Letters

Internet Searches for Suicide Following the Release of *13 Reasons Why*

The Netflix series *13 Reasons Why* explores the suicide of a fictional teen, and the finale graphically shows the suicide over a 3-minute scene.

The series has generated widespread interest (>600 000 news reports[1]), including debate about its public health implications. For some viewers, the series glamorizes the victim and the suicide act in a way that promotes suicide, while other viewers hope the series raises suicide awareness. To advance the debate, we examined how internet searches for suicide changed, both in volume and content, after the series' release.[2]

Editorial

Methods | Using Google Trends (http://google.com/trends) we obtained search trends including the term "suicide," except those also mentioning "squad" (a popular film), emerging from the United States. Using the related search terms tool, we also monitored the top 25 terms and the next 5 most related terms to those, yielding 20 terms after ignoring duplicate, unrelated (eg, "suicide slide"), or unclear (eg, "suicide bridge") terms. Suicide queries were divided by the total number of searches for each day and then scaled to range from 0 to 100, eg, 50 indicates 50% of the highest search proportion. Raw search counts were inferred using Comscore estimates (http://comscore.com).

Our approach was quasiexperimental, comparing internet search volumes after the premiere of *13 Reasons Why* with expected search volumes if the series had never been released (March 31, 2017, through April 18, 2017; the cut-off was chosen to precede American football player Aaron Hernandez's suicide on April 19, 2017, so that our estimates would not be contaminated). Expected volumes were estimated using Hyndman and Khandakar's autoregressive integrated moving average (ARIMA) algorithm, using daily trends from January 15, 2017, to March 30, 2017, to forecast future values.[3] A brief time window to inform our prediction was selected because longer time windows would be contaminated by other past suicide-related events. The ratio of observed and expected volumes with bootstrap CIs were computed using R version 3.2.1 (R Foundation) by day and for the entire postperiod.

Results | All suicide queries were cumulatively 19% (95% CI, 14%-24%) higher for the 19 days following the release of *13 Reasons Why*, reflecting 900 000 to 1.5 million more searches than expected (**Figure**). For 12 of the 19 days studied, suicide queries were significantly greater than expected, ranging from 15% (95% CI, 3%-32%) higher on April 15, 2017, to 44% (95% CI, 28%-65%) higher on April 18, 2017.

Seventeen of the top 20 related queries were higher than expected, with most rising queries focused on suicidal ideation. For instance, "how to commit suicide" (26%; 95% CI, 12%-42%), "commit suicide" (18%; 95% CI, 11%-26%), and "how to kill yourself" (9%; 95% CI, 4%-14%) were all significantly higher. Queries for suicide hotlines were also elevated, including "suicide hotline number" (21%; 95% CI, 1%-44%) and "suicide hotline" (12%; 95% CI, 5%-19%). Last, public awareness indicative searches, such as "suicide prevention" (23%; 95% CI, 6%-40%) or "teen suicide" (34%; 95% CI, 17%-52%), were elevated.

Discussion | *13 Reasons Why* elevated suicide awareness, but it is concerning that searches indicating suicidal ideation also rose.

It is unclear whether any query preceded an actual suicide attempt. However, suicide search trends are correlated with actual suicides,[4] media coverage of suicides concur with increased suicide attempts,[5] and searches for precise suicide methods increased after the series' release.

The deleterious effects of shows such as *13 Reasons Why* could possibly be curtailed by following the World Health Organization's media guidelines for preventing suicide,[6] such as removing scenes showing suicide, or addressed by including suicide hotline numbers in each episode. These strategies could be retrofitted to the released episodes, included in the planned second season, or applied to other programs. Moreover, programs might undergo testing to evaluate any effect on public health outcomes before release to minimize societal harms.

Additional surveillance will clarify our findings, including estimating changes in suicide attempts or calls to national suicide hotlines. Nonetheless, our analyses suggest *13 Reasons Why*, in its present form, has both increased suicide awareness while unintentionally increasing suicidal ideation.

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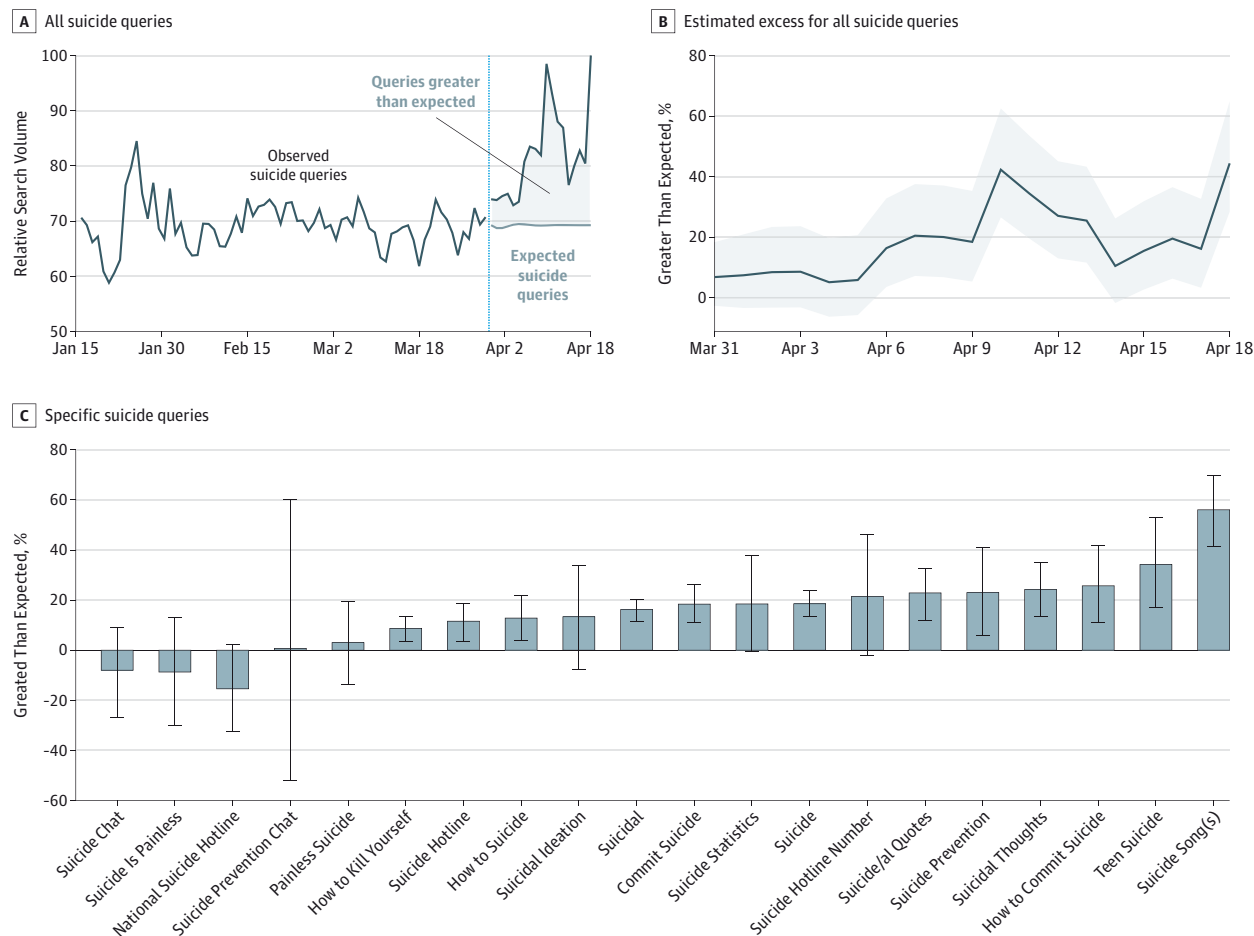
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Figure. Internet Searches Following the Release of *13 Reasons Why*

A All suicide queries

B Estimated excess for all suicide queries

C Specific suicide queries

A, Daily trend for all Google searches with the term "suicide" but not also mentioning "squad" alongside expected trends for the days following the release of the Netflix series *13 Reasons Why*. B, Estimated excess for Google searches with the term "suicide" but not also mentioning "squad" by day with corresponding 95% CIs (blue shaded area) and the estimated cumulative excess for March 31, 2017, through April 18, 2017. The cumulative mean for excess of suicide queries was determined to be 19% (95% CI, 14%-24%). C, Cumulative excess for each listed search term for March 31, 2017, through April 18, 2017.

1. Google. Google News search results for "'13 reasons why' netflix." https://www.google.com/search?q=13+reasons+why+suicide&oq=13+reasons+why+suicide+&aqs=chrome.69i57j0l5.4442j0j9&sourceid=chrome&ie=UTF-8#safe=off&tbm=nws&q=%2213+reasons+why%22+netflix. Accessed May 5, 2017.

2. Ayers JW, Althouse BM, Dredze M. Could behavioral medicine lead the web data revolution? *JAMA*. 2014;311(14):1399-1400.

3. Hyndman RJ, Khandakar Y. Automatic time series forecasting: the forecast package for R 7 [published July 29, 2008]. *J Stat Softw*. doi:10.18637/jss.v027.i03

4. Yang AC, Tsai SJ, Huang NE, Peng CK. Association of Internet search trends with suicide death in Taipei City, Taiwan, 2004-2009. *J Affect Disord*. 2011;132(1-2):179-184.

5. Stack S. Media coverage as a risk factor in suicide. *J Epidemiol Community Health*. 2003;57(4):238-240.

6. World Health Organization (WHO); International Association for Suicide Prevention; WHO Department of Mental Health and Substance Abuse. Preventing suicide: A Resource Guide for Media Professionals. http://www.who.int/mental_health/prevention/suicide/resource_media.pdf. Accessed May 5, 2017.