Topics in Measurement for the Social and Health Sciences

Gary King
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(talk in “Foundations in Global Health” class, HSPH, 9/16/11)
Survey Research

Occasional snapshots, of random selections, of isolated individuals, from unknown geographic locations. Interpersonal incomparability, "non-opinions," Hawthorne effects, no direct connection to behavior. Crumbling foundation: overuse & cell phones → 90+% nonresponse. Web survey opportunity: marginal cost ≈ 0, but what about selection?

Aggregate Government (& other) Statistics

Highly aggregated over time and space. Individuals not identified. No investigator control. Dubious impartiality: Governments, newspapers, NGOs, etc.

One-off studies of individual places, people, or events do not scale, are not representative, do not measure long-term change.
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- In depth studies of individual places, people, or events

The Next 50 Years: Spectacular increases in new data sources, due to...
- Much more of the above — improved, expanded, and applied
- Shrinking computers & the growing Internet: data everywhere
- The replication movement: academic data sharing (e.g., Dataverse)
- Governments encouraging data collection, distribution, experimentation (e.g., GovData)
- Advances in statistical methods, informatics, & software
- The march of quantification: through academia, professions, government, & commerce (SuperCrunchers, The Numerati, MoneyBall)

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Examples of what’s now possible

Opinions of activists:

A few thousand interviews ⇝ millions of political opinions in social media posts (1B tweets/5 days)

Exercise:

A survey: “How many times did you exercise last week?”

⇝ 500K people carrying cell phones with accelerometers

Social contacts:

A survey: “Please tell me your 5 best friends”

⇝ continuous record of phone calls, emails, text messages, bluetooth, social media connections, electronic address books

Economic development in developing countries:

Dubious or nonexistent governmental statistics ⇝ satellite images of human-generated light at night, or networks of roads and other infrastructure

Expert-vs-Statistician contests:

Whenever enough information is quantified (& a right answer exists), stats wins every time

Many, many more...
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**Diet:**
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Some New Data Types

Unstructured text:
emails (1 LOC every 10 minutes), speeches, government reports, blogs, social media updates, web pages, newspapers, scholarly literature

Commercial activity:
credit cards, sales data, and real estate transactions, product RFIDs

Geographic location:
cell phones, Fastlane or EZPass transponders, garage cameras

Health information:
digital medical records, hospital admittances, google/MS health, and accelerometers and other devices being included in cell phones

Biological sciences:
effectively becoming social sciences as genomics, proteomics, metabolomics, and brain imaging produce huge numbers of person-level variables

Satellite imagery:
increasing in scope, resolution, and availability.

Electoral activity:
ballot images, precinct-level results, individual-level registration, primary participation, and campaign contributions
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Web surfing artifacts: clicks, searches, and advertising clickthroughs. (Google collects 1 petabyte/72 minutes on human behavior!)

Multiplayer web games and virtual worlds: Billions of highly controlled experiments on human behavior

Government bureaucracies: moving from paper to electronic data bases, increasing availability

Governmental policies: requiring more data collection, such e.g., "No Child Left Behind Act"; allowing randomized policy experiments; Obama pushing data distribution

Scholarly data: the replication movement in academia is massively increasing data sharing
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Enormous Emerging Opportunities for Social Scientists

For the first time: technologies, policies, data, and methods are making it feasible to attack some of the most vexing problems that afflict human society. A massive change from studying problems to understanding and solving problems. Opportunities require a change in our job descriptions, with new:

1. Computer-assisted methods: Traditional quantitative-only or qualitative-only approaches are infeasible.
2. Large-scale, interdisciplinary, collaborative research.
3. New statistical methods & engineering required.

And then there's you & me: In most legislatures, courts, academic departments, . . . , change comes from replacement not conversion. Will we wait to be replaced? or put in the effort to convert and learn how to use the new information?

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  4. Better theory: to respond to massive new evidence, privacy challenges, data-driven science
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One Approach to Improve Surveys: Anchoring Vignettes

- Interpersonal comparability
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- Can we be understood by a survey respondent if we can’t be understood by our spouse, siblings, and parents?
Readings on Anchoring Vignettes


The Importance of Survey Research

In political science: 1/2 of all quantitative articles
Other social sciences and related professional areas: Very widely used
A large fraction of our information base over the last half century
A multi-billion dollar industry
Of widespread public interest

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Examples of Interpersonal Incomparability

- **"How healthy are you? Excellent, Good, Fair, or Poor"**
  - Suppose an otherwise healthy 25-year-old woman with a cold and a backache answers "fair" and a 90-year-old man just able to get out of bed says "excellent". Is the young woman less healthy or are the two interpreting the same question differently?

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  - On 9/10/2001, 55% of Americans approved of the way George W. Bush was "handling his job as president". The next day — which the president spent in hiding — 90% approved. Was this massive opinion change, or was the same question interpreted differently?
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Anchoring Vignettes & Self-Assessments: Political Efficacy (about voting)

[Alison] lacks clean drinking water. She and her neighbors are supporting an opposition candidate in the forthcoming elections that has promised to address the issue. It appears that so many people in her area feel the same way that the opposition candidate will defeat the incumbent representative.

[Jane] lacks clean drinking water because the government is pursuing an industrial development plan. In the campaign for an upcoming election, an opposition party has promised to address the issue, but she feels it would be futile to vote for the opposition since the government is certain to win.

[Moses] lacks clean drinking water. He would like to change this, but he can't vote, and feels that no one in the government cares about this issue. So he suffers in silence, hoping something will be done in the future.

How much say [does ‘name’ / do you] have in getting the government to address issues that interest [him / her / you]?

(a) Unlimited say, (b) A lot of say, (c) Some say, (d) Little say, (e) No say at all
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Does $R_1$ or $R_2$ have More Political Efficacy?

- The only reason different respondents do not agree on vignette positions: Different standards
- Why assumptions hold: investigator creates Alison, Jane & Moses
A Simple, Nonparametric Method

Define self-assessments relative to vignettes:

(Special procedures for vignette ties and inconsistencies)
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- (Special procedures for vignette ties and inconsistencies)
Comparing China and Mexico
Opposition leader Vicente Fox elected President.
71-year rule of PRI party ends.
Peaceful transition of power begins.

Plenty of political efficacy
China: How much say do you have in getting the government to address issues that interest you?
The left graph is a histogram of the observed categorical self-assessments.

The right graph is a histogram of $C$, our nonparametric DIF-corrected estimate of the same distribution.
A Methodological Problem

For every question on your survey now: add 3-12 vignettes

Too expensive, especially for public health surveys in many countries.

A second method allows: vignettes asked of a small subset of respondents, or in a different survey
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Categorizing Years of Age

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<tr>
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<th>Respondent 2</th>
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<tbody>
<tr>
<td>90</td>
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<tr>
<td>80</td>
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<td>70</td>
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- If thresholds vary, categorical answers are meaningless.
- Our parametric model works by estimating the thresholds.
- Vignettes provide identifying information for the $\tau$’s.
Key Measurement Assumptions

1. **Response Consistency**: Each respondent uses the self-assessment and vignette categories in approximately the same way across questions. (DIF occurs across respondents, not across questions for any one respondent.)

2. **Vignette Equivalence**:
   - (a) The actual level for any vignette is the same for all respondents.
   - (b) The quantity being estimated exists.
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Self-Assessments v. Medical Tests

Self-Assessment:
In the last 30 days, how much difficulty did [you/name] have in seeing and recognizing a person you know across the road (i.e. from a distance of about 20 meters)?

(A) none, (B) mild, (C) moderate, (D) severe, (E) extreme/cannot do

The Snellen Eye Chart Test:
Gary King (IQSS)
Measurement
22 / 27
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```
 20/60
W E E M
E E M W W
M W M W E
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Vision

- Snellen Eye Chart ("gold standard")
- Standard Approach
- Anchoring Vignettes

Slovakian Eyesight Worse
Chinese Eyesight Worse
### Fixing DIF in Self-Assessments of Visual (Non)acuity

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**Direct applications**

- By Academic researchers: public health, medicine, political science, psychology, education, sociology, law, marketing research, economics.

**Survey Organizations:**
- World Health Organization in several waves in about 80 countries
- U.S. Government doing 120 surveys in 70 countries/year
- Major marketing research firms

**Methodological Developments**

- Statistics, political methodology, public health, econometrics
- Forging agreement when none seemed possible
- Privacy in the Information Age (National Research Council)
- Legal scholarship
- Formalizing Philosophy

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Gary King (IQSS)
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    - U.S. Government doing 120 surveys in 70 countries/year
    - major marketing research firms

- **Methodological Developments**
  - Statistics, political methodology, public health, econometrics

- **Forging agreement when none seemed possible**
  - Privacy in the Information Age (National Research Council)
  - Legal scholarship
  - Formalizing Philosophy
Conclusions

Our approach can fix DIF, if response consistency and vignette equivalence hold — and the survey questions are good.

Anchoring vignettes will not eliminate all DIF, but problems would have to occur at unrealistically extreme levels to make the unadjusted measures better than the adjusted ones.

Expense can be held down to a minimum by assigning each vignette to a smaller subsample. E.g., 4 vignettes asked for 1/4 of the sample each adds only one question/respondent.

Writing vignettes aids in the clarification and discovery of additional domains of the concept of interest — even if you do not do a survey.

We do not provide a solution for other common survey problems: Question wording, Accurate translation, Question order, Sampling design, Interview length, Social backgrounds of interviewer and respondent, etc.
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For More Information

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Includes:

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