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# Asking Sensitive Questions: Testing A New Alternative to the Randomized Response Technique

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The 2011 ASA Spring Methodology Conference at Tilburg University,
Mai 18 to 20

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# Sensitive Questions and Truthful Answers

- Challenge in survey research on sensitive topics: Getting a truthful answer to questions that have a clear socially desirable answer (e.g. 'No')
- For example, whether respondents…
  - …have evaded tax payments.
  - …have committed an act of violence.
  - …have cheated in exams.
  - …have plagiarized a research paper.
- Some respondents give no truthful ('Yes'-)answer because they fear consequences, deem it a too intrusive question or just feel uncomfortable answering truthfully (Tourangeau & Yan 2007).
- This leads to underestimation of the surveyed behavior (social desirability bias).

# Eliciting Truthful Answers to Sensitive Questions – No Easy Task with Direct Questioning (DQ)

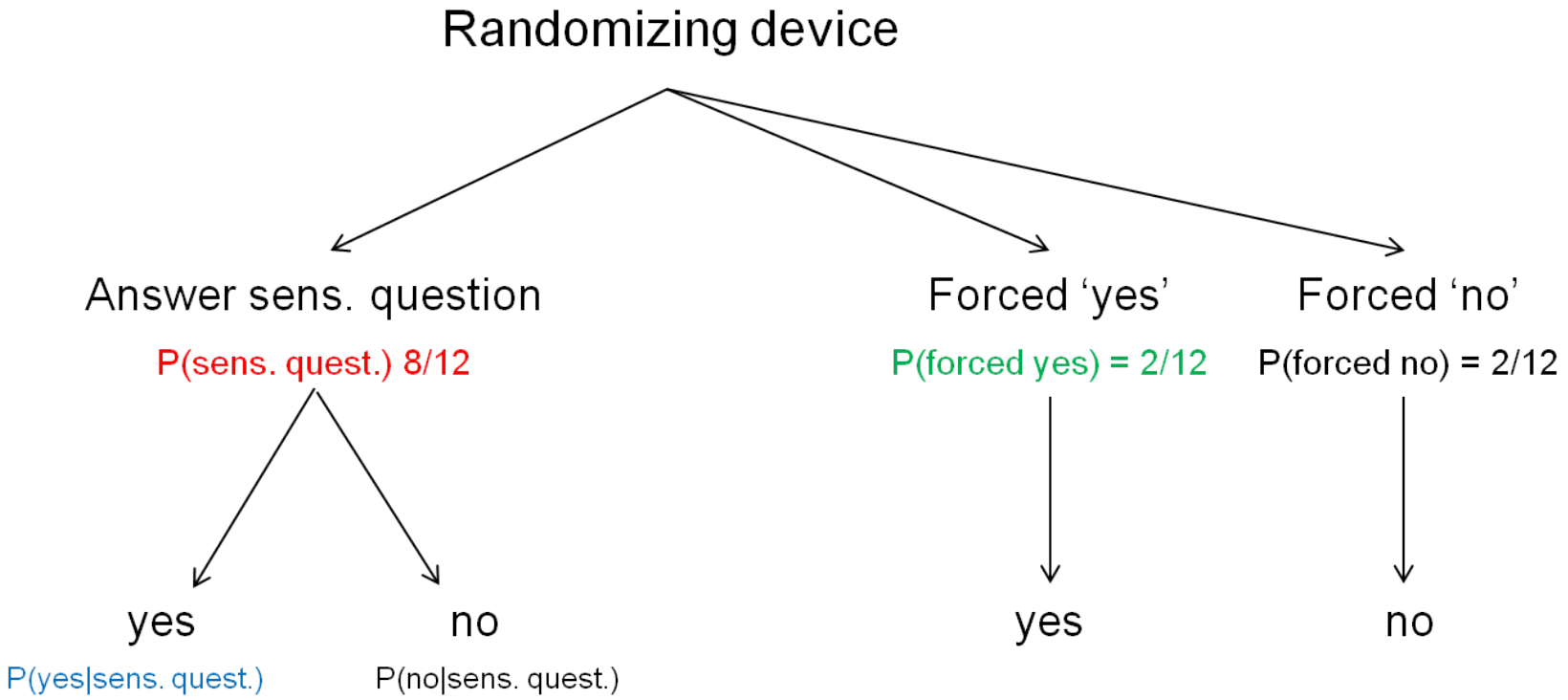
Share of respondents with false negative response ("liars") from validation studies:

- Penal conviction: 42.5% (F2F, Wolter 2010)
- Welfare and unemployment benefit fraud: 75% (F2F, van der Heijden et al. 2000)
- Driving under influence: 54% (P&P, Locander et al. 1976)
- Bankruptcy: 32% (Ibid.)

# An Indirect Approach: The Randomized Response Technique (RRT, forced response variant)

- Main principle: 100% privacy protection through randomization (‘random noise in the answering process’)
- A randomizing device, the outcome of which is only known to the respondent, decides whether…
  1. the sensitive question has to be answered truthfully
  2. a forced ‘yes’ has to be given
  3. a forced ‘no’ has to be given.

- An example: ≥




- Respondents give the true answer only with probability $P_{\text{sens. quest.}}<1$ (and a forced yes/no with $P_{\text{forced yes/no}}$).
- Therefore, a 'yes' could be the true answer to the sensitive Question ($P_{\text{yes|sens. quest.}}$) but it could also just be a forced 'yes' ($P_{\text{forced yes}}$).

# Critical Issues with RRT (forced response)

- Complicated procedure, low respondents' understanding of RRT's principle 'protection through randomization'.
- Reluctance of respondents to give a forced-yes (or a 'false' answer in general) (Edgell et al. 1982, Lensvelt-Mulders & Boeije 2007)
- Self-protective 'no'-bias (Jann, Jerke, Krumpal fc.)
- Seemingly bad performance in self-administered online-mode:
  - Lower prevalence estimates than DQ, even negative estimates (Böcherer et al. 2005, Holbrook & Krosnick 2010, Coutts & Jann 2011)
  - Not superior to DQ (but at least not worse…) (Coutts & Jann 2011, Peeters 2006, Snijders & Weesie 2008)

# A New Alternative: The Crosswise Model (Yu et al. 2008)

- Simple idea: Ask a sensitive question and a non-sensitive question and let the respondent indicate whether…
  - A: the answer is 'yes' to both questions or 'no' to both questions
  - B: the answer is 'yes' to one question and 'no' to the other question

| | | *non-sens. question* | |
|---|---|---|---|
| | | no | yes |
| *sens. question* | no | **A** | **B** |
| | yes | **B** | **A** |

- In either case (A,B) the researcher does not know whether a particular respondent's answer to the sens. question is 'yes' or 'no'.
- The prevalence of the non-sens. question must be unequal to 0.5 and known (furthermore, it must be independent of the sensitive question)
- Examples: ≥ ≥

# Prevalence Estimation for the Crosswise Model

- Let…
  - X be the sensitive question with $\pi = \Pr(X = \text{yes})$
  - Y be the non-sensitive question with $p = \Pr(Y = \text{yes})$
  - X and Y are independent: Cov(X,Y) = 0
- Prevalence for observed answer option A (‚same answers'):

$$\phi = p\pi + (1-p)(1-\pi)$$

- Prevalence estimate for yes to sensitive question:

$$\hat{\pi}_{CM} = \frac{\hat{\phi} + p - 1}{2p - 1}$$

- Variance for prevalence estimate:

$$\widehat{\text{Var}}(\hat{\pi}_{CM}) = \frac{\hat{\phi}(1-\hat{\phi})}{n(2p-1)^2}$$

➔ Note that, formally, the crosswise model is identical to Warner's RRT.

# Study A: Experimental Comparison of Crosswise vs. Direct Questioning (Jann, Jerke & Krumpal fc.)

- Paper & pencil classroom survey on plagiarism at different Universities:
  - ETH Zurich, University of Leipzig, LMU Munich, Spring/Summer 2009
  - Total sample size approx. 500 students
  - Experimental conditions:
    - ¼ direct questioning
    - ¾ crosswise model
  - Thanks to Norman Braun and Jochen Gross for supporting the data collection at LMU Munich

# Crosswise Item Study A

**Block 1**

1. Question: *Is your mother's birthday in January, February or March?*

2. Question: *When writing an assignment (e.g. seminar paper, term paper, thesis), have you ever intentionally adopted a passage from someone else's work without citing the original?*

**How are your answers to the two questions?**

- ☐ **(A)** ***No*** **to both questions or** ***Yes*** **to both questions**
- ☐ **(B)** ***Yes*** **to one of the two questions and** ***No*** **to the other one**

# Results Study A: Prevalence Estimates by Experimental Condition (in %)

| Exp. Condition | | Partial plagiarism | Severe plagiarism |
|---|---|---|---|
| 1 Direct questioning | | 7.3 | 1.0 |
| | *se* | *2.7* | *1.0* |
| | N | 96 | 96 |
| 2 Crosswise | | 22.3 | 1.6 |
| | *se* | *5.5* | *5.0* |
| | N | 310 | 310 |
| Difference | | 15.0 | .6 |
| | *se* | *6.1* | *5.1* |
| | N | 406 | 406 |

# Study B: Experimental Comparison of Crosswise vs. DQ vs. RRT

- Online survey on student cheating and plagiarism:
  - University of Bern, Switzerland, March/April 2011
  - Mailing to all 8'610 students
  - 2379 completed questionnaires ➔ response rate of 27.6%
  - Random, balanced assignment of respondents to different experimental conditions:
    1. Direct questioning
    2. RRT forced resp. "Number picking"
    3. RRT forced resp. "Virtual random wheel"
    4. RRT forced resp. innoc. question "Benford"
    5. Crosswise "Number picking"
    6. Crosswise "Innocuous question"

# Crosswise Item Study B

## Question Pair 1

**Question A:** Is your mother's birthday in January or February?
*(If you don't know, please take the birthday of another person you personally know.)*

**Question B:** Have you ever copied from a fellow student during an exam?

**Compare your answers to the two questions: Are the answers the same or different?**

- same *(both Yes or both No)*
- different *(one Yes, and the other No)*

# Results Study B: Prevalence Estimates by Experimental Condition (in %)

| Exp. condition | | Copying in exam | Cheat sheet in exam | Perf. enhancing drugs for exam | Partial plagiarism | Severe plagiarism |
|---|---|---|---|---|---|---|
| Direct Quest. | | 0.20 | 0.08 | 0.05 | 0.02 | 0.01 |
| | *SE* | *0.02* | *0.01* | *0.01* | *0.01* | *0* |
| | N | 393 | 393 | 392 | 288 | 289 |
| RRT forced resp. | | 0.21 | 0.10 | 0.00 | 0.03 | -0.01 |
| | *SE* | *0.02* | *0.02* | *0.02* | *0.02* | *0.02* |
| | N | 1139 | 1140 | 1137 | 836 | 835 |
| Crosswise | | 0.29 | 0.14 | 0.12 | 0.07 | 0.02 |
| | *SE* | *0.03* | *0.03* | *0.03* | *0.03* | *0.03* |
| | N | 765 | 767 | 760 | 564 | 562 |
| Difference CW - DQ | | 0.10 | 0.06 | 0.08 | 0.04 | 0.01 |
| | *SE* | *0.04* | *0.03* | *0.03* | *0.03* | *0.03* |
| | N | 1158 | 1160 | 1152 | 852 | 851 |
| Difference CW - RRT | | 0.08 | 0.04 | 0.12 | 0.04 | 0.03 |
| | *SE* | *0.04* | *0.03* | *0.03* | *0.04* | *0.04* |
| | N | 1904 | 1907 | 1897 | 1400 | 1397 |

# Results Study B: Prevalence Estimates for 2 Different Crosswise-Versions – NSQ & RD (in %)

| Exp. condition | | Copying in exam | Cheat sheet in exam | Perf. enhancing drugs for exam | Partial plagiarism | Severe plagiarism |
|---|---|---|---|---|---|---|
| Direct Quest. | prev. | 0.20 | 0.08 | 0.05 | 0.02 | 0.01 |
| | *SE* | *0.02* | *0.01* | *0.01* | *0.01* | *0* |
| | N | 393 | 393 | 392 | 288 | 289 |
| Crosswise_NSQ | prev. | 0.32 | 0.19 | 0.15 | 0.06 | 0.06 |
| (non-sensitive question version of | *SE* | *0.05* | *0.04* | *0.04* | *0.05* | *0.05* |
| Crosswise) | N | 384 | 384 | 378 | 281 | 280 |
| Crosswise_RD | prev. | 0.26 | 0.09 | 0.10 | 0.07 | -0.02 |
| (random-device version of Crosswise) | *SE* | *0.04* | *0.04* | *0.04* | *0.05* | *0.04* |
| | N | 381 | 383 | 382 | 283 | 282 |
| Difference CW_NSQ - DQ | | 0.13 | 0.10 | 0.10 | 0.04 | 0.05 |
| | *SE* | *0.05* | *0.05* | *0.05* | *0.05* | *0.05* |
| | N | 777 | 777 | 770 | 569 | 569 |
| Difference CW_RD - DQ | | 0.07 | 0.01 | 0.05 | 0.05 | -0.03 |
| | *SE* | *0.05* | *0.04* | *0.04* | *0.05* | *0.04* |
| | N | 774 | 776 | 774 | 571 | 571 |

# Conclusions

- Crosswise Model clearly outperforms DQ in both studies: **Respondents report significantly higher prevalence for sensitive behaviors with the Crosswise Model.**
- An exception are items with very low prevalence (plagiarism), where SE are just too high to estimate differences precisely.
- Also the Randomized Response Technique (RRT) in the forced response variant is sign. outperformed by the Crosswise Model in 2 of 5 cheating behaviors and always shows higher prevalence estimates (Study B).
- Contrary to RRT, Crosswise does not seem to suffer from the self-protective no-bias which leads to lower prevalence estimates in some cheating behaviors for the RRT compared to DQ.

# Conclusions

- The Crosswise Model, therefore, is a promising and probably superior alternative to RRT in self-administered modes such as P&P or Online.
- We also tested the Crosswise Model in a version with an (explicit) randomizing device instead of the non-sensitive question. However, the result for this variant of the Crosswise Model are somewhat less promising than for the non-sensitive question version of the Crosswise Model.
- Another survey is currently under way and will bring about more evidence to clarify whether this finding is robust.

# Thank you!

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