Sensing Distress Following A Terrorist Event

Xidao Wen and Yu-Ru Lin
University of Pittsburgh

Problem

Source

Research in Terrorism

Risk Prediction

Impact Evaluation

Terrorism Risk Statistic/Probabilistic Modeling (Willis et al 2007, Laskey 2004, Hudson et al 2005, Jha 2009)

- Economic Impact (Rose 2009)
- **Psychological impact** (Galea et al 2002, Lerner et al 2003, Shalev et al 2005)
- …

Source

Research Questions

Analytical

- RQ1: How do people express their emotions immediately after the attacks?
- RQ2: How does people's emotional response evolve after the attacks?

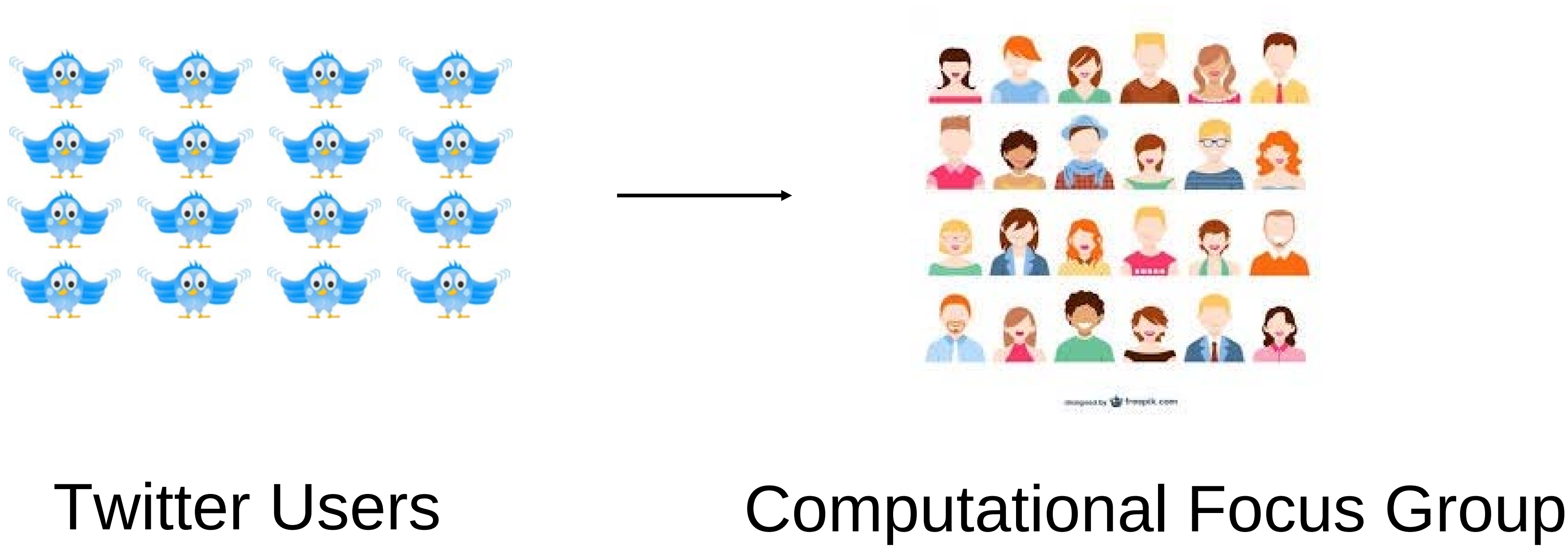
Computational / methodological

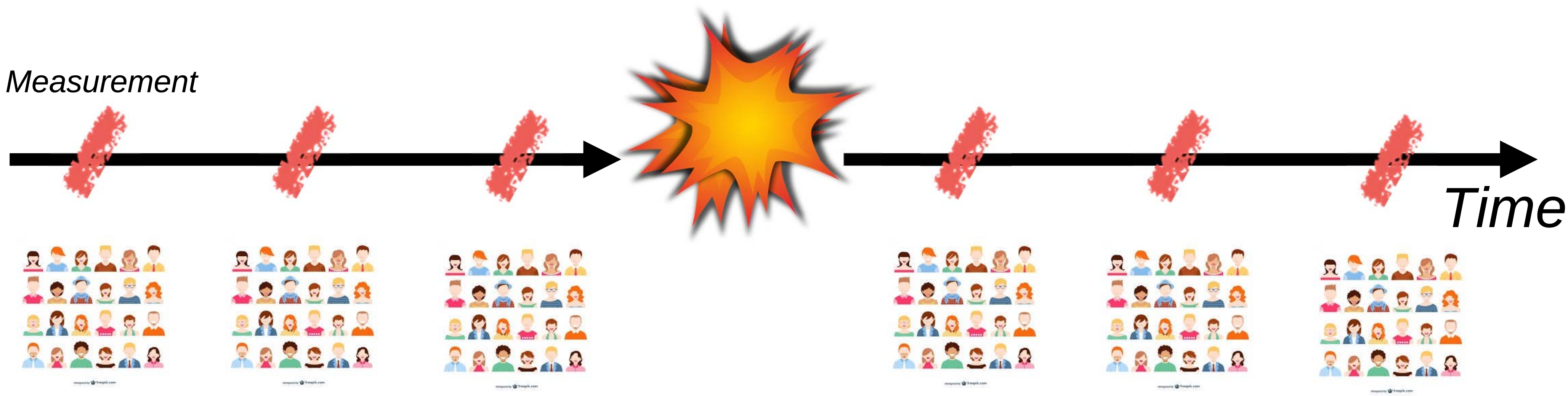
- Can we evaluate these questions in a timely manner?

Method

Dataset

- Computational focus group based on Geo-locations (Lin et al 2014) of Parisians.
  - 16K users from Paris, ~4 million tweets
  - 220k geo-tagged tweets



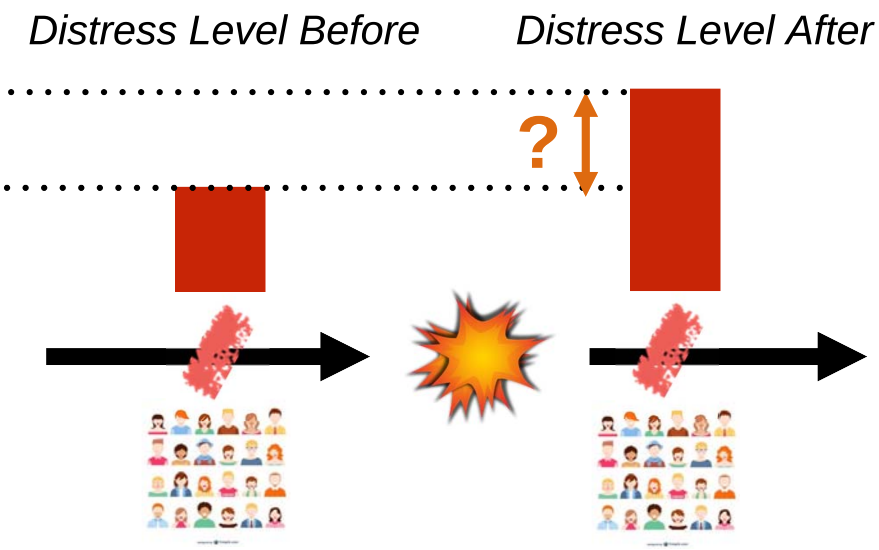


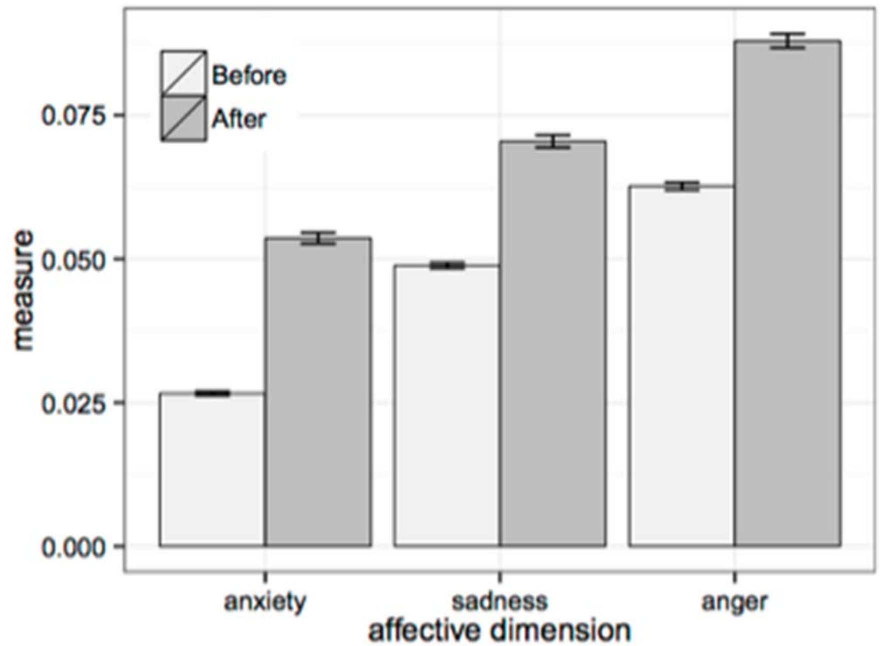
- Construct a computational focus group.
- Track behavioral measures for each user over time.
- Build and test Psychological and Sociological hypothesis.

Defining Distress

- Distress Response
  - or distress status as in three dimensions, ***anxiety***, ***sadness***, ***anger***.
  - measured by Linguistic Inquiry Word Count (LIWC) (Pennebaker 2001).
  - words in *Anxiety*: *worry, fearful, nervous, …*
  - words in *Anger*: *hate, kill, annoyed, …*
  - words in *Sadness*: *crying, grief, sad, …*
- The proportion of tweets contain words in the LIWC lexicon of *anxiety, sadness,* and *anger* respectively.

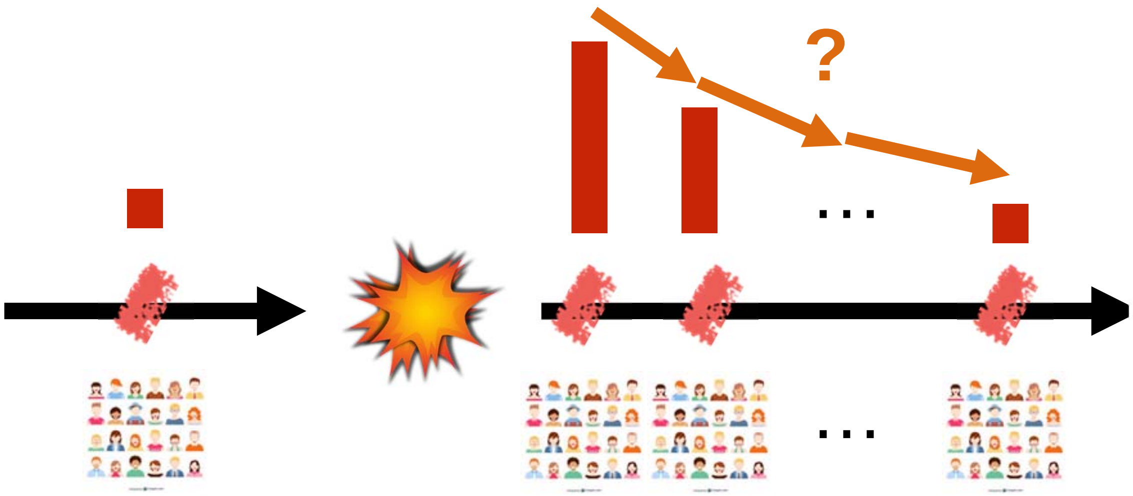
- RQ1: How do people express their emotions immediately after the attacks?

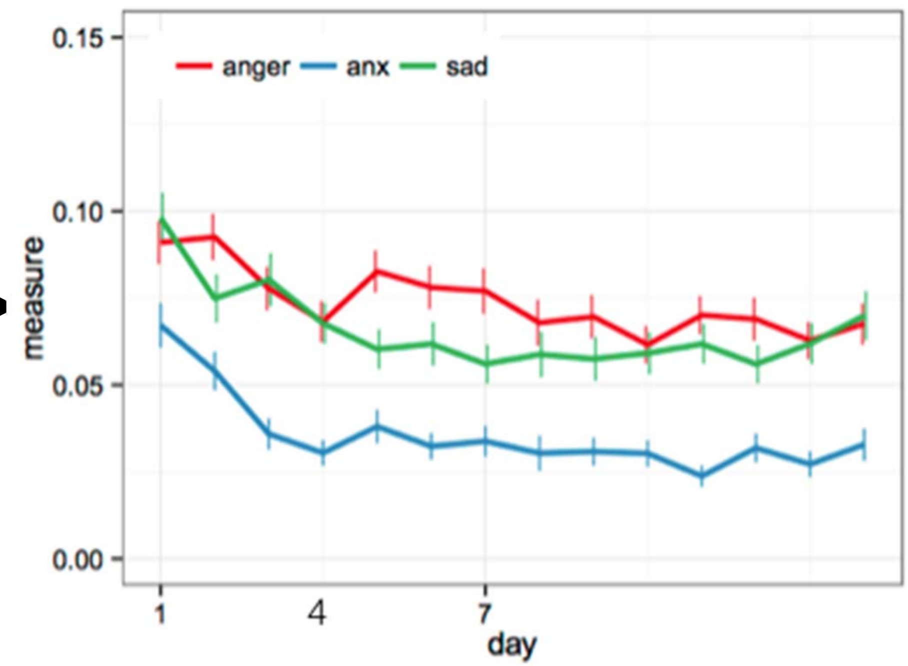




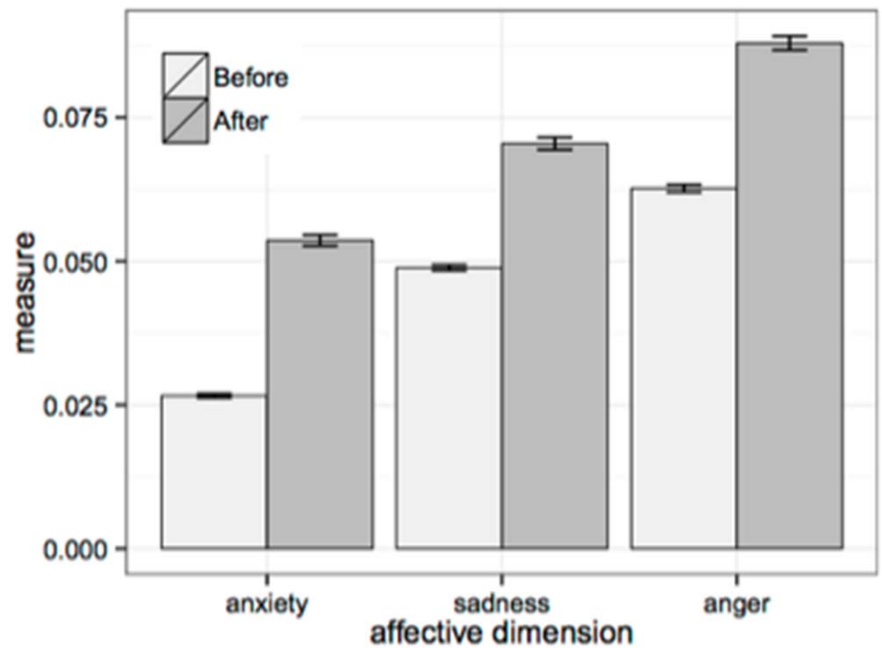
Significant Increases in distress levels right after the attacks.

- RQ2: How does people's emotional response evolve after the attacks?





Distress levels fall back to stable pattern within seven days.



- How are individual differences associated with different distress responses?

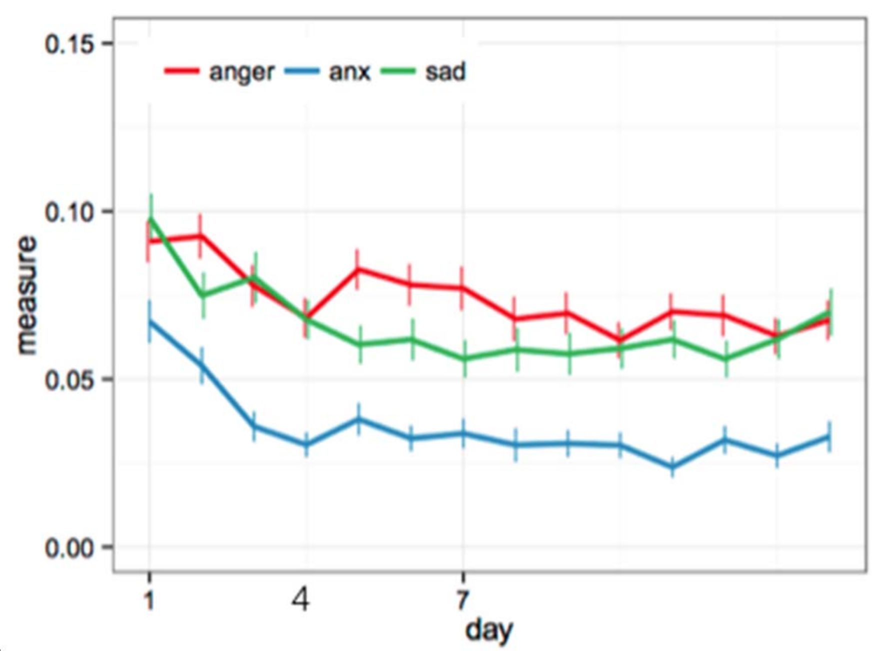
Geographic Proximity

Media Exposure

Factors in literature

Social Support

Gender



Results

	Anxiety	*Sadness*	*Anger*
Post-Geographical proximity	↑ **		
Media Exposure	↑ ***		↑ ***
Male		↓ *	

- How individual differences are associated with the immediate distress response?

***, $p < .01$

**, $p < .05$

*, $p < .1$

	Anxiety	*Sadness*	*Anger*
Social Interaction	↓ ***	↓ ***	↓ ***
#Followers		↓ ***	

- How individual differences are associated with the distress recovery process?

***,p < .01

**,p < .05

*,p < .1

Summary

- We construct a computational focus group of Parisians and track their behavioral changes over time in the face of the Paris Attacks in Nov. 2015.

- Compared with traditional approaches, our framework is able to quickly evaluate the immediate emotional response and its recovery process.

- We discover the individual differences are associated with different immediate response as well as different recovery processes

  - Social interactions alleviate the distress level while media exposure related to the attacks rises the level of distress.

Future Work

- We plan to conduct different case studies under this framework to evaluate the impact of terrorist attacks as well as other types of traumatic events.
- We plan to explore the frameworks can study the impact beyond the emotions in the urban space, e.g., human mobility, lifehood.

Thank you and Questions?

xidao.wen@pitt.edu

@XidaoWen

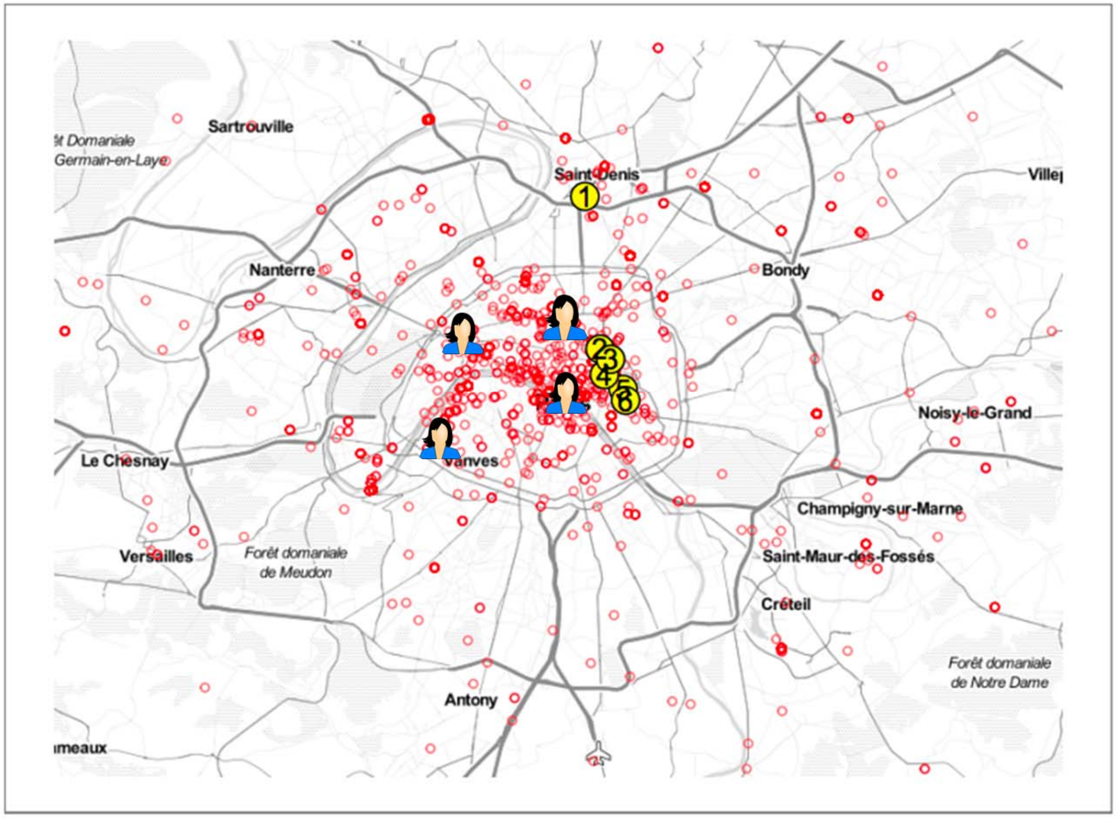
Back-ups

Table 1: Regression Results

	Linear Regression Models			Growth Mixture Models					
				Intercept			Slope		
	(anx)	(sad)	(anger)	(anx)	(sad)	(anger)	(anx)	(sad)	(anger)
followers count	−.001	.002	−.003	.001	.009**	−.003	−.002	−.014**	.002
friends count	−.002	−.002	−.001	.000	.001	.001	−.003	−.004	−.006
gender male	−.01	−.01*	−.002	.000	−.009	−.002	−.005	.018	−.003
prior geographic distance	.000	−.002	.002	−.003	.007	−.007	.005	−.016*	.02**
post geographic distance	−.004	.004	−.004	.000	−.004	.000	−.003	.008	−.006
after the attacks	*aggregated measures*						*repeated measures*		
cognitive complexity	−.002	−.004	−.001				.002	.000	−.001
psychological distancing	−.01**	.001	.001				−.002	.000	−.003
media exposure	.01**	−.004	.01**				.016**	−.002	.013**
communication rate	−.001	−.004	.001				−.004**	−.007**	−.007**
Subjects	1,168	1,168	1,168	1,121	1,121	1,121	1,121	1,121	1,121

Note: the table lists the estimated coefficients. $^{*}p<.05$; $^{**}p<.01$

- Independent Variables
  - **Geographic Proximity**
  - Media Exposure
  - Social Support
  - Gender



Prior- and Post-Attack Geographic Proximity

Measured by the inverse of Alice’s median distance from her geo-located tweets to the closest attack sites.

- Independent Variables
  - Geographic Proximity
  - **Media Exposure**
  - Social Support
  - Gender

Measured by the proportion of Alice's tweets contain hyperlinks and attack related keywords

- Independent Variables
  - Geographic Proximity
  - Media Exposure
  - **Social Support**
  - Gender

Measured by Follower/Followee size
and Tendency of interacting with others