# Computational Sociology

## Online experiments and surveys

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Rutgers University

February 22, 2021

# Plan

1. Course updates
2. Online experiments
3. Online surveys

# Course updates

- Homework 2 released
  - Fill in form if you need Twitter credentials
    - And send me a message so I can add you to the account
  - Due 3/5 at 5pm EST

# Course updates

- Project proposal due 3/2 at 5pm
  - Submission via a Google Form (To be shared on Slack)
  - Schedule meeting to discuss your project idea before submitting
- 3-5 pages, double-spaced
  - Outline/motivation, brief lit review
  - Data and collection strategy
  - Methodology
  - References

# Online experiments

## Motivation for online experiments

- Lab experiments provide control but little realism (low external validity)
  - e.g. Undergraduate students do not represent wider populations
- Field experiments provided realism but little control (low internal validity)
  - e.g. Many factors may affect internal validity
- Digital field experiments can provided both, at scale

# Online experiments

## Methods: Internal experiments

- Companies and other actors experiment internally
  - A/B tests used to test different user-interface and product differences
  - Some now use complex, machine-learning driven "adaptive" experimentation systems to conduct test thousands of different conditions.*
- The vast majority of these experiments are private, but some are published by researchers
  - Kramer, Guillory, and Hancock. 2014. "Emotional contagion" study.
- Researchers recently made an entire archive of thousands of experiments available, see the Upworthy Research Archive

* See Offer-Westort, Molly, Alexander Coppock, and Donald P. Green. 2021. "Adaptive Experimental Design: Prospects and Applications in Political Science." *American Journal of Political Science*.

# Online experiments

## The Emotional Contagion Study

CrossMark
click for updates

### Experimental evidence of massive-scale emotional contagion through social networks

Adam D. I. Kramer[a,1], Jamie E. Guillory[b,2], and Jeffrey T. Hancock[b,c]

[a]Core Data Science Team, Facebook, Inc., Menlo Park, CA 94025; and Departments of [b]Communication and [c]Information Science, Cornell University, Ithaca, NY 14853

Edited by Susan T. Fiske, Princeton University, Princeton, NJ, and approved March 25, 2014 (received for review October 23, 2013)

**Emotional states can be transferred to others via emotional contagion, leading people to experience the same emotions without their awareness. Emotional contagion is well established in laboratory experiments, with people transferring positive and negative emotions to others. Data from a large real-world social network, collected over a 20-y period suggests that longer-lasting moods (e.g., depression, happiness) can be transferred through networks [Fowler JH, Christakis NA (2008) *BMJ* 337:a2338], although the results are controversial. In an experiment with people who use Facebook, we test whether emotional contagion occurs outside of in-person interaction between individuals by reducing the amount of emotional content in the News Feed. When positive expressions were reduced, people produced fewer positive posts and more negative posts; when negative expressions were reduced, the opposite pattern occurred. These results indicate that emotions expressed by others on Facebook influence our own emotions, constituting experimental evidence for massive-scale contagion via social networks. This work also suggests that, in contrast to prevailing assumptions, in-person interaction and nonverbal cues are not strictly necessary for emotional contagion, and that the observation of others' positive experiences constitutes a positive experience for people.**

computer-mediated communication | social media | big data

demonstrated that (*i*) emotional contagion occurs via text-based computer-mediated communication (7); (*ii*) contagion of psychological and physiological qualities has been suggested based on correlational data for social networks generally (7, 8); and (*iii*) people's emotional expressions on Facebook predict friends' emotional expressions, even days later (7) (although some shared experiences may in fact last several days). To date, however, there is no experimental evidence that emotions or moods are contagious in the absence of direct interaction between experiencer and target.

On Facebook, people frequently express emotions, which are later seen by their friends via Facebook's "News Feed" product (8). Because people's friends frequently produce much more content than one person can view, the News Feed filters posts, stories, and activities undertaken by friends. News Feed is the primary manner by which people see content that friends share. Which content is shown or omitted in the News Feed is determined via a ranking algorithm that Facebook continually develops and tests in the interest of showing viewers the content they will find most relevant and engaging. One such test is reported in this study: A test of whether posts with emotional content are more engaging.

The experiment manipulated the extent to which people ($N$ = 689,003) were exposed to emotional expressions in their News Feed. This tested whether exposure to emotions led people to

# Online experiments

## Design and results

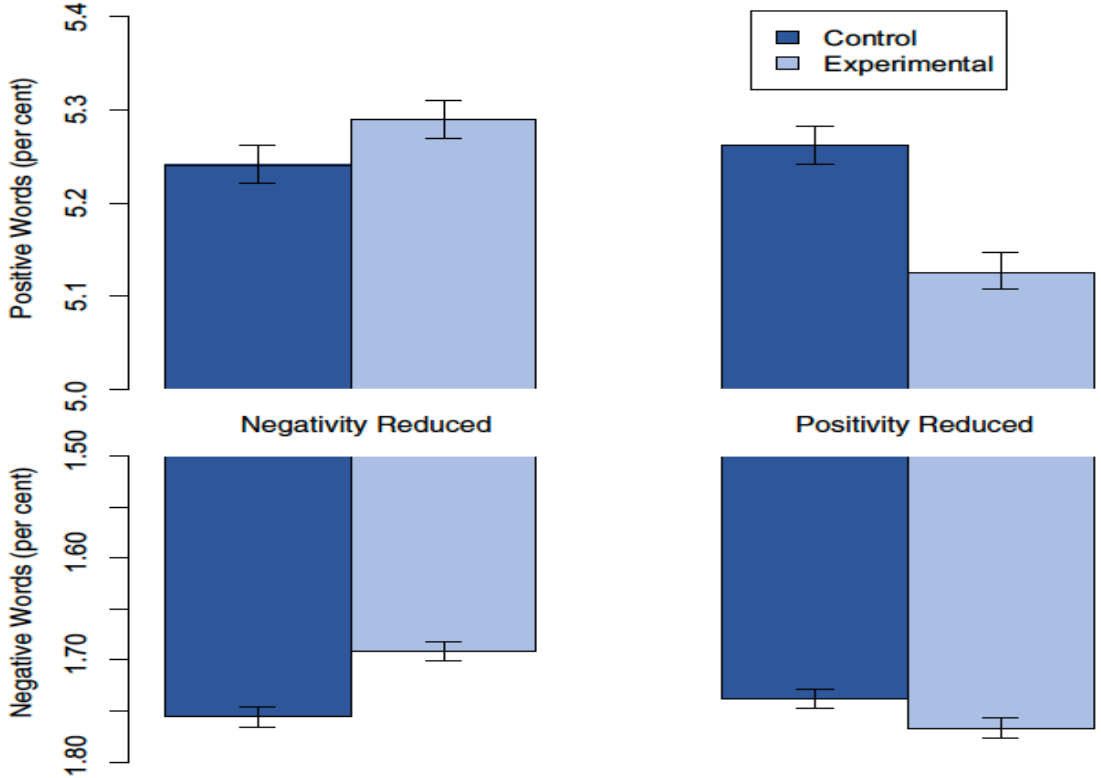



**Fig. 1.** Mean number of positive (*Upper*) and negative (*Lower*) emotion words (percent) generated people, by condition. Bars represent standard errors.

# Online experiments

## Reactions


https://www.cbsnews.com/news/controversial-facebook-emotion-study-journal-responds/

# Online experiments

## Reactions

### Editorial Expression of Concern and Correction

**PSYCHOLOGICAL AND COGNITIVE SCIENCES**

PNAS is publishing an Editorial Expression of Concern regarding the following article: "Experimental evidence of massive-scale emotional contagion through social networks," by Adam D. I. Kramer, Jamie E. Guillory, and Jeffrey T. Hancock, which appeared in issue 24, June 17, 2014, of *Proc Natl Acad Sci USA* (111:8788–8790; first published June 2, 2014; 10.1073/pnas.1320040111). This paper represents an important and emerging area of social science research that needs to be approached with sensitivity and with vigilance regarding personal privacy issues.

Questions have been raised about the principles of informed consent and opportunity to opt out in connection with the research in this paper. The authors noted in their paper, "[The work] was consistent with Facebook's Data Use Policy, to which all users agree prior to creating an account on Facebook, constituting informed consent for this research." When the authors prepared their paper for publication in PNAS, they stated that: "Because this experiment was conducted by Facebook, Inc. for internal purposes, the Cornell University IRB [Institutional Review Board] determined that the project did not fall under Cornell's Human Research Protection Program." This statement has since been confirmed by Cornell University.

Obtaining informed consent and allowing participants to opt out are best practices in most instances under the US Department of Health and Human Services Policy for the Protection of Human Research Subjects (the "Common Rule"). Adherence to the Common Rule is PNAS policy, but as a private company Facebook was under no obligation to conform to the provisions of the Common Rule when it collected the data used by the authors, and the Common Rule does not preclude their use of the data. Based on the information provided by the authors, PNAS editors deemed it appropriate to publish the paper. It is nevertheless a matter of concern that the collection of the data by Facebook may have involved practices that were not fully consistent with the principles of obtaining informed consent and allowing participants to opt out.

Inder M. Verma
*Editor-in-Chief*

**PSYCHOLOGICAL AND COGNITIVE SCIENCES**

Correction for "Experimental evidence of massive-scale emotional contagion through social networks," by Adam D. I. Kramer, Jamie E. Guillory, and Jeffrey T. Hancock, which appeared in issue 24, June 17, 2014, of *Proc Natl Acad Sci USA* (111:8788–8790; first published June 2, 2014; 10.1073/pnas.1320040111).

The authors note that, "At the time of the study, the middle author, Jamie E. Guillory, was a graduate student at Cornell University under the tutelage of senior author Jeffrey T. Hancock, also of Cornell University (Guillory is now a postdoctoral fellow at Center for Tobacco Control Research and Education, University of California, San Francisco, CA 94143)." The author and affiliation lines have been updated to reflect the above changes and a present address footnote has been added. The online version has been corrected.

The corrected author and affiliation lines appear below.

**Adam D. I. Kramer[a,1], Jamie E. Guillory[b,2], and Jeffrey T. Hancock[b,c]**

[a]Core Data Science Team, Facebook, Inc., Menlo Park, CA 94025; and Departments of [b]Communication and [c]Information Science, Cornell University, Ithaca, NY 14853

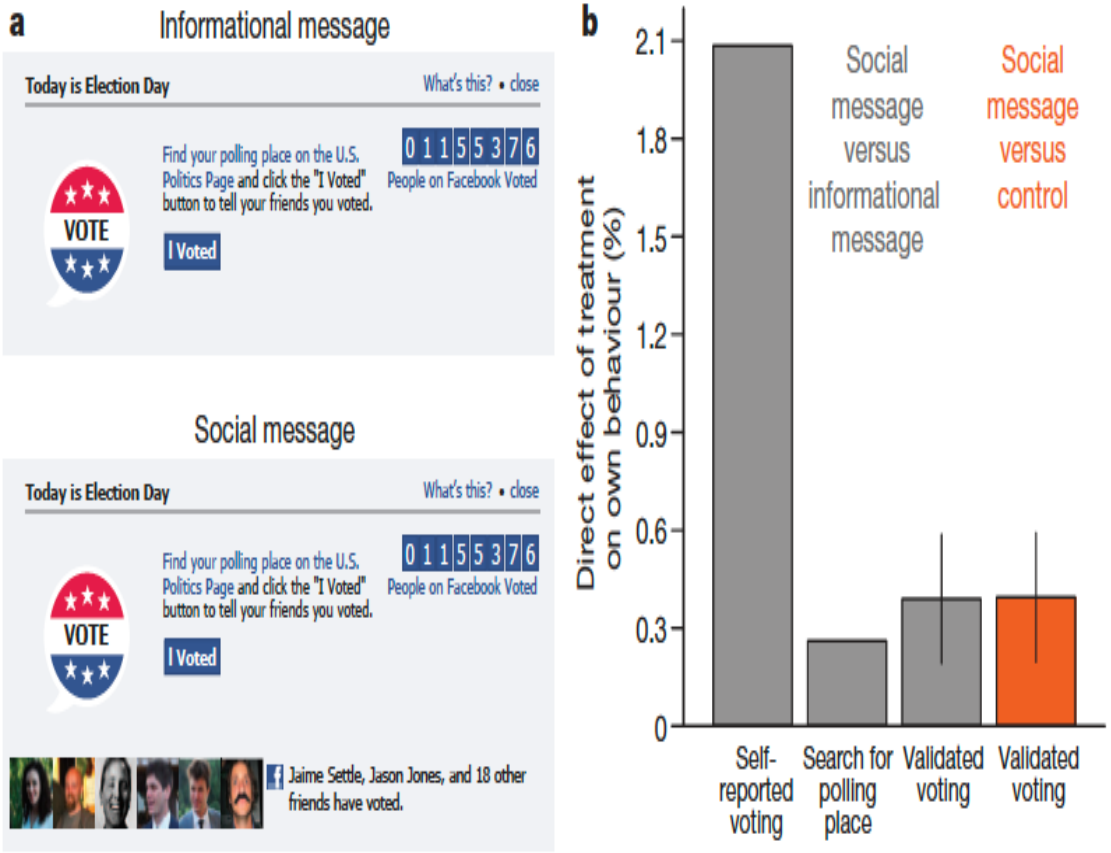
[1]To whom correspondence should be addressed. Email: akramer@fb.com.

[2]Present address: Center for Tobacco Control Research and Education, University of California, San Francisco, CA 94143.

www.pnas.org/cgi/doi/10.1073/pnas.1412583111

# Online experiments

## Facebook and voter turnout




Bond, Robert M., Christopher J. Fariss, Jason J. Jones, Adam D. I. Kramer, Cameron Marlow, Jaime E. Settle, and James H. Fowler. 2012. "A 61-Million-Person Experiment in Social Influence and Political Mobilization." *Nature* 489 (7415): 295–98. https://doi.org/10.1038/nature11421.

# Online experiments

## Methods: Using existing environments

- Researchers can use platforms to create their own experiments
  - e.g. Doleac and Stein (2013) used different pictures on Craigslist to measure discrimination
  - e.g. van de Rijt et al. (2014) randomly donated to Kickstarters, upvoted reviews, awarded Wikipedia contributers, and signed petitions to study the Matthew Effect
  - e.g. Munger (2017) used a Twitter "bot" to measure the effect of sanctions on racial harassment

# Online experiments

## Countering hate speech on Twitter

Polit Behav
DOI 10.1007/s11109-016-9373-5

ORIGINAL PAPER

### Tweetment Effects on the Tweeted: Experimentally Reducing Racist Harassment

Kevin Munger[1]

# Online experiments

## Design and experimental manipulation


**Fig. 3** Treatments. **a** The treatment—black bot. **b** The bot applying the treatment—white bot

# Online experiments

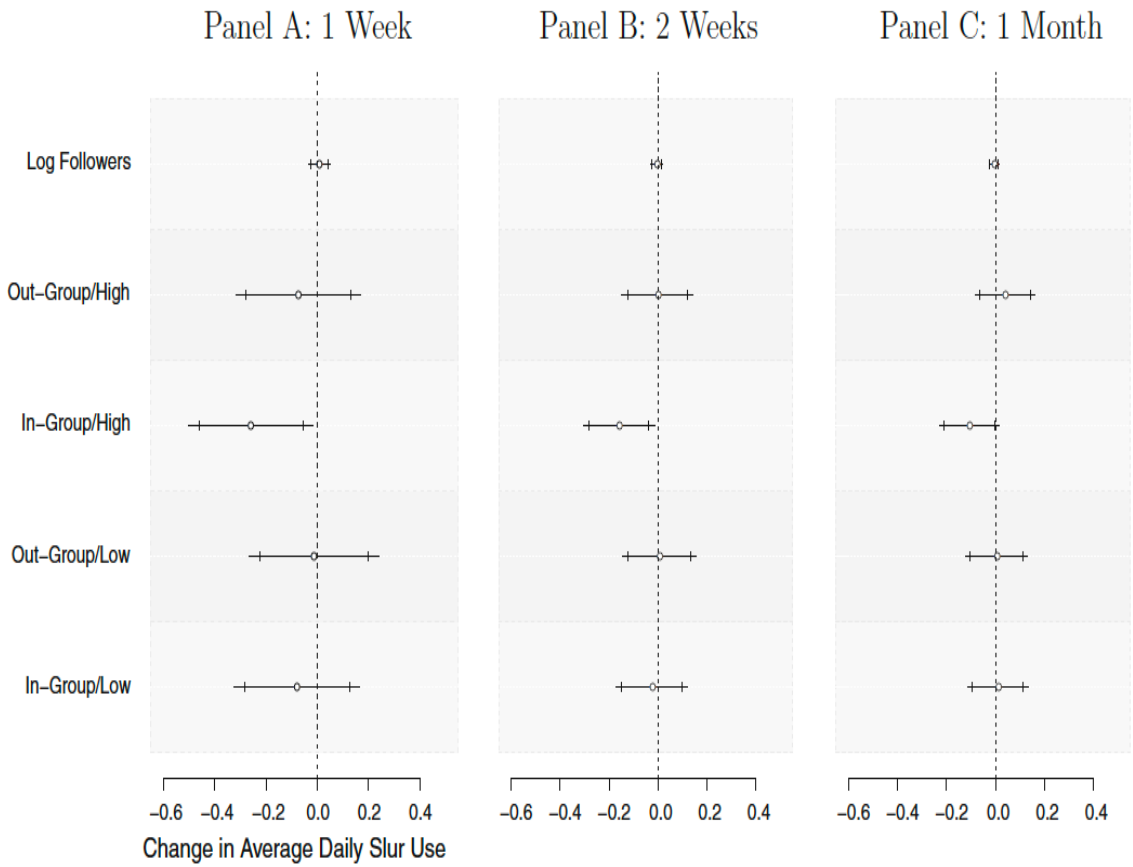
## Hypotheses

**Table 1** Experimental design and hypothesized effect sizes

| | In-group | Out-group |
|---|---|---|
| Low followers | Medium effect | Small effect |
| High followers | Large effect | Medium effect |

# Online experiments

## Results



# Online experiments

## Methods: Digital labs

- Create a virtual environment, fully controlled by the researcher
- High-cost (fixed costs associated with developing a platform)
- But high-rewards
- Zero variable cost experiments
  - Nobody wants to do a boring experiment for free; incentivize participation

# Online experiments

## The Music Lab Study

REPORTS

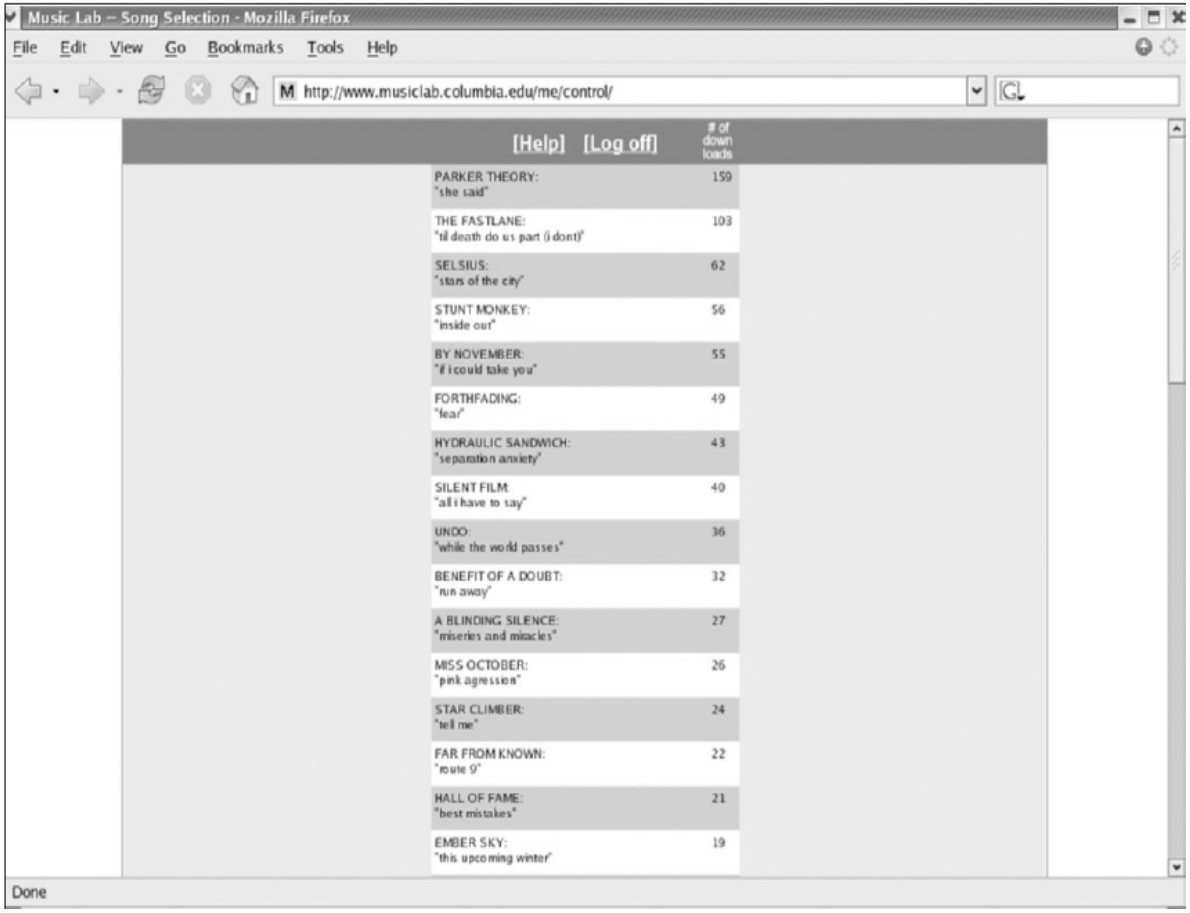
### Experimental Study of Inequality and Unpredictability in an Artificial Cultural Market

Matthew J. Salganik,[1,2]* Peter Sheridan Dodds,[2]* Duncan J. Watts[1,2,3]*

Hit songs, books, and movies are many times more successful than average, suggesting that "the best" alternatives are qualitatively different from "the rest"; yet experts routinely fail to predict which products will succeed. We investigated this paradox experimentally, by creating an artificial "music market" in which 14,341 participants downloaded previously unknown songs either with or without knowledge of previous participants' choices. Increasing the strength of social influence increased both inequality and unpredictability of success. Success was also only partly determined by quality: The best songs rarely did poorly, and the worst rarely did well, but any other result was possible.

# Online experiments

## The Music Lab Study



# Online experiments

## The Music Lab Study

Two on Culture

*Social Psychology Quarterly*
2008, Vol. 71, No. 4, 338–355

### Leading the Herd Astray: An Experimental Study of Self-fulfilling Prophecies in an Artificial Cultural Market

MATTHEW J. SALGANIK
*Princeton University*

DUNCAN J. WATTS
*Yahoo! Research and Columbia University*

*Individuals influence each others' decisions about cultural products such as songs, books, and movies; but to what extent can the perception of success become a "self-fulfilling prophecy"? We have explored this question experimentally by artificially inverting the true popularity of songs in an online "music market," in which 12,207 participants listened to and downloaded songs by unknown bands. We found that most songs experienced self-fulfilling prophecies, in which perceived—but initially false—popularity became real over time. We also found, however, that the inversion was not self-fulfilling for the market as a whole, in part because the very best songs recovered their popularity in the long run. Moreover, the distortion of market information reduced the correlation between appeal and popularity, and led to fewer overall downloads. These results, although partial and speculative, suggest a new approach to the study of cultural markets, and indicate the potential of web-based experiments to explore the social psychological origin of other macrosociological phenomena.*

# Online experiments

## Ethics

- Digital experimentation forces us to pay more attention to ethics
- Salganik proposes the "three R's"
  - *Replace* experiments with less invasive methods, where possible.
  - *Refine* treatment to reduce potential harm.
  - *Reduce* number of participants as much as possible.

# Online surveys

## Three eras of survey sampling

- Area probability sampling
  - Face-to-face interviews
- Random digit dialling
  - Phone interviews
- Non-probability sampling
  - Online surveys
    - Linked “big data”

# Online surveys

## Issues with online sampling

- No sampling frame
- Non-representative populations
- Selection bias (i.e. opt-in surveys)
- Violations of IID assumption violations (e.g. snowball sampling)

# Online surveys

## Forecasting elections with non-representative polls

Contents lists available at ScienceDirect

International Journal of Forecasting

journal homepage: www.elsevier.com/locate/ijforecast

### Forecasting elections with non-representative polls

Wei Wang [a,*], David Rothschild [b], Sharad Goel [b], Andrew Gelman [a,c]

[a] Department of Statistics, Columbia University, New York, NY, USA
[b] Microsoft Research, New York, NY, USA
[c] Department of Political Science, Columbia University, New York, NY, USA

ARTICLE INFO

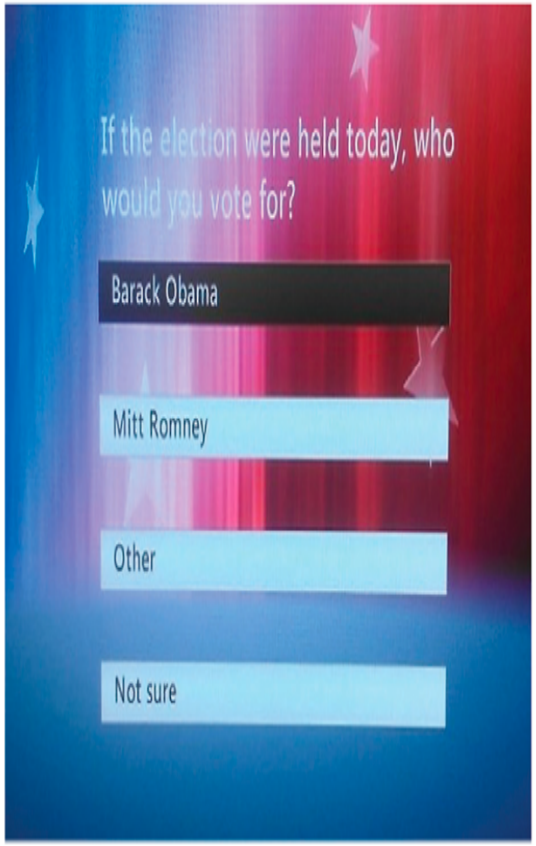
*Keywords:*
Non-representative polling
Multilevel regression and poststratification
Election forecasting

ABSTRACT

Election forecasts have traditionally been based on representative polls, in which randomly sampled individuals are asked who they intend to vote for. While representative polling has historically proven to be quite effective, it comes at considerable costs of time and money. Moreover, as response rates have declined over the past several decades, the statistical benefits of representative sampling have diminished. In this paper, we show that, with proper statistical adjustment, non-representative polls can be used to generate accurate election forecasts, and that this can often be achieved faster and at a lesser expense than traditional survey methods. We demonstrate this approach by creating forecasts from a novel and highly non-representative survey dataset: a series of daily voter intention polls for the 2012 presidential election conducted on the Xbox gaming platform. After adjusting the Xbox responses via multilevel regression and poststratification, we obtain estimates which are in line with the forecasts from leading poll analysts, which were based on aggregating hundreds of traditional polls conducted during the election cycle. We conclude by arguing that non-representative polling shows promise not only for election forecasting, but also for measuring public opinion on a broad range of social, economic and cultural issues.

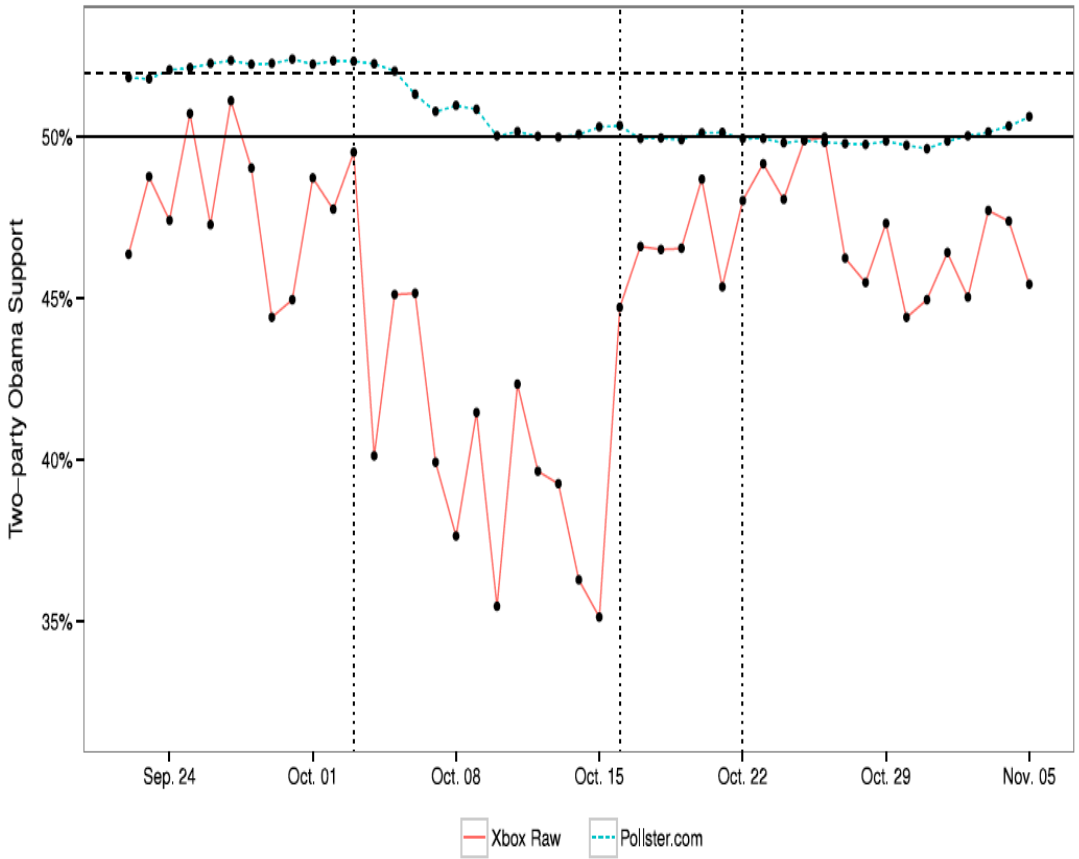
# Online surveys

## Survey design



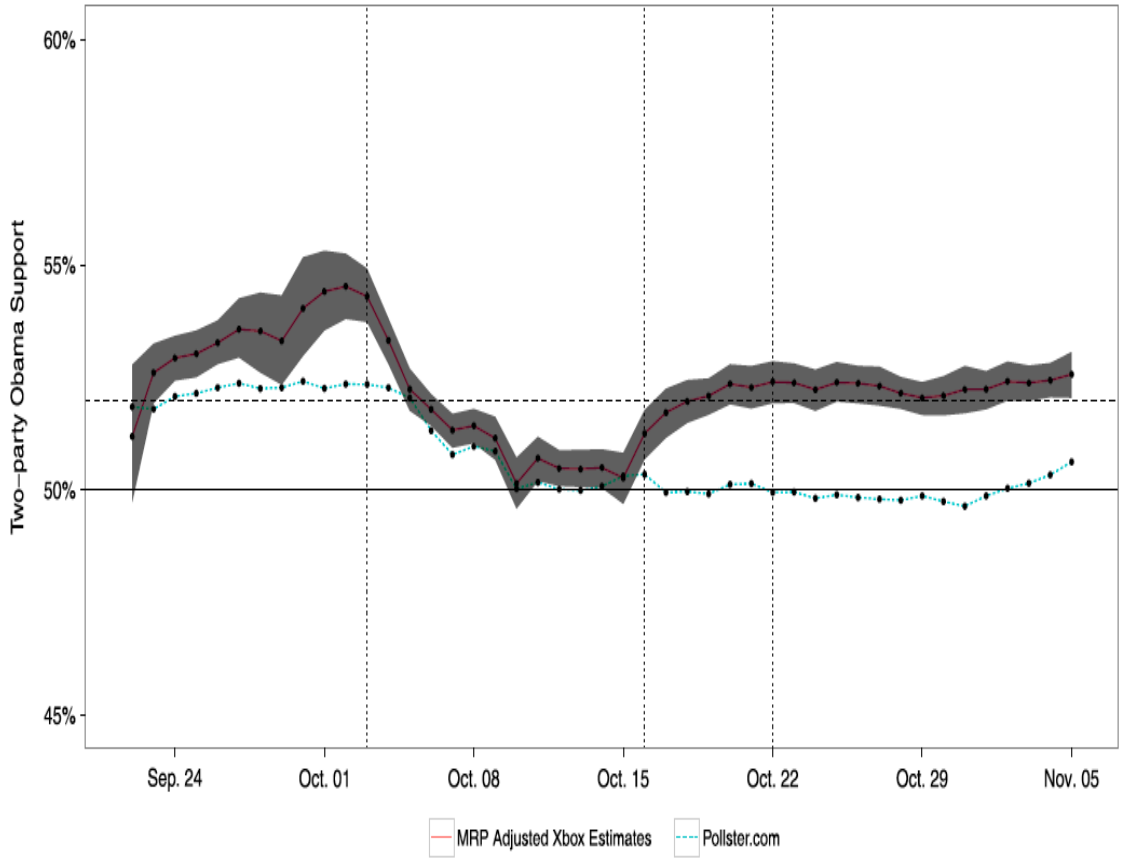

# Online surveys

## Polls before adjustment



# Online surveys

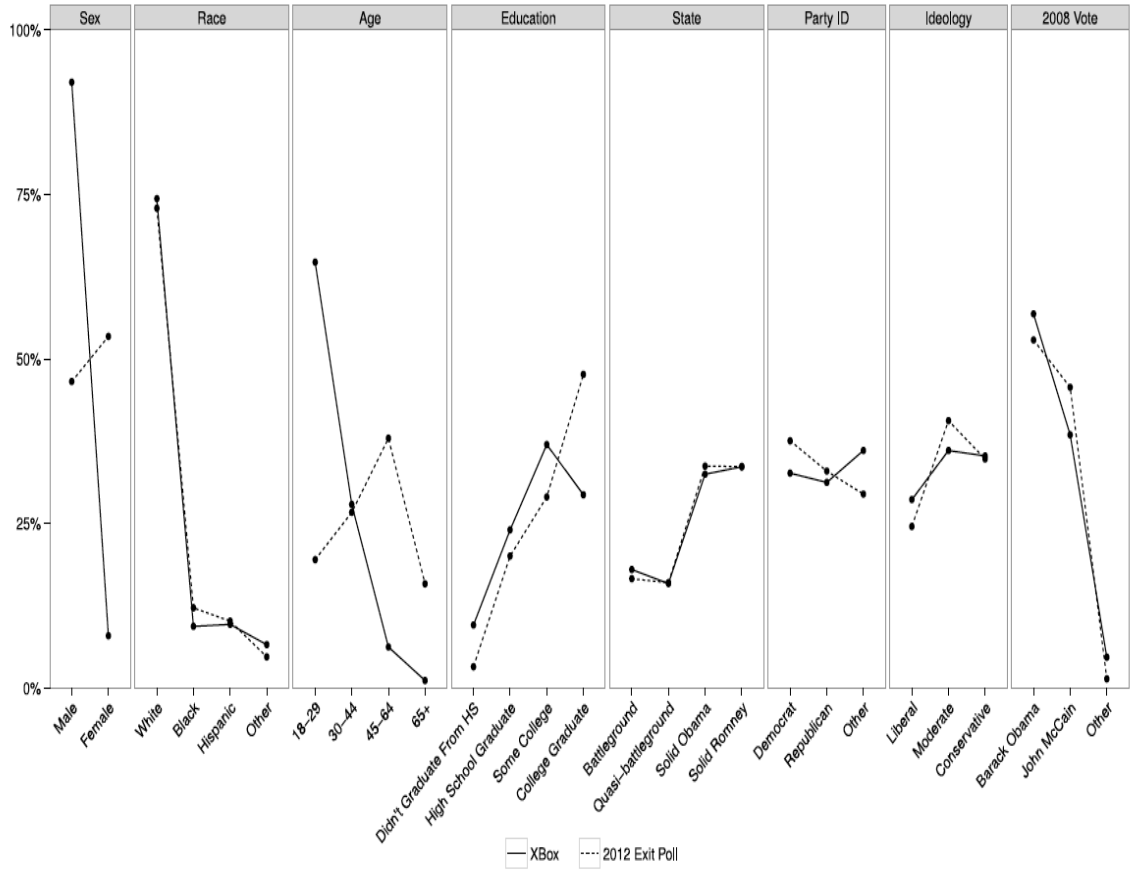
## Polls after adjustment




*Multilevel regression and post-stratification.* See Salganik 130-6 for mathematical intuition; Monica Alexander has a great MRP primer with R code.

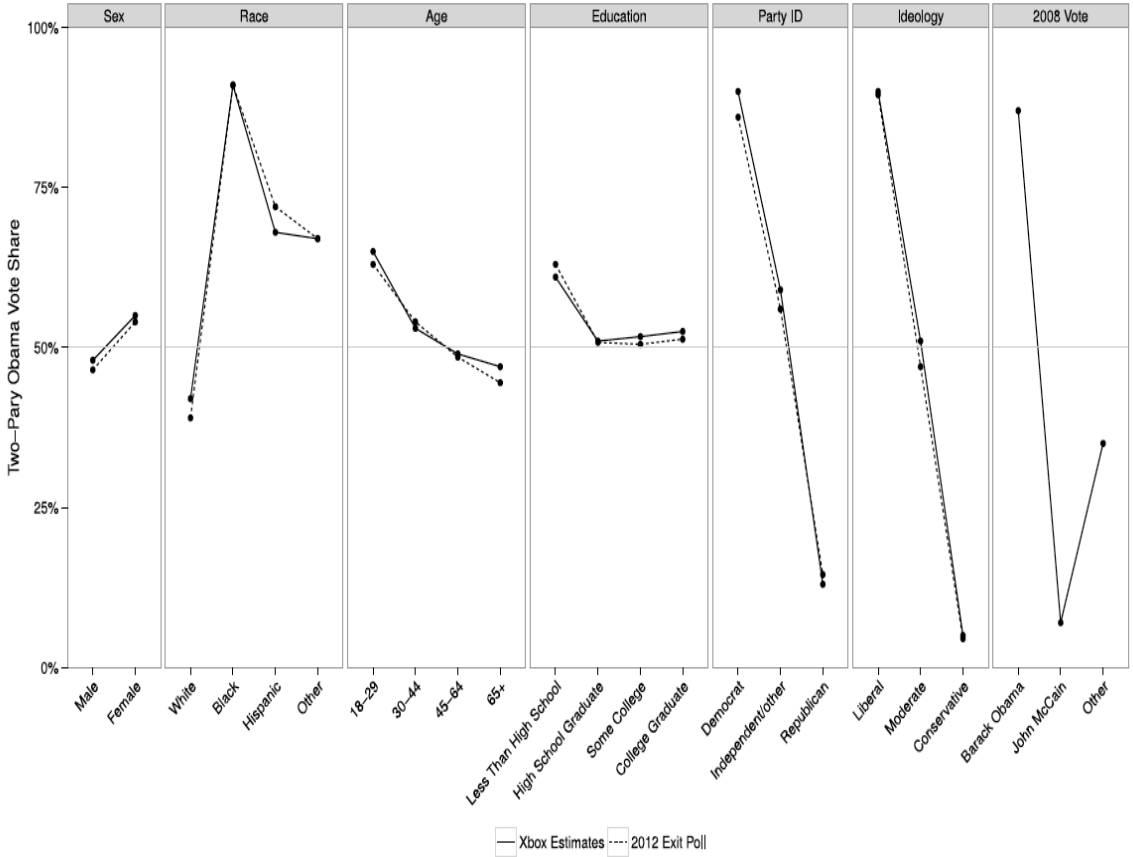
# Online surveys

## Demographics of Xbox users versus voters



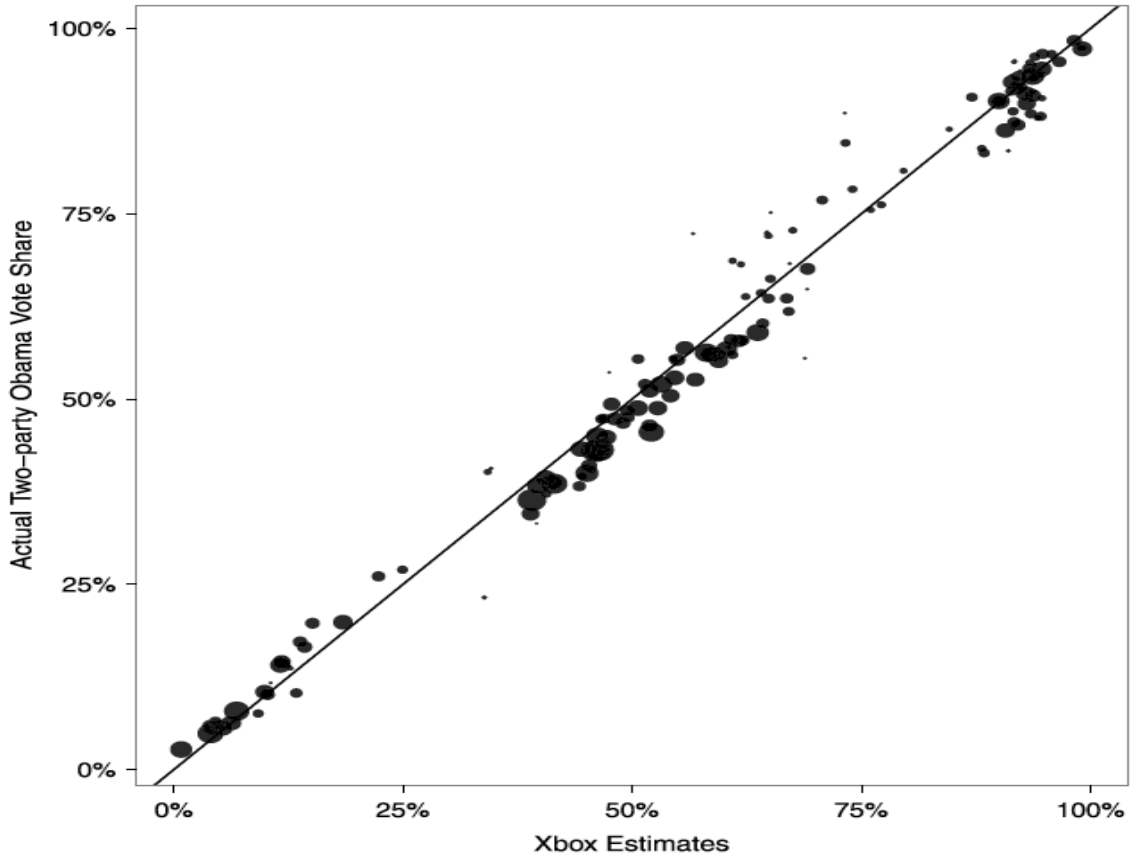
# Online surveys

## Population sub-group estimates



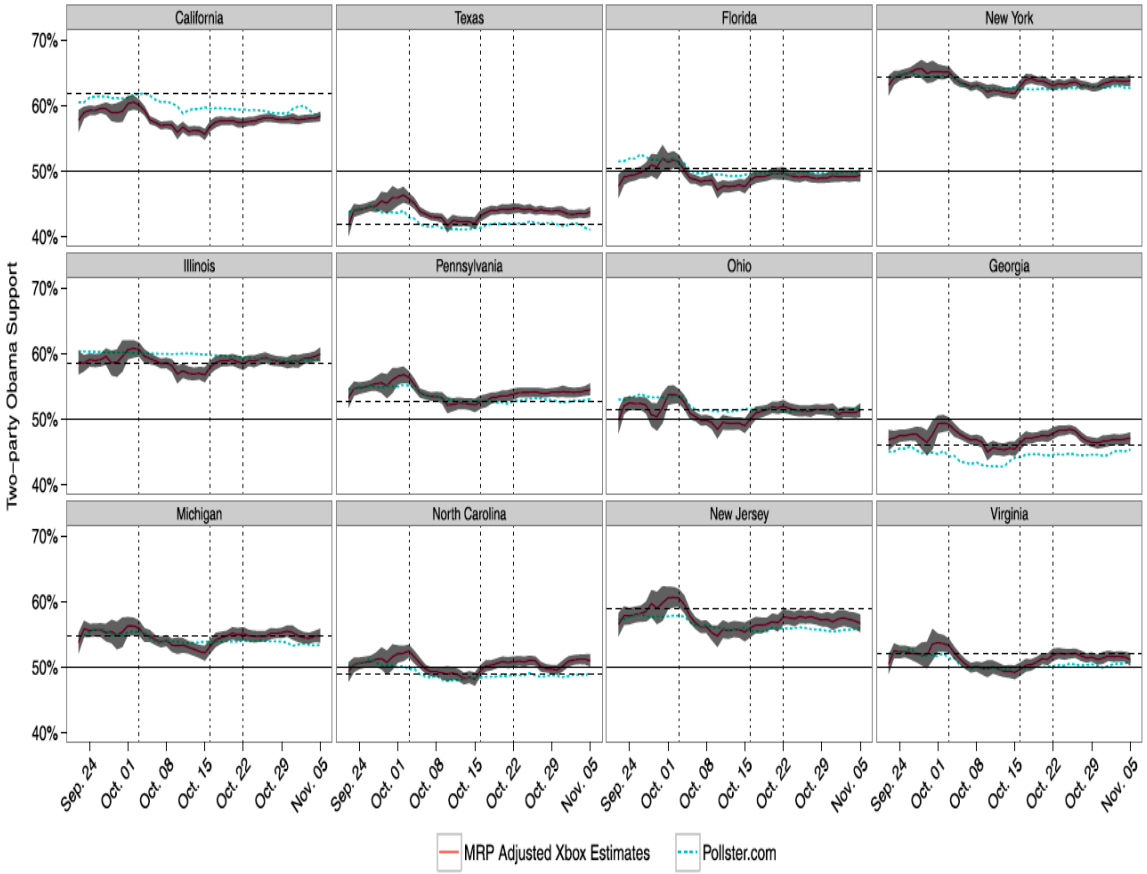
# Online surveys

## Errors



# Online surveys

## State-level estimates



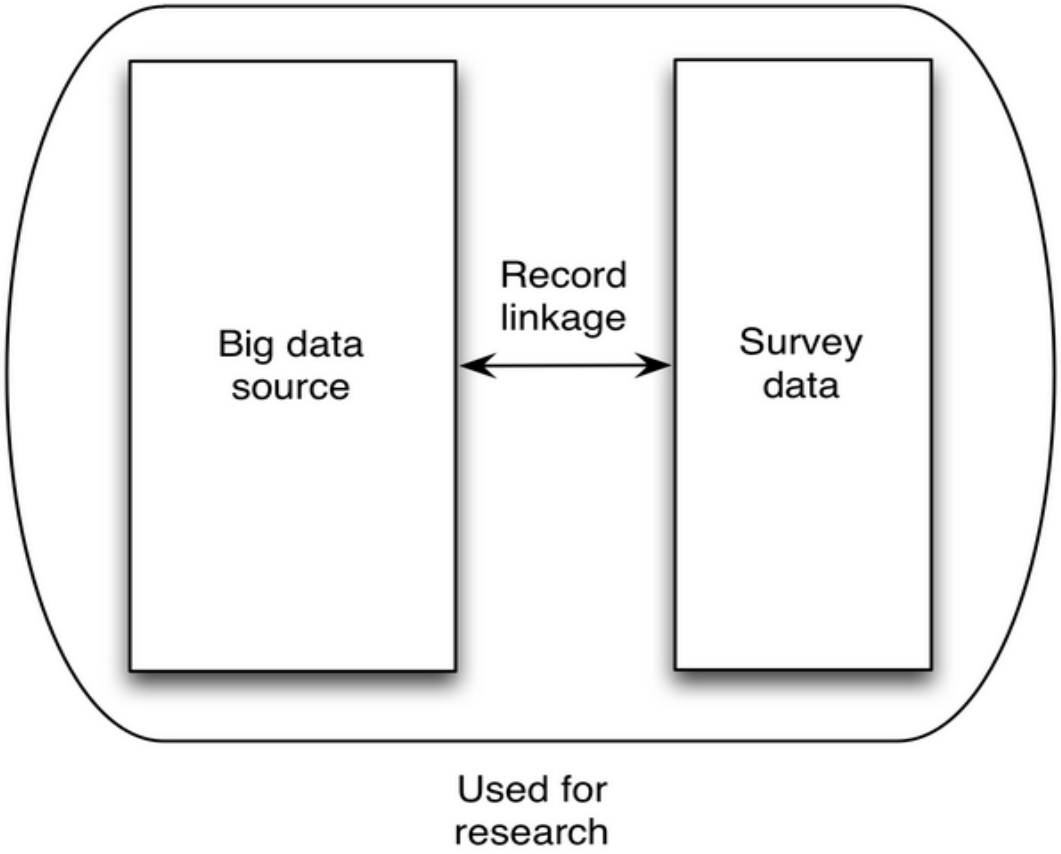
# Online surveys

## Working with non-probability samples

- Cheaper than fielding nationally-representative polls
- But more difficult to work with than conventional survey data
  - New statistical procedures and data sources non-probability sampling viable
    - Although MRP and other techniques have not been widely adopted by sociologists

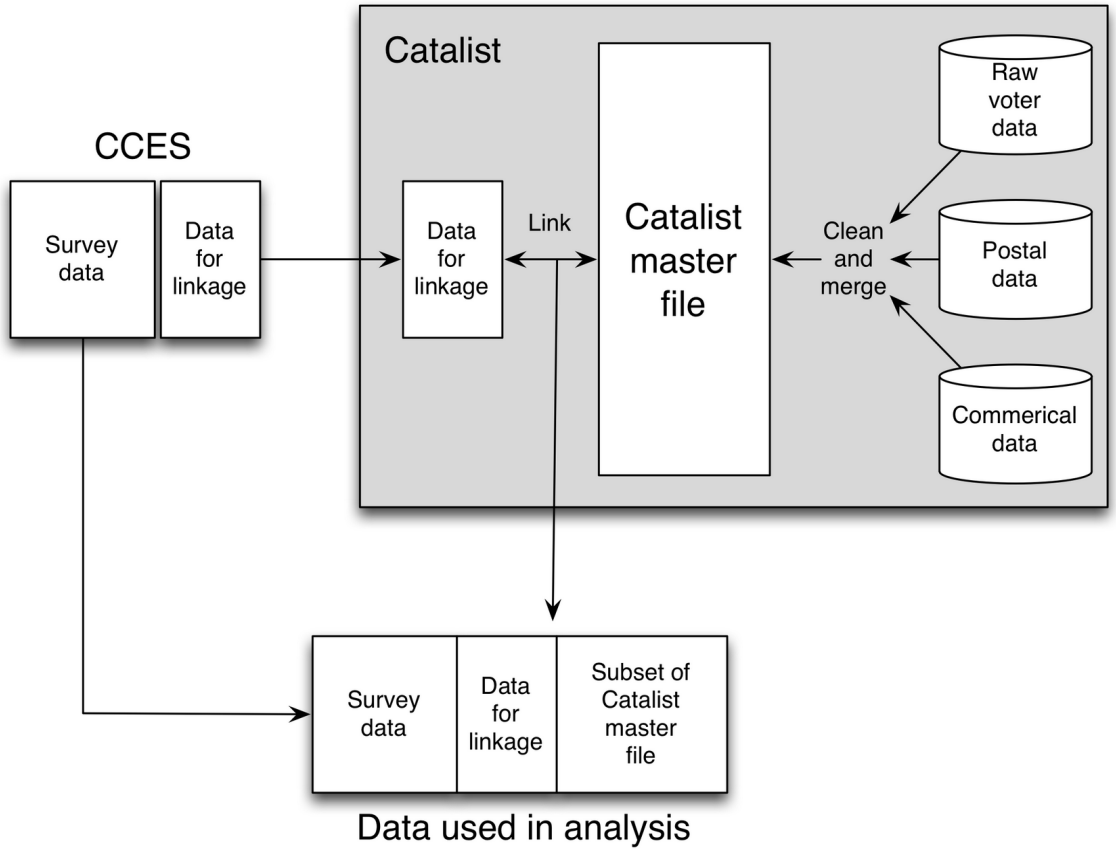
# Online surveys

## Record linkage / “enriched asking”



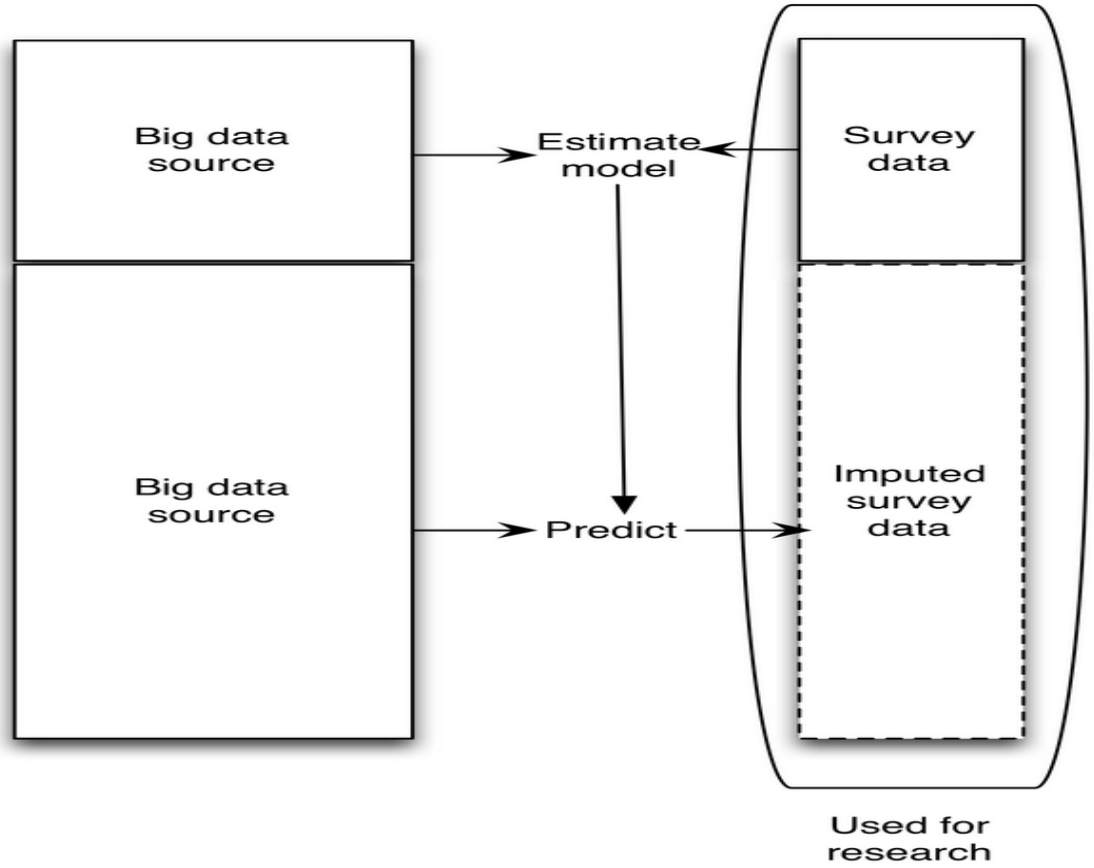
# Online surveys

## Enriched asking: voter behavior



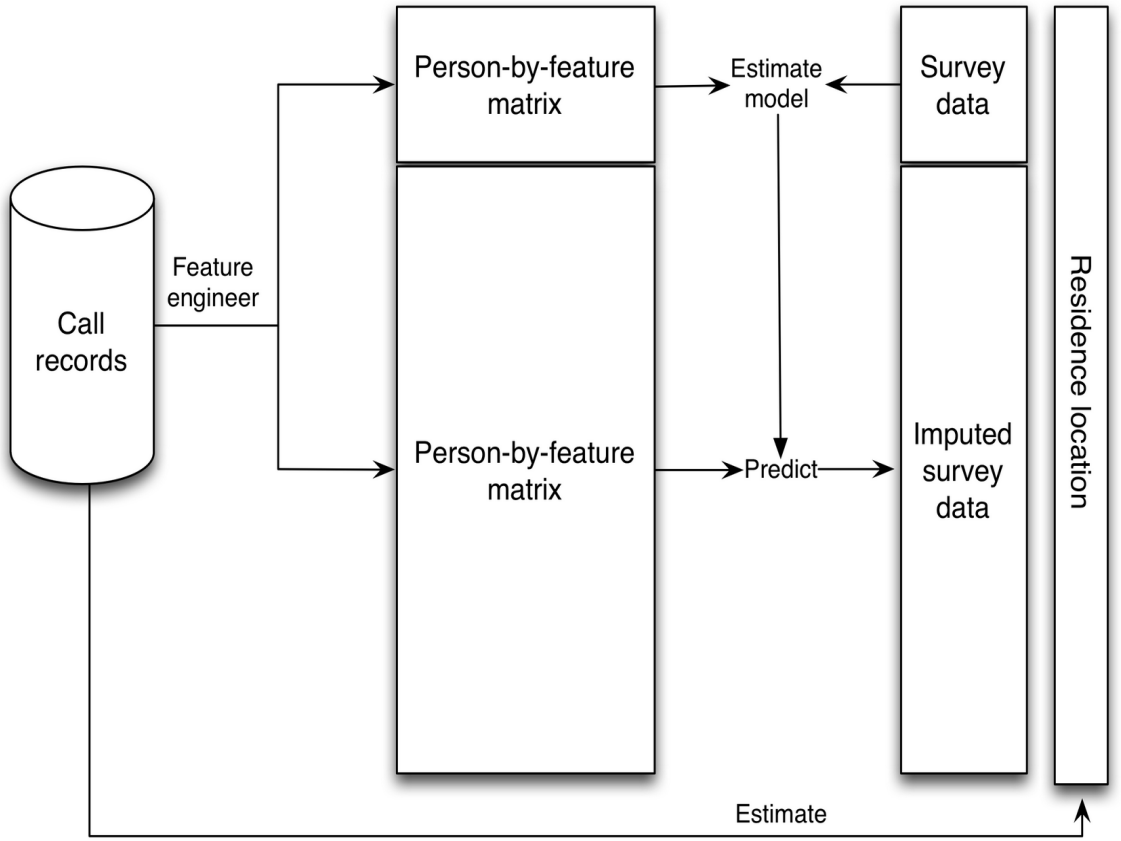
# Online surveys

## Big data imputation / "amplified asking"



# Online surveys

## Amplified asking: Mapping poverty in Rwanda



# Final thoughts

- New technologies and data sources allow us to reinvent existing methods
  - Innovative work combines social scientific approaches, statistics, and programming in new ways
- Digital experiments and surveys open up many opportunities for social scientific research
  - These methods come with more challenges and require different skills to conventional methods
  - We must think more about ethics, related to informed consent, affects on study participants, and implications of partnerships with other organizations

# Questions