

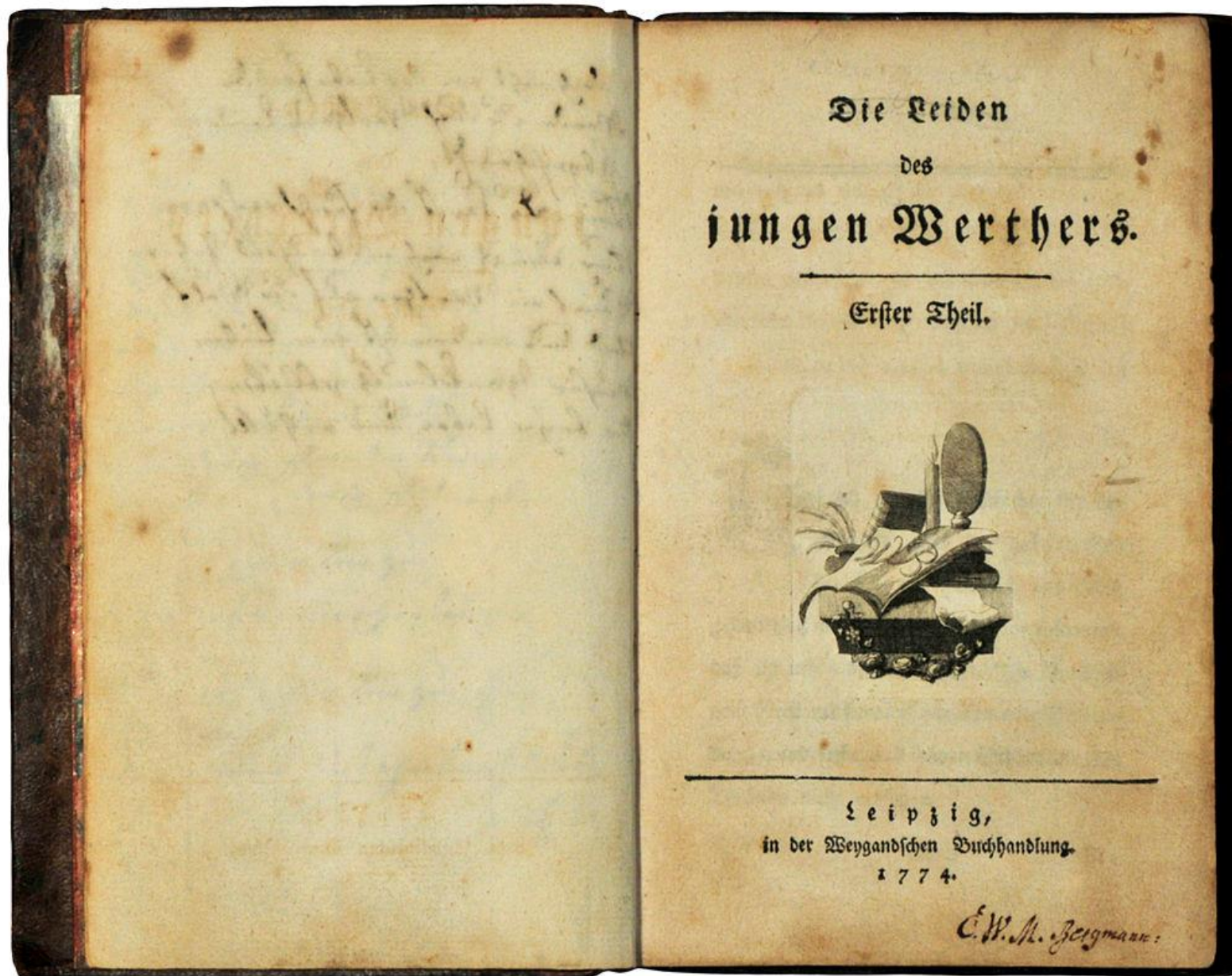
# The Werther Effect Revisited: Measuring the Effect of News Items on User Behavior

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The Sorrows of Young Werther / von Goethe

# Definitions

- "*Copycat suicide*" (Werther effect) is colloquial term referring to the occurrence of a person learning of a suicide via the media, and their subsequent attempt to commit suicide because of this.
- "*Papageno effect*" is the effect that mass media can have by presenting non-suicide alternatives to crises.

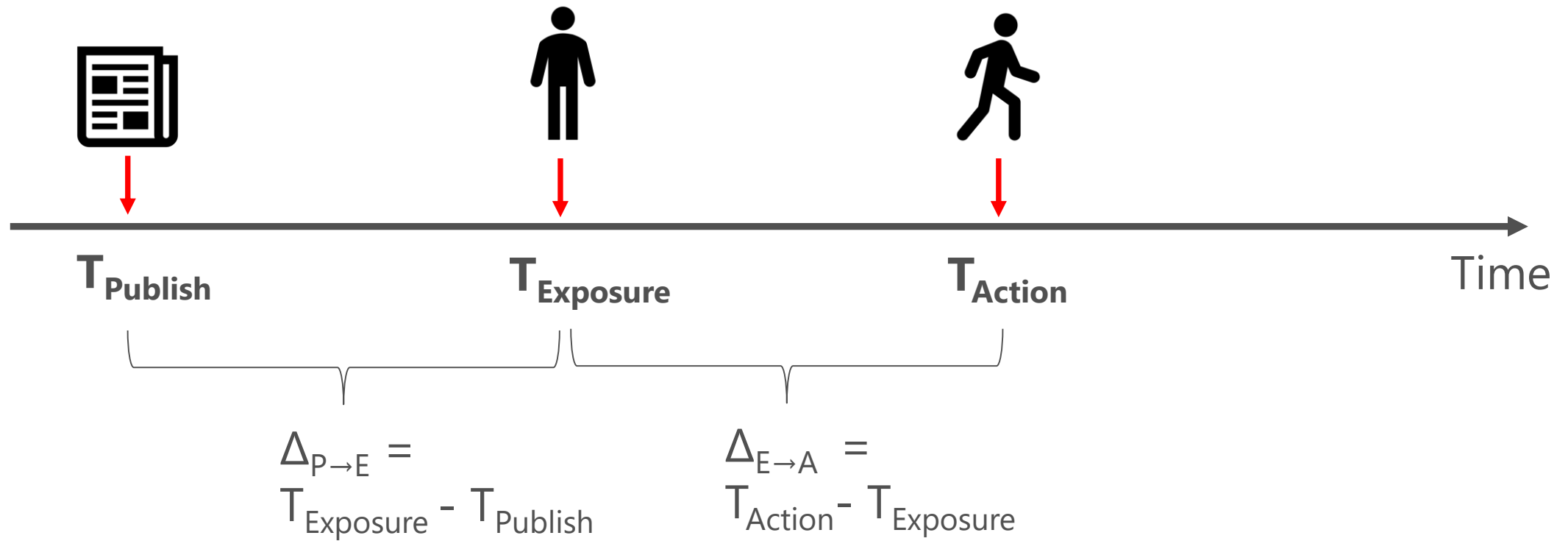
[CDC Home](#)[Search](#)[Health Topics A-Z](#)**MMWR™***Recommendations and Reports*

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## Suicide Contagion and the Reporting of Suicide: Recommendations from a National Workshop

# Problem definition



# Events of interest

- Negative: Suicide
- Positive: Seeking screening for HIV-AIDS, breast cancer, or cancer, and looking for information on mastectomies.

# Data

- **News items:** All items on Bing News, containing time, venue, and title.
- **Search data:** All US-based queries, including query text, time, pages displayed, zip code, and anonymous user ID.
- **Demographic data:** From ComScore browsing data.
- All data was collected between 1/1/2015 and 31/10/2015.

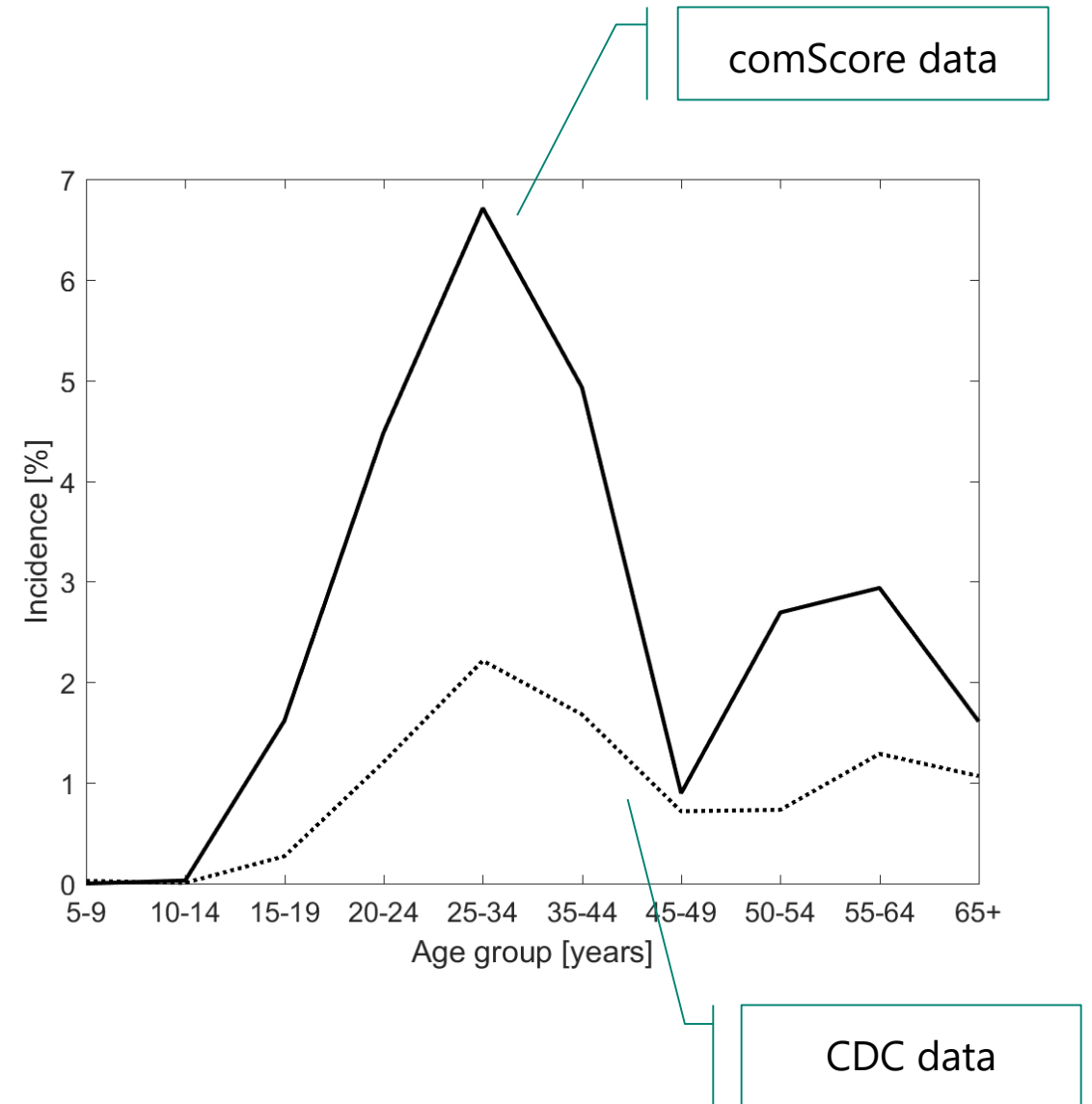
# Topics

	News items			Queries		
	Include	Exclude	Number	Include	Exclude	Number
Suicides	Suicide	Bomb, blast, attack, squad	106,440	Suicide, kill AND how to, how do I, ways to commit	Suicide girl, stop, prevent, help, talk, cope, avoid, spell, hotline	335,976
HIV AIDS	HIV, AIDS		1,002,983	HIV, AIDS AND symptoms, screening, risk, test, signs		150,229
Breast cancer	Mammogram, mammograph		391,438	Mammogram, mammograph AND location, at, screening, recommend, provide, how, where, getting		401,502
Mastectomies	Mastectomy		420,287	Breast cancer AND symptoms, screening, risk, test, signs		10,636
Cancer	Cancer		4,947,622	Cancer AND symptoms, screening, risk, test, signs		867,939



# Demographic indicators for users with action queries

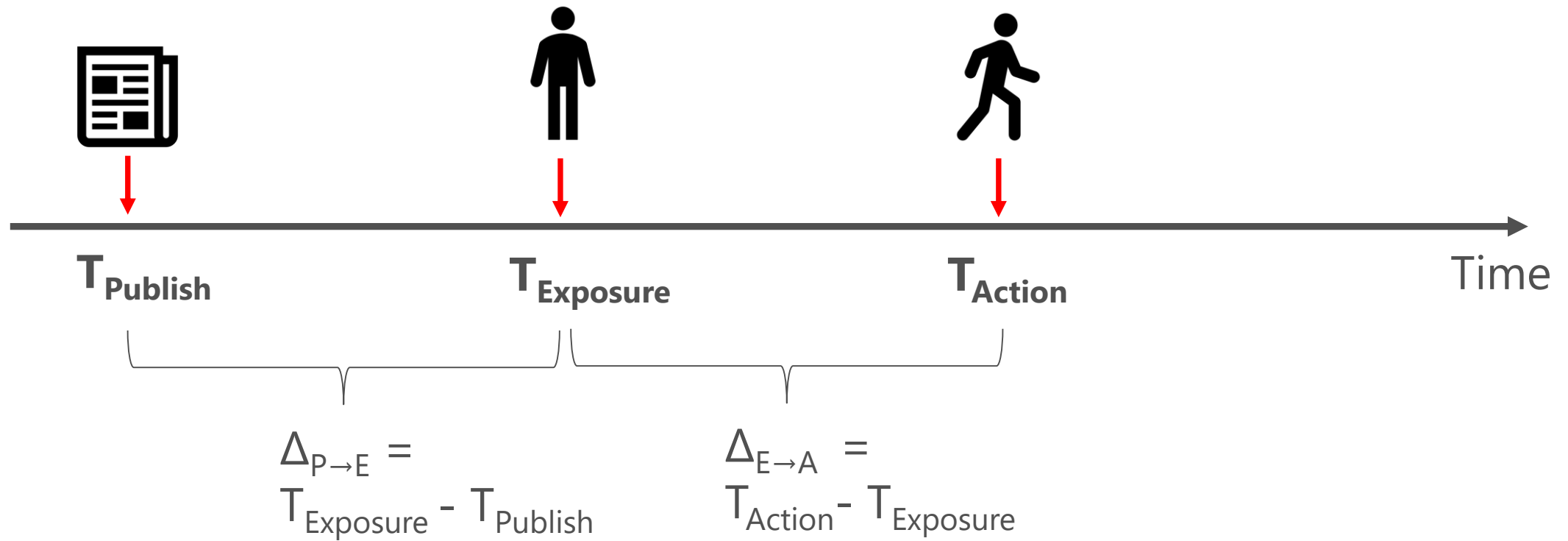
- The majority of people asking AQs on breast cancer and/or mastectomies were women (73% and 71%, respectively).
- More males than females ask about suicides (1.05:1).



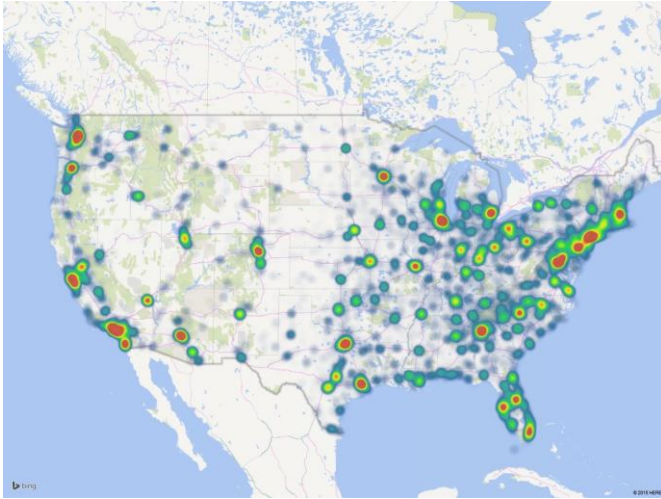
# Access of news items via search engines

Topic	Percent of items
Suicides	46.9
HIV AIDS	24.8
Breast cancer	79.5
Mastectomies	41.1
Cancer	37.5
<b>Average</b>	<b>44.2</b>

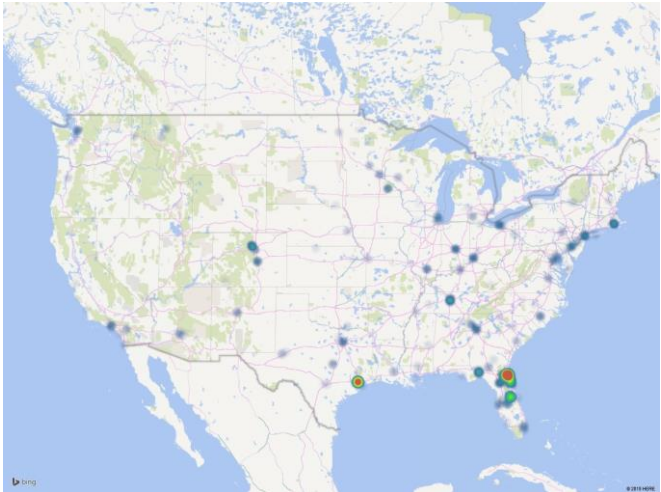
# Problem definition



# Estimating exposure probability

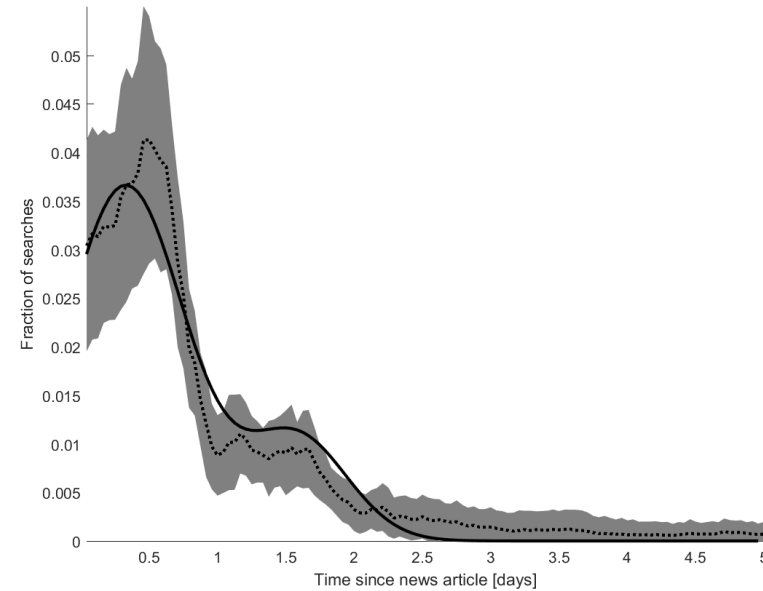


cnn.com



jacksonville.com

Factorize:  $P_{\text{Exposure}} = P_{\text{Location}} \cdot P_{\text{Time}}$



# Estimating time to action

Topic	Average time [sec]
Suicides	90.2
HIV AIDS	127.1
Breast cancer	88.4
Mastectomies	162.1
Cancer	192.7

# Evaluating the effects of words on actions

- Direct evaluation: Which words are more likely to cause action?
- Term transfer: If a word is used in an article, will a person use it?
- Effect of repeated exposures.

# Estimating the effect of terms on actions

- Let  $P_{i,j}$  be the probability that the  $i$ -th AQ was the result of viewing news item  $S_j$ .
- $P_{i,j}$  is estimated as the product of  $P_{\text{Time}}$  and  $P_{\text{Location}}$ .
- The News Item Action Score (NIAS) is the total contribution of a news item to AQs made after it.
- NIAS of news item  $j$  is calculated as the median of all  $P_{i,j}$  for which  $T_{\text{Action}} > T_{\text{Publish}}$ .

# Predicting NIAS values

Topic	Spearman	AUC for top 1%
Suicides	0.477	0.943
HIV AIDS	0.346	0.894
Breast cancer	0.728	0.845
Mastectomies	0.705	0.910
Cancer	0.733	0.916



# Most influential terms

Topic	Highest NIAS	Lowest NIAS
Suicides	murder suicide, family, teen, police, friend's suicide	couple found, influenced Strack, ruled murder, lives, inquest into
HIV AIDS	study, new, vaccine, sex, africa	hiv transmission, immune cells, ridge, police report, room
Breast cancer	cancer, start, american cancer, 45, 40	schedule your, benefit hospital, crawl, wyandotte zombie
Mastectomies	double mastectomy, double, woman, cancer, breast cancer	cancer survivor, challenges views, photo, photo shoot, shoot
Cancer	breast cancer, dies, new, lung cancer, of cancer	beating cancer, oil to, Martin Crowe, 50k bail, for Utah

# Term transfer

- We define a *transferred term* as one which passed from the news item to the AQ.
- Evaluation: The ratio between the fraction of most likely news items which contained a term and the ones that did not.
- Example: All AQs which contained the words "*assisted suicide*" and their most likely news items. Among these news items we calculated the fraction of news items that contained the words "*assisted suicide*", divided by the fraction of news items that did not

# Term transfer (2)

## Suicide

Term	Transfer ratio
apparent	0.00
man	0.00
dead in	0.00
police	0.36
death	0.83
suicide	0.99
suicides	1.02
murder	1.23
assisted suicide	1.23
assisted	1.24
commits suicide	1.72
murder suicide	1.74
commits	1.86
dead	8.70

## Breast cancer

Term	Transfer ratio
american	0.12
mammograms	0.35
start	0.65
breast	0.71
40	0.73
mammogram	1.03
mammograms at	1.16
women	1.27
guidelines	1.68
45	1.99
new	2.42
50	3.85
at 45	4.54

# The effect of repeated exposure

Do news stories have to have a larger, same, or smaller NIAS to elicit additional AQs after previous AQs?

Topic	Slope	R <sup>2</sup>
Suicides	$8.7 \times 10^{-10}$	0.56
HIV AIDS	$-2.8 \times 10^{-10}$	0.73
Breast cancer	$-1.0 \times 10^{-7}$	0.63
Mastectomies	$-2.2 \times 10^{-7}$	0.77
Cancer	$-1.1 \times 10^{-7}$	0.63

# Summary

- The Werther Effect has been studied at the population level. Ours is the first study to show it on the individual level.
- We separated the influence of news items on readers to *spatial* and *temporal* components.
- Our analysis has shown that it is possible to evaluate the future effect of a news item for both negative and positive effects.

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