0.748)
Engaged	0.745	1.183	1.217	1.019
	(0.467, 1.187)	(0.747, 1.873)	(0.620, 2.389)	(0.520, 1.996)
It's complicated	1.700	1.988	3.881	1.959
	(1.314, 2.199)	(1.440, 2.744)	(2.388, 6.306)	(1.041, 3.686)
Widowed	1.408	3.049	3.704	1.824
	(1.017, 1.949)	(2.183, 4.257)	(1.517, 9.046)	(0.583, 5.709)
Separated	1.200	0.997	1.338	1.153
	(0.541, 2.664)	(0.321, 3.092)	(0.187, 9.573)	(0.160, 8.316)
Divorced	0.739	0.752	2.094	4.456
	(0.352, 1.552)	(0.283, 1.999)	(0.515, 8.506)	(1.837, 10.812)
Mobile browser	1.036	1.243	0.676	1.086
	(0.805, 1.334)	(0.926, 1.668)	(0.380, 1.204)	(0.660, 1.789)
Android	1.274	0.847	1.060	1.139
	(1.002, 1.620)	(0.581, 1.235)	(0.604, 1.861)	(0.704, 1.843)
iOS	1.152	0.944	1.171	0.840
	(0.961, 1.381)	(0.719, 1.239)	(0.721, 1.900)	(0.535, 1.319)
Blackberry	1.169	1.137	1.132	0.549
	(0.876, 1.561)	(0.766, 1.688)	(0.516, 2.482)	(0.224, 1.343)
Any smartphone	0.879	0.782	0.484	0.828
	(0.799, 0.967)	(0.685, 0.892)	(0.372, 0.630)	(0.659, 1.042)
Posts/messages sent	0.979	0.971	0.910	0.898
	(0.946, 1.013)	(0.926, 1.019)	(0.828, 0.999)	(0.815, 0.990)
Observations	89,597	89,597	89,597	89,597

Note: 95% confidence intervals estimated using robust standard errors.

Table 32. Posts/messages received

	Dependent variable:			
	Cancer	CVD	Drug overdose	Suicide
	(1)	(2)	(3)	(4)
Confirmation date	1.060	1.252	1.316	1.040
	(1.024, 1.098)	(1.192, 1.316)	(1.209, 1.433)	(0.967, 1.118)
Single	1.149	1.802	2.252	1.686
	(1.043, 1.265)	(1.604, 2.024)	(1.792, 2.830)	(1.333, 2.132)
In a relationship	0.954	1.128	2.063	1.167
	(0.819, 1.111)	(0.929, 1.370)	(1.554, 2.739)	(0.855, 1.592)
In an open relationship	1.224	1.433		1.596
	(0.455, 3.295)	(0.456, 4.499)		(0.228, 11.195)
Married	0.863	0.684	0.613	0.638
	(0.806, 0.925)	(0.618, 0.756)	(0.481, 0.783)	(0.516, 0.788)
Engaged	0.705	1.177	1.259	1.091
	(0.442, 1.124)	(0.743, 1.866)	(0.641, 2.475)	(0.556, 2.142)
It's complicated	1.614	1.977	3.990	2.077
	(1.248, 2.087)	(1.432, 2.729)	(2.454, 6.488)	(1.102, 3.914)
Widowed	1.325	3.024	3.796	1.940
	(0.957, 1.834)	(2.165, 4.225)	(1.554, 9.273)	(0.620, 6.071)
Separated	1.132	0.991	1.390	1.247
	(0.511, 2.509)	(0.319, 3.077)	(0.194, 9.946)	(0.173, 8.999)
Divorced	0.696	0.746	2.130	4.671
	(0.332, 1.461)	(0.281, 1.982)	(0.524, 8.665)	(1.928, 11.316)
Mobile browser	1.028	1.240	0.676	1.095
	(0.799, 1.324)	(0.924, 1.665)	(0.380, 1.201)	(0.665, 1.803)
Android	1.326	0.859	1.085	1.147
	(1.044, 1.684)	(0.589, 1.253)	(0.620, 1.900)	(0.712, 1.848)
iOS	1.195	0.954	1.183	0.836
	(0.998, 1.431)	(0.727, 1.252)	(0.731, 1.913)	(0.533, 1.311)
Blackberry	1.201	1.143	1.127	0.539
	(0.900, 1.603)	(0.771, 1.696)	(0.514, 2.471)	(0.220, 1.321)
Any smartphone	0.825	0.773	0.493	0.880
	(0.751, 0.907)	(0.678, 0.881)	(0.380, 0.639)	(0.701, 1.105)
Posts/messages received	1.078	0.985	0.877	0.815
	(1.041, 1.116)	(0.939, 1.032)	(0.798, 0.964)	(0.741, 0.897)
Observations	89,597	89,597	89,597	89,597

Note: 95% confidence intervals estimated using robust standard errors.

Table 33. Photo tags received

	Dependent variable:			
	Cancer	CVD	Drug overdose	Suicide
	(1)	(2)	(3)	(4)
Confirmation date	1.048	1.244	1.286	1.026
	(1.013, 1.086)	(1.184, 1.306)	(1.181, 1.399)	(0.955, 1.103)
Single	1.196	1.833	2.310	1.655
	(1.087, 1.315)	(1.637, 2.052)	(1.844, 2.894)	(1.317, 2.080)
In a relationship	0.994	1.163	2.239	1.215
	(0.854, 1.157)	(0.960, 1.410)	(1.687, 2.971)	(0.895, 1.649)
In an open relationship	1.259	1.472		1.637
	(0.467, 3.391)	(0.469, 4.626)		(0.235, 11.384)
Married	0.892	0.703	0.656	0.661
	(0.833, 0.955)	(0.636, 0.776)	(0.513, 0.840)	(0.536, 0.816)
Engaged	0.734	1.220	1.398	1.161
	(0.460, 1.170)	(0.770, 1.933)	(0.714, 2.740)	(0.591, 2.278)
It's complicated	1.676	2.018	4.112	2.073
	(1.297, 2.167)	(1.463, 2.784)	(2.523, 6.702)	(1.103, 3.898)
Widowed	1.383	3.110	3.982	1.934
	(0.999, 1.915)	(2.230, 4.339)	(1.634, 9.705)	(0.618, 6.048)
Separated	1.184	1.000	1.362	1.153
	(0.534, 2.626)	(0.322, 3.099)	(0.192, 9.655)	(0.160, 8.314)
Divorced	0.727	0.758	2.171	4.534
	(0.346, 1.526)	(0.286, 2.012)	(0.535, 8.817)	(1.877, 10.949)
Mobile browser	1.034	1.247	0.699	1.111
	(0.803, 1.332)	(0.929, 1.674)	(0.393, 1.242)	(0.675, 1.829)
Android	1.295	0.849	1.053	1.141
	(1.020, 1.645)	(0.582, 1.237)	(0.603, 1.841)	(0.709, 1.837)
iOS	1.169	0.938	1.106	0.806
	(0.976, 1.400)	(0.715, 1.231)	(0.686, 1.784)	(0.515, 1.264)
Blackberry	1.179	1.130	1.108	0.533
	(0.884, 1.574)	(0.762, 1.677)	(0.505, 2.428)	(0.218, 1.301)
Any smartphone	0.861	0.807	0.568	0.959
	(0.784, 0.945)	(0.709, 0.918)	(0.438, 0.736)	(0.767, 1.200)
Photo tags received	1.009	0.910	0.700	0.695
	(0.976, 1.044)	(0.868, 0.954)	(0.636, 0.770)	(0.632, 0.765)
Observations	89,597	89,597	89,597	89,597

Note: 95% confidence intervals estimated using robust standard errors.

J. Extended cause-specific estimates for models included in Figure 3

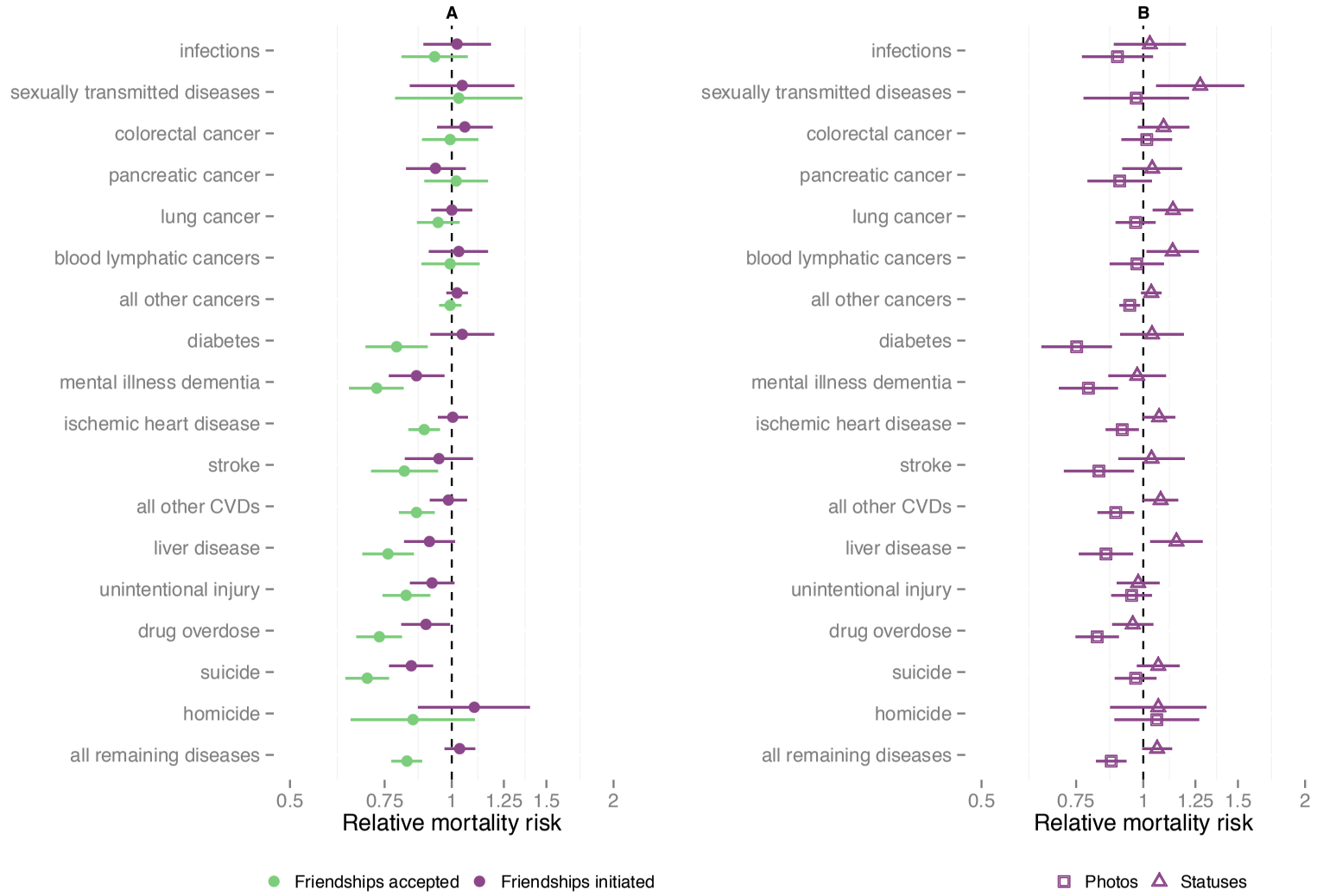

Fig. 8. *Facebook activities, by directionality and activity type (seventeen cause of death categories).*

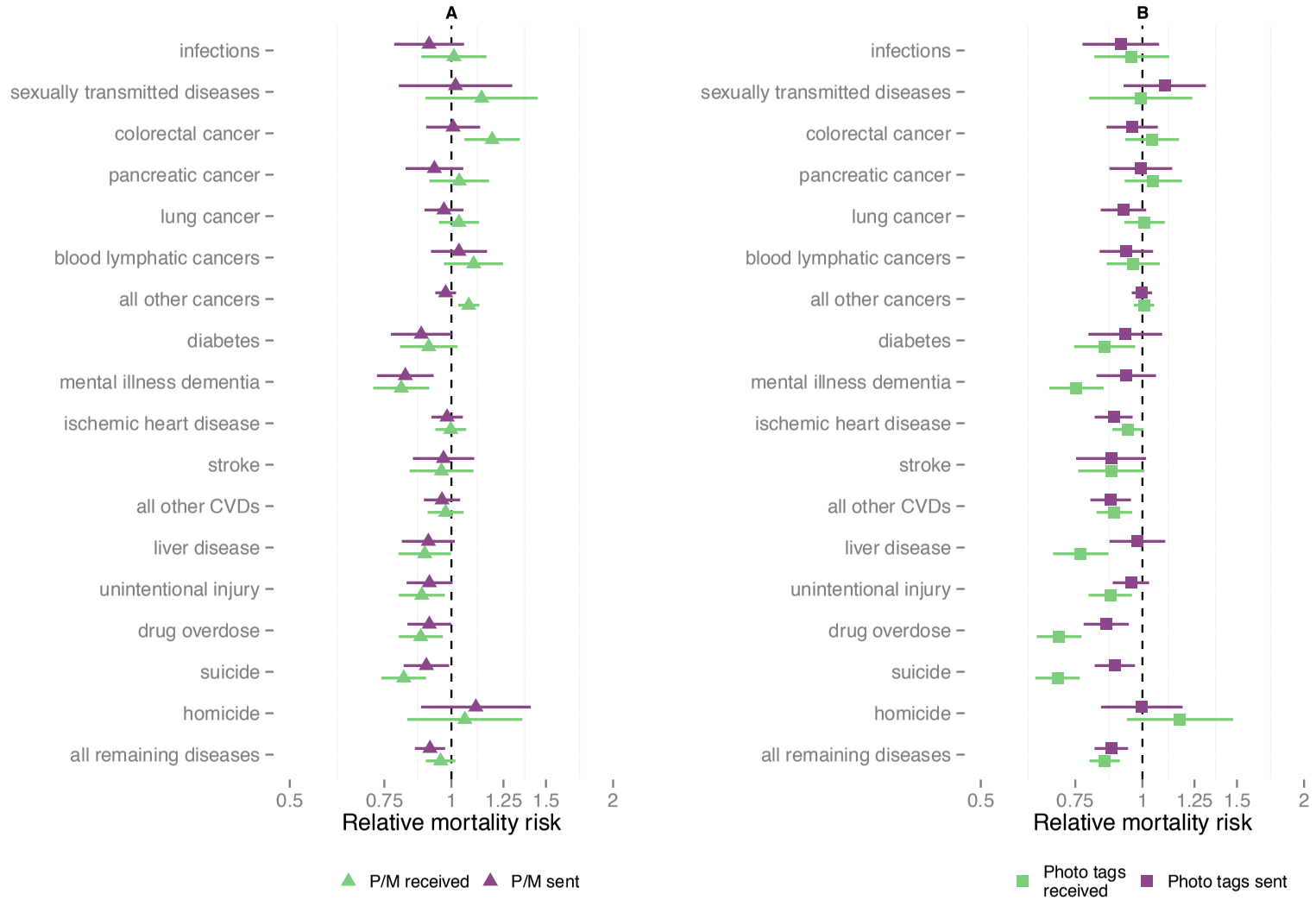

Fig. 9. *Facebook activities, by directionality and activity type (seventeen cause of death categories).*

K. Results for full (non-voter included) population

For these full sample replication models, we added control variables for the proportion of Facebook friends who, during the observation period, took any action on the site through a common, recognizable computer application (desktop browser, mobile browser, iOS app, Android app, Blackberry app), listed education (three variables for proportions of friends listing high school, college, and graduate school education), and an indicator variable for whether the individual was present in the California voter record.

Some profiles in the sample appeared to have many Facebook friends who were completely inactive. This friend inactivity is consistent with clusters of fake profiles. Only 10% of profiles in this Facebook sample had fewer than 90% of their friends take an action on the website over the six-month period. To more clearly compare these results to those in the main paper, we also display the 'voter' subsample with these additional controls.

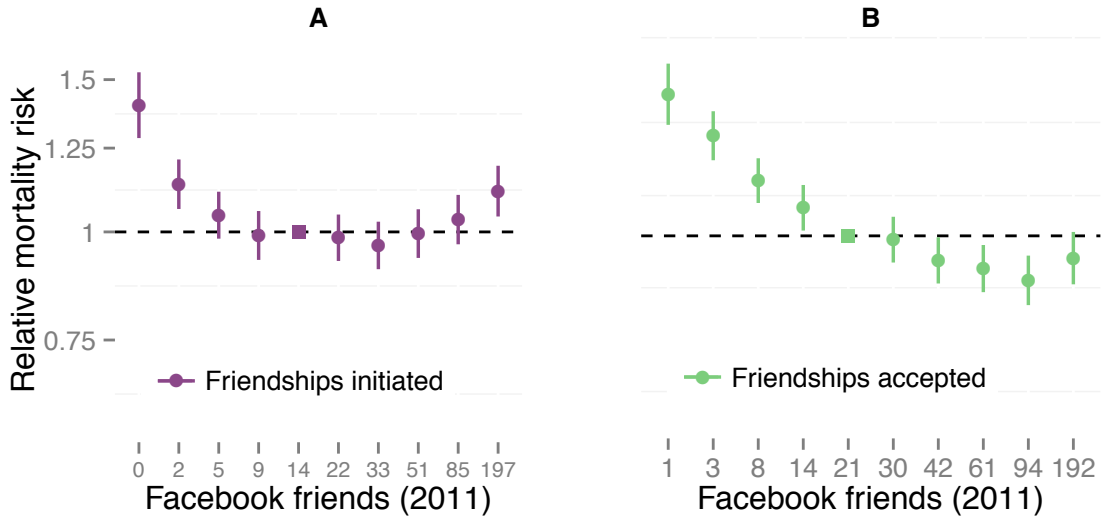

Fig. 10. *Facebook friends and relative mortality risk (all-cause mortality).* This figure shows all-cause mortality regressed on deciles of Facebook friend counts, by initiated and received Facebook friendships. These results replicate Figure 1 for the full, including non-voting population.

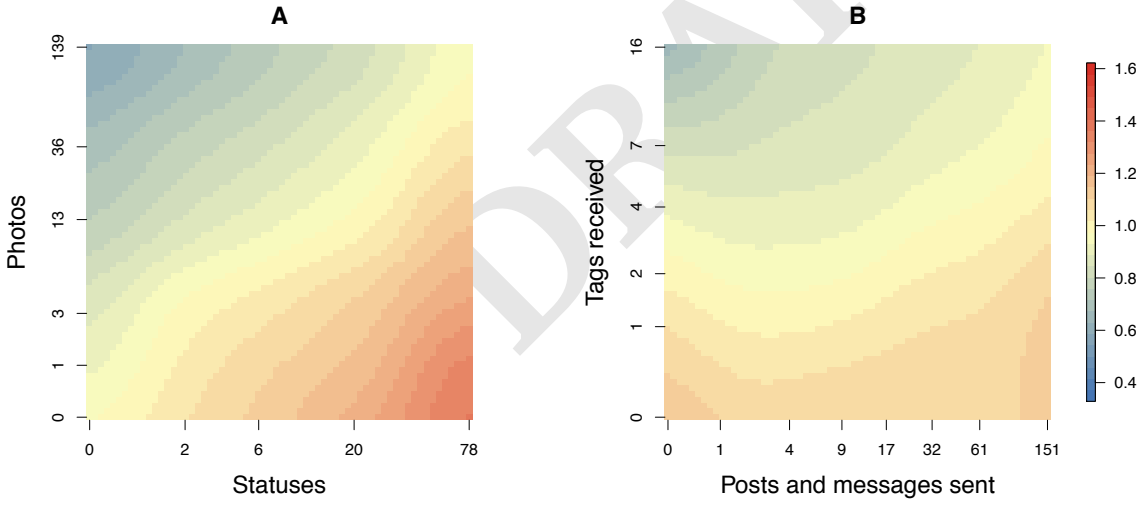

Fig. 11. *Facebook activities, smoothed mortality risk by quantile activity-activity interaction.* This figure shows all-cause mortality risk among Facebook users for combinations of activities. These results replicate Figure 2 for the full, including non-voting population. Controlling for attributes of Facebook friends (especially control variables related to friends' first and last name characteristics and device types) increases the non-linearity of the relationship for posts and messages sent.

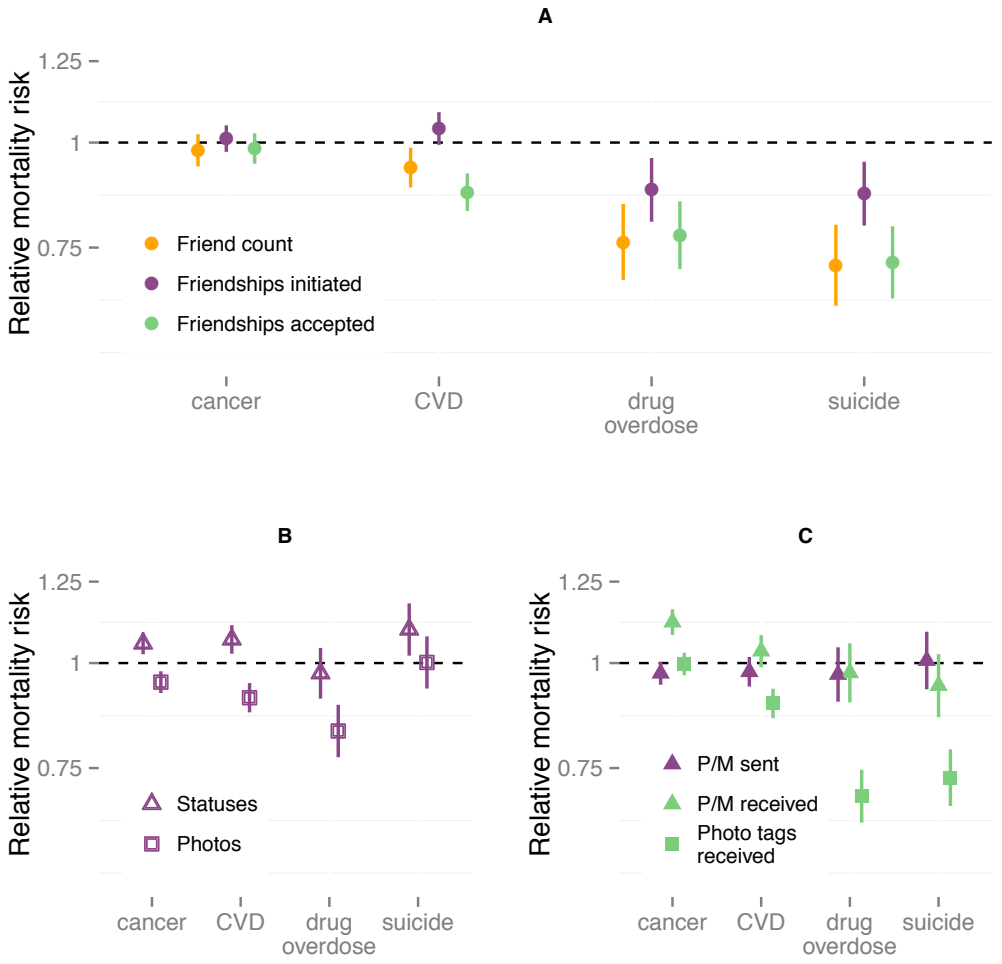

Fig. 12. *Facebook activities, by directionality and activity type.* This figure shows cause-specific morality risk among Facebook users by online activity levels (counts of Facebook tool use), separated by the directionality of the action (from or to the subject) and activity type (the type of Facebook tool used). These results replicate Figure 3 for the full, including non-voting population.

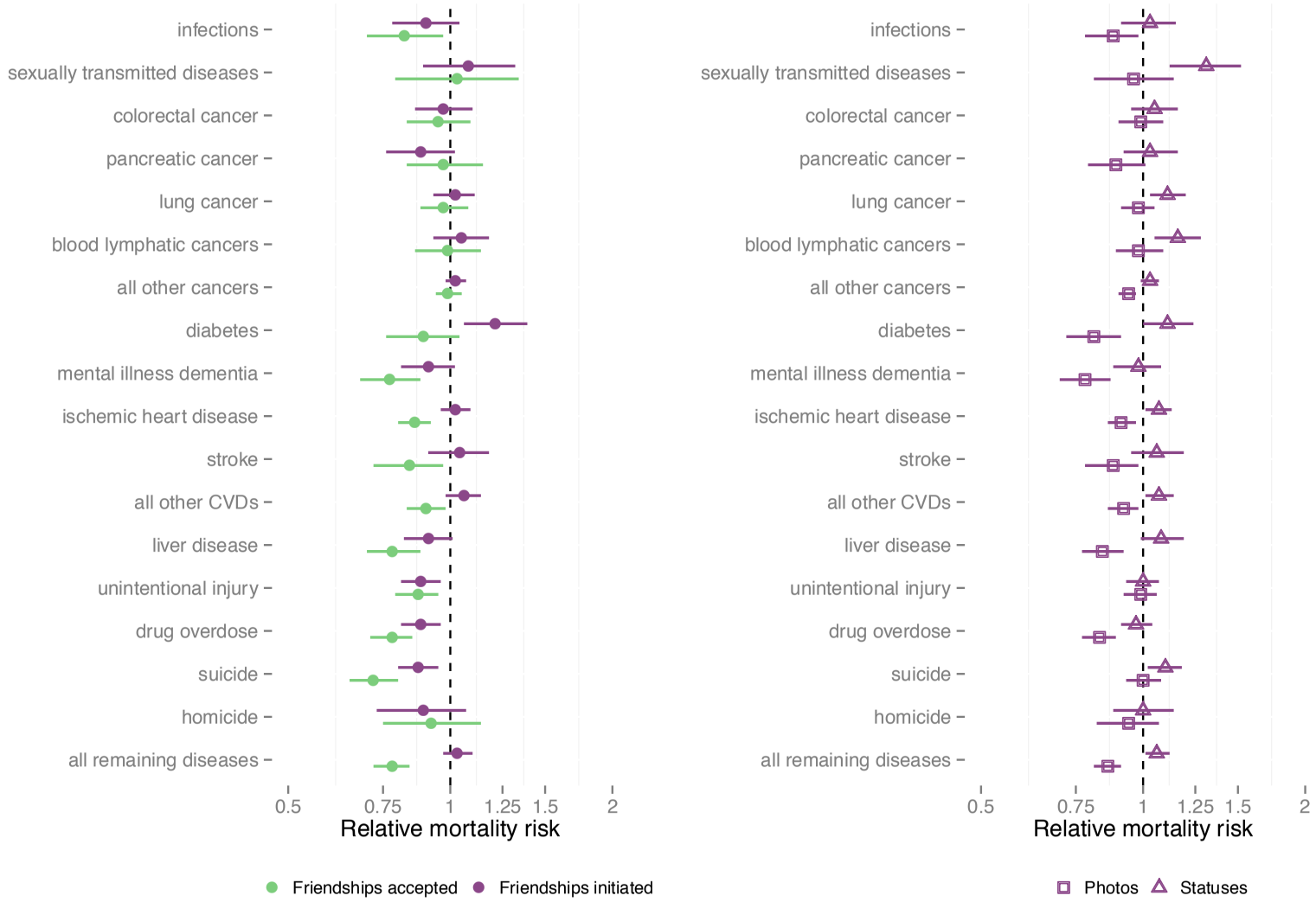

Fig. 13. *Facebook activities, by directionality and activity type (seventeen cause of death categories).* These results replicate Figure 8 for the full, including non-voting population.

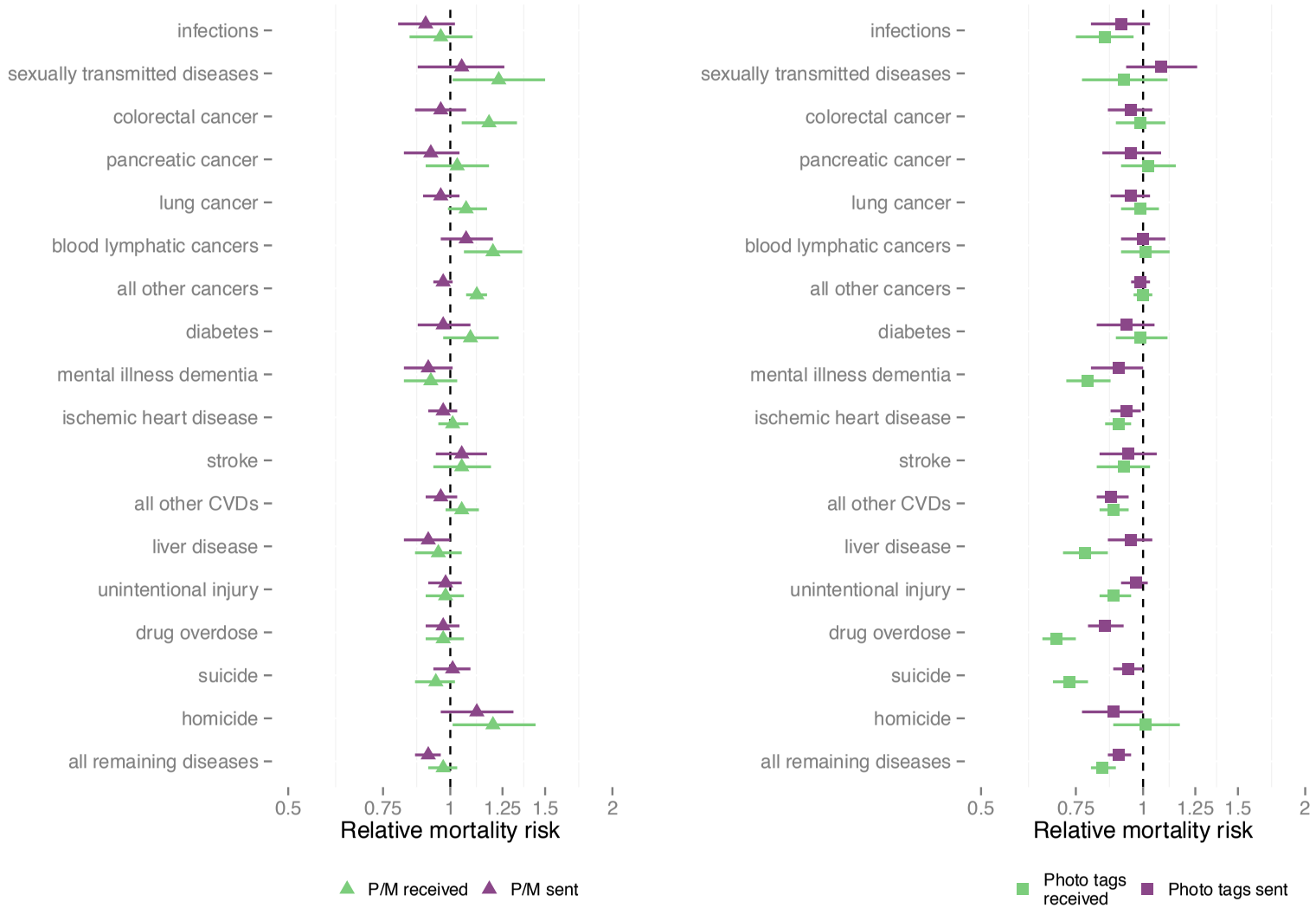

Fig. 14. *Facebook activities, by directionality and activity type (seventeen cause of death categories).* These results replicate Figure 9 for the full, including non-voting population.

L. Results for 'voter' population with controls added for 'full' population analyses

To more clearly compare the 'non-voter' population results to those in the main paper, we display here the 'voter' subsample with the additional non-voter population controls. We note that the friend-based controls were related to having more than just a few Facebook friends, and these correlations may be artifacts of the friend-based control method. We do not include them in the main paper results for this reason.

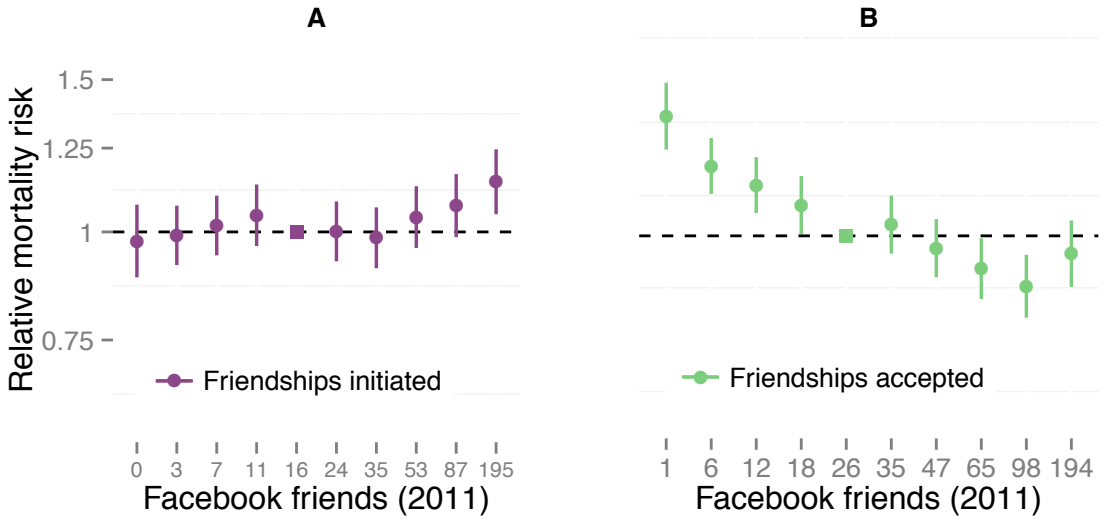

Fig. 15. *Facebook friends and relative mortality risk (all-cause mortality).* This figure shows all-cause mortality regressed on deciles of Facebook friend counts, by initiated and received Facebook friendships. These results replicate Figure 1 on the 'voting' population using the controls added for the full, non-voting population results.

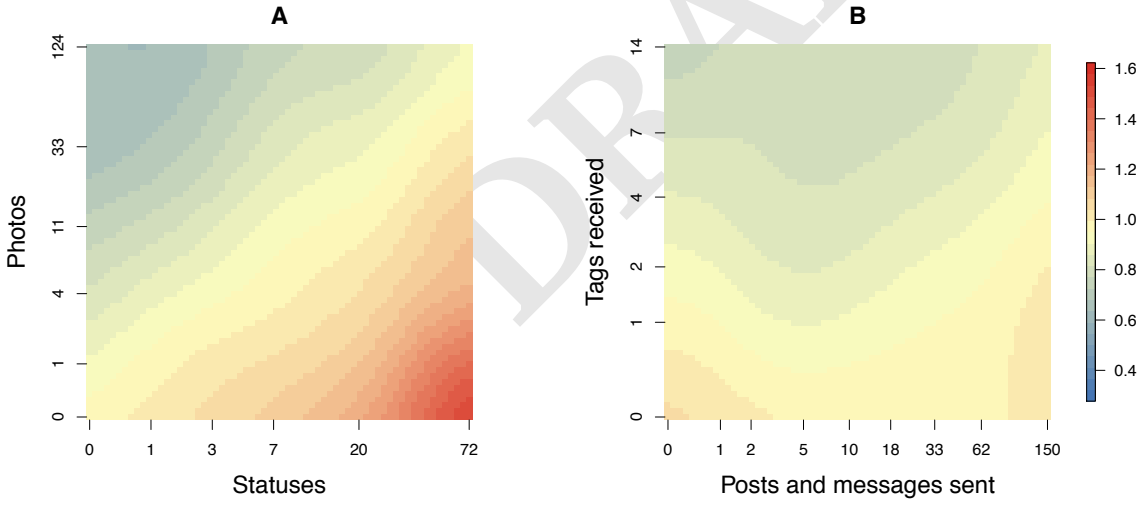

Fig. 16. *Facebook activities, smoothed mortality risk by quantile activity-activity interaction.* This figure shows all-cause mortality risk among Facebook users for combinations of activities. These results replicate Figure 2 on the 'voting' population using the controls added for the full, non-voting population results.

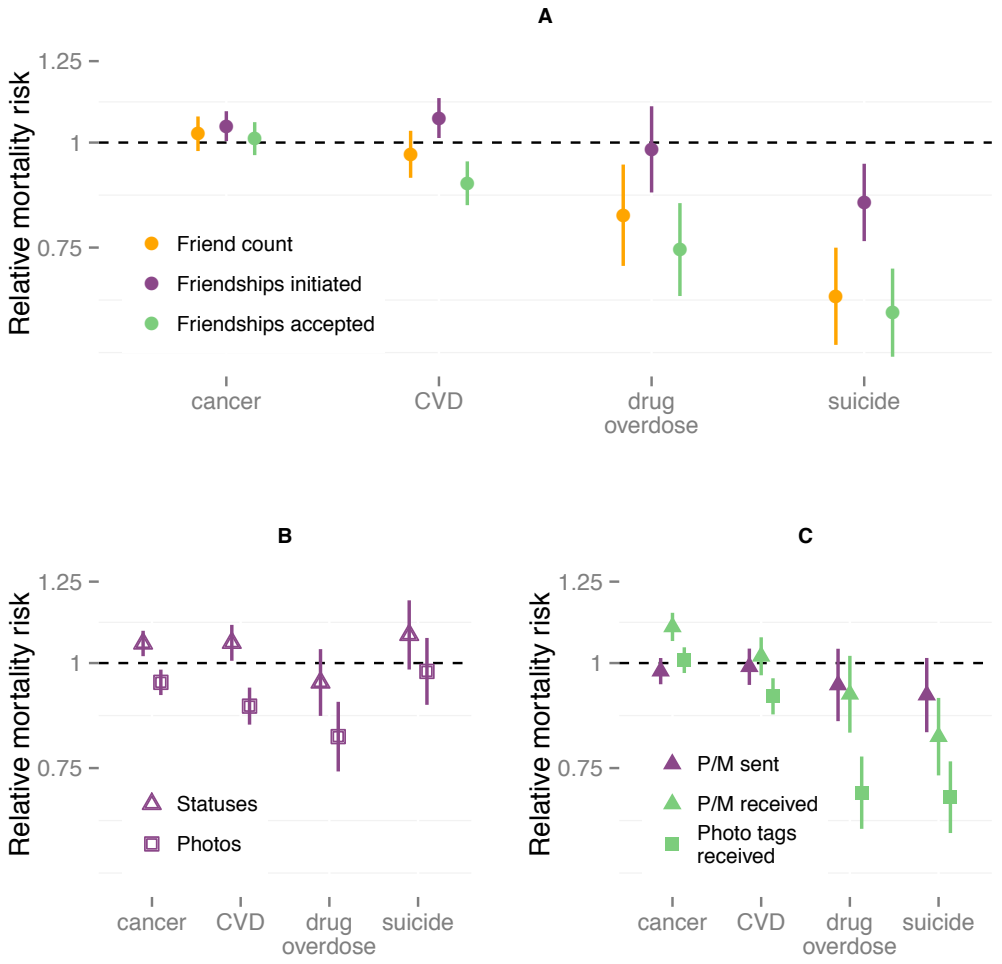

Fig. 17. *Facebook activities, by directionality and activity type.* This figure shows cause-specific morality risk among Facebook users by online activity levels (counts of Facebook tool use), separated by the directionality of the action (from or to the subject) and activity type (the type of Facebook tool used). These results replicate Figure 3 on the 'voting' population using the controls added for the full, non-voting population results.

M. Results for 'voter' population with race/ethnicity controls

As a robustness check, we repeated our main analyses with coarse controls for race/ethnicity. Race/ethnicity was inferred from last names, based on distributions in the US Census [8]. This method has previously been used to infer race/ethnicity of Twitter [9] and Facebook [10] users, in addition to common usage in health studies, e.g., cancer incidence [11] and health disparities [12]. We included dummy variables in our models for last names that were associated with 50% or more of US Census respondents reporting being "Hispanic", "Asian/Pacific Islander", or "Black". For last names not in the US Census data (approximately 12% of the voter record) or for which there was only partial race/ethnicity information, we imputed race/ethnicity using multivariate imputation by chained equations [13]. Our estimates for"Asian/Pacific Islander" and "Black" were lower than those seen in surveys of California registered voters [14]. According to this last name method, the California voter record as 64% white, 24% Hispanic, 6% Asian/Pacific Islander, and 1% black, while individuals on Facebook in Fall 2010 and in the California voter record were 70% white, 18% Hispanic, 6% Asian/Pacific Islander, and 1% black. These additional controls had small effects on our comparison of voters on Facebook vs. voters not on Facebook: After controlling for race/ethnicity, rates of suicide were slightly lower in the Facebook population than in the general population, though the effect was not robust to a Bonferonni correction, and race/ethnicity had no effect on our within-Facebook comparisons.

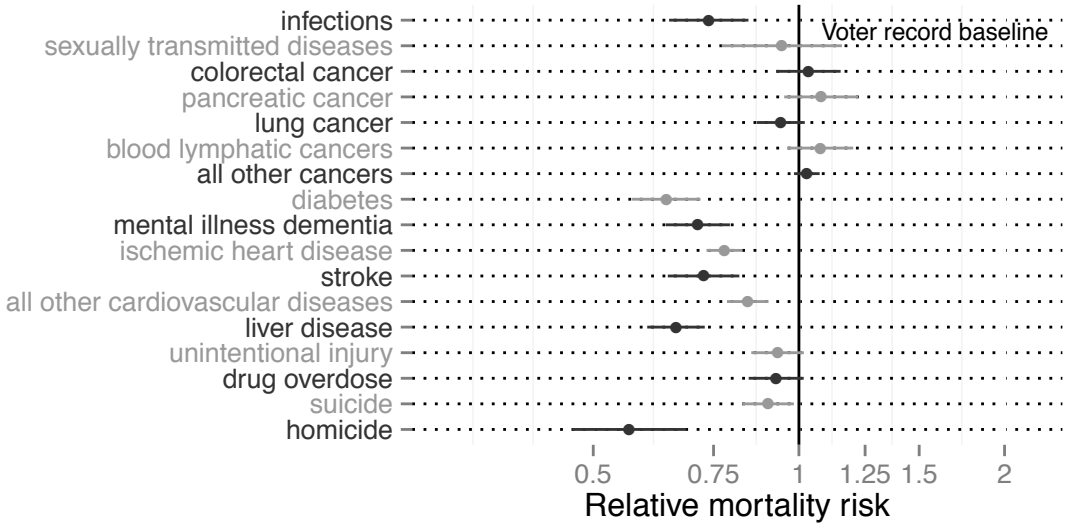

Fig. 18. *Facebook, California voter record mortality rate by cause comparison – with race/ethnicity control.* This figure shows relative cause-specific mortality risk among Facebook users whose first name, last name, and date of birth are listed in the California voter record compared to all California registered voters. The y-axis (on bottom) is the relative mortality risk estimated in a Cox proportional hazard model, and the x-axis is the cause of death. The all registered voter comparison group was exactly matched on age and gender so that the comparison groups are, by-design, perfectly balanced on these covariates.

Table 34. Infections risk, voter record.

	Dependent variable:
	Deceased
Facebook	0.738
	(0.646, 0.844)
Male	1.689
	(1.512, 1.888)
Hispanic	1.382
	(1.215, 1.572)
Asian/Pacific Islander	0.425
	(0.300, 0.602)
Black Non-Hispanic	1.036
	(0.553, 1.940)
Observations	11,834,575
Note:	95% confidence intervals in parentheses.

Table 35. Sexually transmitted diseases risk, voter record.

	Dependent variable:
	Deceased
Facebook	0.944
	(0.771, 1.156)
Male	9.197
	(6.903, 12.253)
Hispanic	0.899
	(0.717, 1.128)
Asian/Pacific Islander	0.442
	(0.265, 0.739)
Black Non-Hispanic	1.568
	(0.710, 3.460)
Observations	11,834,575
Note:	95% confidence intervals in parentheses.

Table 36. Colorectal cancer risk, voter record.

	Dependent variable:
	Deceased
Facebook	1.033
	(0.927, 1.151)
Male	1.278
	(1.159, 1.409)
Hispanic	0.894
	(0.784, 1.019)
Asian/Pacific Islander	0.735
	(0.580, 0.932)
Black Non-Hispanic	0.966
	(0.556, 1.677)
Observations	11,834,575
Note:	95% confidence intervals in parentheses.

Table 37. Pancreatic cancer risk, voter record.

	Dependent variable:
	Deceased
Facebook	1.078
	(0.952, 1.221)
Male	1.482
	(1.323, 1.660)
Hispanic	0.952
	(0.817, 1.109)
Asian/Pacific Islander	0.703
	(0.530, 0.932)
Black Non-Hispanic	0.478
	(0.186, 1.228)
Observations	11,834,575
Note:	95% confidence intervals in parentheses.

Table 38. Lung cancer risk, voter record.

	Dependent variable:
	Deceased
Facebook	0.941
	(0.868, 1.020)
Male	1.140
	(1.061, 1.225)
Hispanic	0.541
	(0.480, 0.610)
Asian/Pacific Islander	0.684
	(0.573, 0.817)
Black Non-Hispanic	1.586
	(1.150, 2.188)
Observations	11,834,575
Note:	95% confidence intervals in parentheses.

Table 39. Blood lymphatic cancers risk, voter record.

	Dependent variable:
	Deceased
Facebook	1.075
	(0.962, 1.201)
Male	1.561
	(1.412, 1.727)
Hispanic	1.133
	(1.000, 1.284)
Asian/Pacific Islander	0.768
	(0.605, 0.976)
Black Non-Hispanic	0.935
	(0.518, 1.687)
Observations	11,834,575
Note:	95% confidence intervals in parentheses.

Table 40. All other cancers risk, voter record.

	Dependent variable:
	Deceased
Facebook	1.027
	(0.984, 1.072)
Male	0.923
	(0.887, 0.960)
Hispanic	0.926
	(0.879, 0.975)
Asian/Pacific Islander	0.775
	(0.706, 0.851)
Black Non-Hispanic	1.207
	(0.991, 1.469)
Observations	11,834,575
Note:	95% confidence intervals in parentheses.

Table 41. Diabetes risk, voter record.

	Dependent variable:
	Deceased
Facebook	0.639
	(0.570, 0.718)
Male	1.714
	(1.563, 1.879)
Hispanic	1.336
	(1.201, 1.487)
Asian/Pacific Islander	0.471
	(0.360, 0.617)
Black Non-Hispanic	1.616
	(1.068, 2.445)
Observations	11,834,575
Note:	95% confidence intervals in parentheses.

Table 42. Mental illness dementia risk, voter record.

	Dependent variable:
	Deceased
Facebook	0.711
	(0.639, 0.793)
Male	1.443
	(1.318, 1.579)
Hispanic	0.646
	(0.568, 0.736)
Asian/Pacific Islander	0.489
	(0.380, 0.629)
Black Non-Hispanic	0.854
	(0.514, 1.420)
Observations	11,834,575
Note:	95% confidence intervals in parentheses.

Table 43. Ischemic heart disease risk, voter record.

	Dependent variable:
	Deceased
Facebook	0.778
	(0.732, 0.827)
Male	3.039
	(2.871, 3.217)
Hispanic	0.771
	(0.717, 0.829)
Asian/Pacific Islander	0.566
	(0.495, 0.648)
Black Non-Hispanic	1.394
	(1.090, 1.783)
Observations	11,834,575
Note:	95% confidence intervals in parentheses.

Table 44. Stroke risk, voter record.

	Dependent variable:
	Deceased
Facebook	0.725
	(0.643, 0.818)
Male	1.277
	(1.156, 1.409)
Hispanic	1.143
	(1.010, 1.293)
Asian/Pacific Islander	1.081
	(0.881, 1.326)
Black Non-Hispanic	2.222
	(1.504, 3.283)
Observations	11,834,575
Note:	95% confidence intervals in parentheses.

Table 45. all other CVDs risk, voter record.

	Dependent variable:
	Deceased
Facebook	0.842
	(0.785, 0.903)
Male	2.002
	(1.880, 2.131)
Hispanic	0.731
	(0.672, 0.796)
Asian/Pacific Islander	0.425
	(0.354, 0.510)
Black Non-Hispanic	1.378
	(1.044, 1.819)
Observations	11,834,575
Note:	95% confidence intervals in parentheses.

Table 46. Liver disease risk, voter record.

	Dependent variable:
	Deceased
Facebook	0.661
	(0.600, 0.728)
Male	1.883
	(1.739, 2.038)
Hispanic	1.265
	(1.155, 1.384)
Asian/Pacific Islander	0.298
	(0.224, 0.397)
Black Non-Hispanic	0.896
	(0.565, 1.422)
Observations	11,834,575
Note:	95% confidence intervals in parentheses.

Table 47. Unintentional injury risk, voter record.

	Dependent variable:
	Deceased
Facebook	0.931
	(0.852, 1.017)
Male	3.217
	(2.941, 3.518)
Hispanic	0.845
	(0.767, 0.931)
Asian/Pacific Islander	0.479
	(0.385, 0.595)
Black Non-Hispanic	0.976
	(0.650, 1.465)
Observations	11,834,575
Note:	95% confidence intervals in parentheses.

Table 48. Drug overdose risk, voter record.

	Dependent variable:
	Deceased
Facebook	0.926
	(0.844, 1.016)
Male	1.657
	(1.523, 1.803)
Hispanic	0.542
	(0.483, 0.609)
Asian/Pacific Islander	0.224
	(0.162, 0.309)
Black Non-Hispanic	1.091
	(0.747, 1.594)
Observations	11,834,575
Note:	95% confidence intervals in parentheses.

Table 49. Suicide risk, voter record.

	Dependent variable:
	Deceased
Facebook	0.901
	(0.826, 0.983)
Male	3.083
	(2.824, 3.365)
Hispanic	0.465
	(0.414, 0.522)
Asian/Pacific Islander	0.565
	(0.467, 0.683)
Black Non-Hispanic	0.935
	(0.633, 1.380)
Observations	11,834,575
Note:	95% confidence intervals in parentheses.

Table 50. Homicide risk, voter record.

	Dependent variable:
	Deceased
Facebook	0.564
	(0.466, 0.684)
Male	3.411
	(2.874, 4.047)
Hispanic	1.193
	(1.016, 1.401)
Asian/Pacific Islander	0.580
	(0.393, 0.855)
Black Non-Hispanic	2.525
	(1.558, 4.092)
Observations	11,834,575
Note:	95% confidence intervals in parentheses.

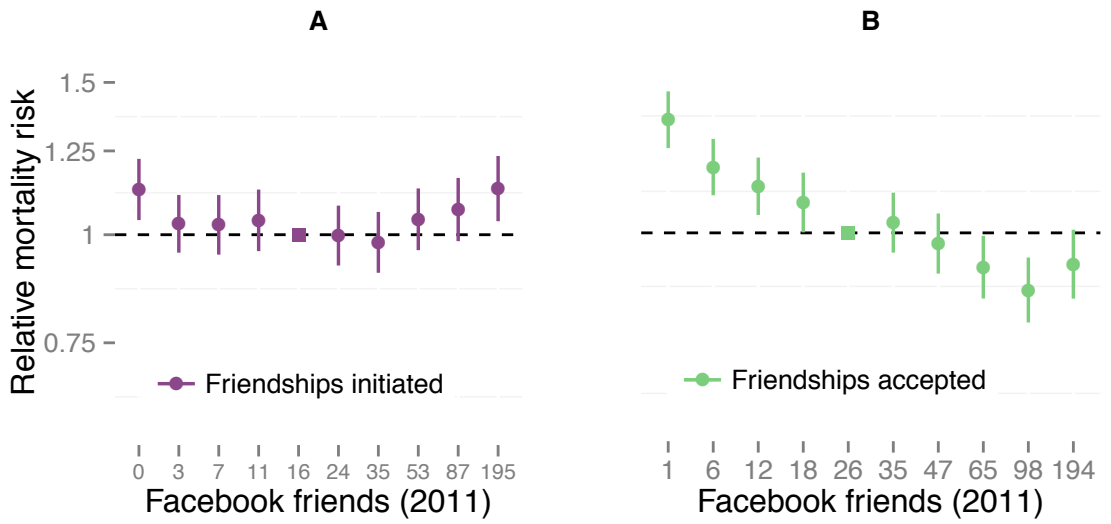

Fig. 19. *Facebook friends and relative mortality risk (all-cause mortality) – with race/ethnicity control.* This figure shows all-cause mortality regressed on deciles of Facebook friend counts, by initiated and received Facebook friendships. These results replicate Figure 1 on the 'voting' population using the controls added for the full, non-voting population results.

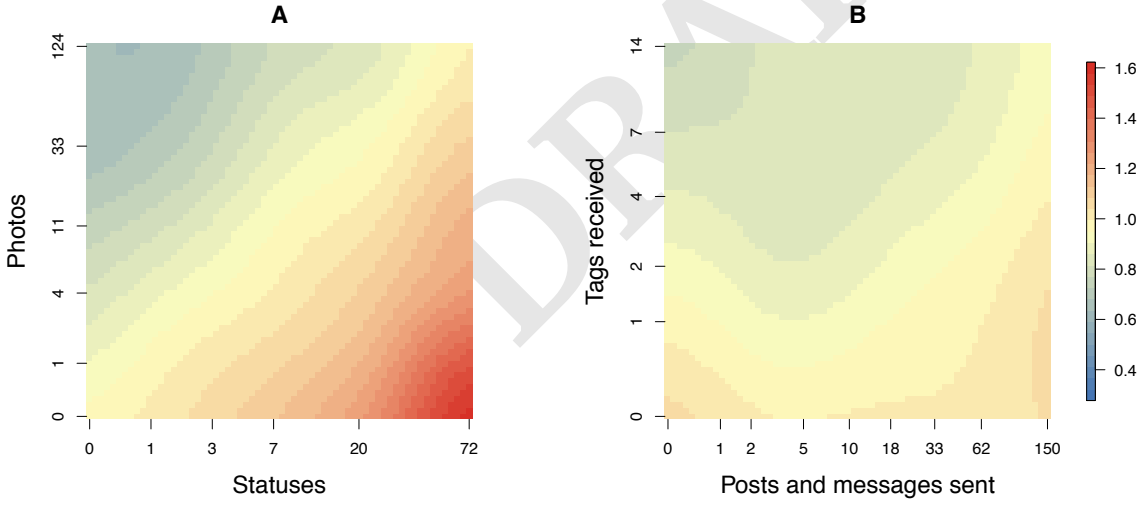

Fig. 20. *Facebook activities, smoothed mortality risk by quantile activity-activity interaction – with race/ethnicity control.* This figure shows all-cause mortality risk among Facebook users for combinations of activities. These results replicate Figure 2 on the 'voting' population using the controls added for the full, non-voting population results.

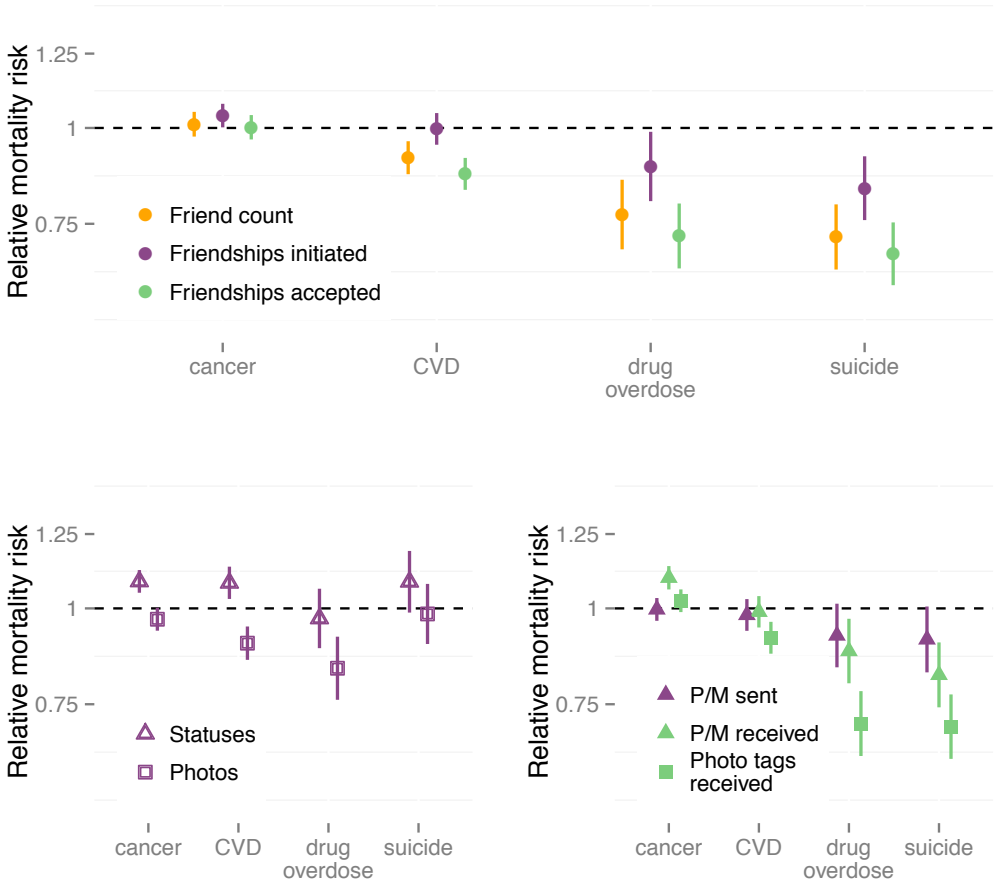

Fig. 21. *Facebook activities, by directionality and activity type – with race/ethnicity control.* This figure shows cause-specific morality risk among Facebook users by online activity levels (counts of Facebook tool use), separated by the directionality of the action (from or to the subject) and activity type (the type of Facebook tool used). These results replicate Figure 3 on the 'voting' population using the controls added for the full, non-voting population results.

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