# Evaluating Special Techniques for Surveying Sensitive Topics: An Approach that Detects False Positives*

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Have you ever provided misleading or incorrect information on your tax return?

- Yes
- No

Did you vote in the 2012 US presidential election?

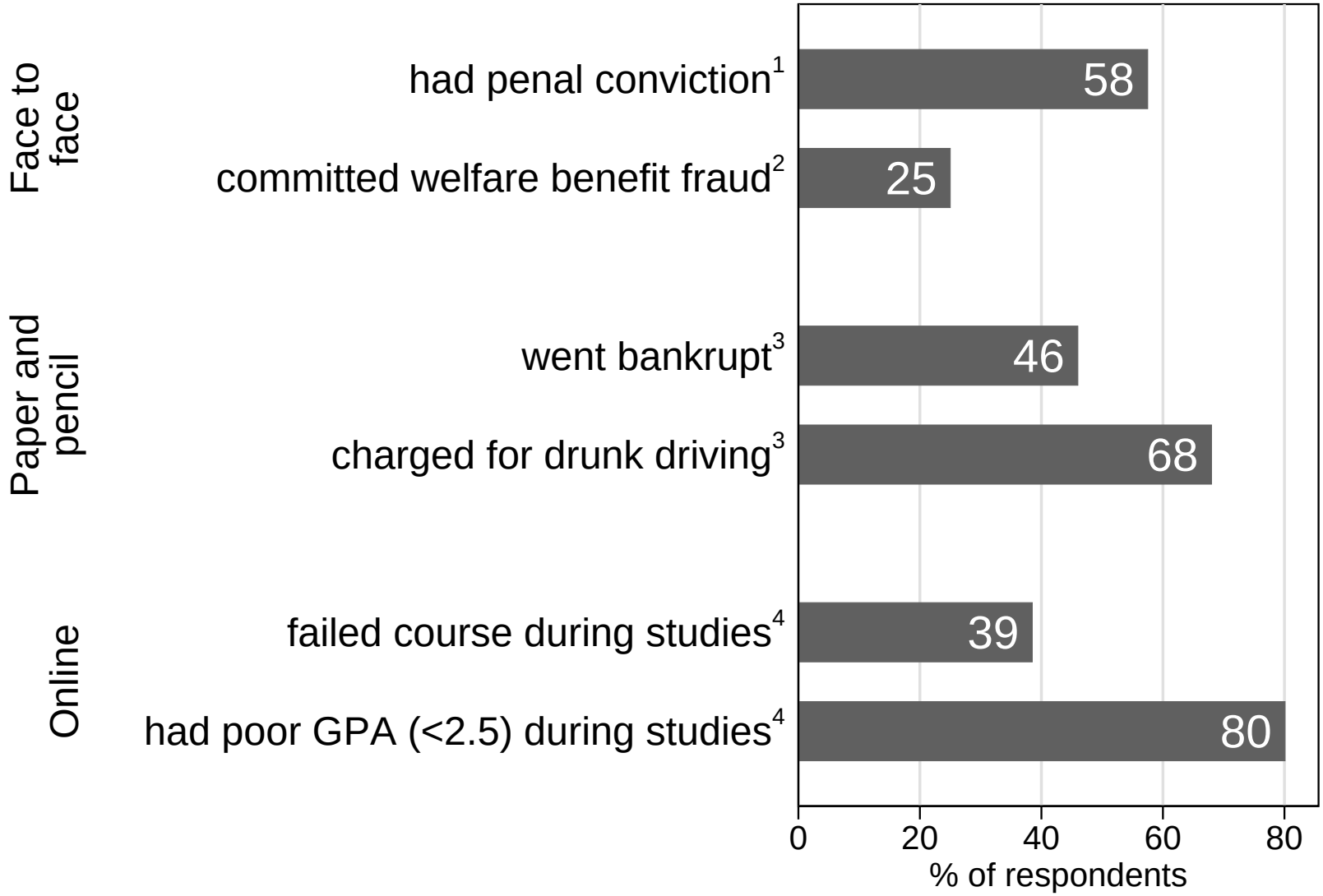
- Yes
- No

Have you ever intentionally taken something from a store without paying for it?

- Yes
- No

# Substantial Underreporting of Sensitive Behavior

Proportion of confirmed norm-breakers with truthful self-report (true rate = 100%)

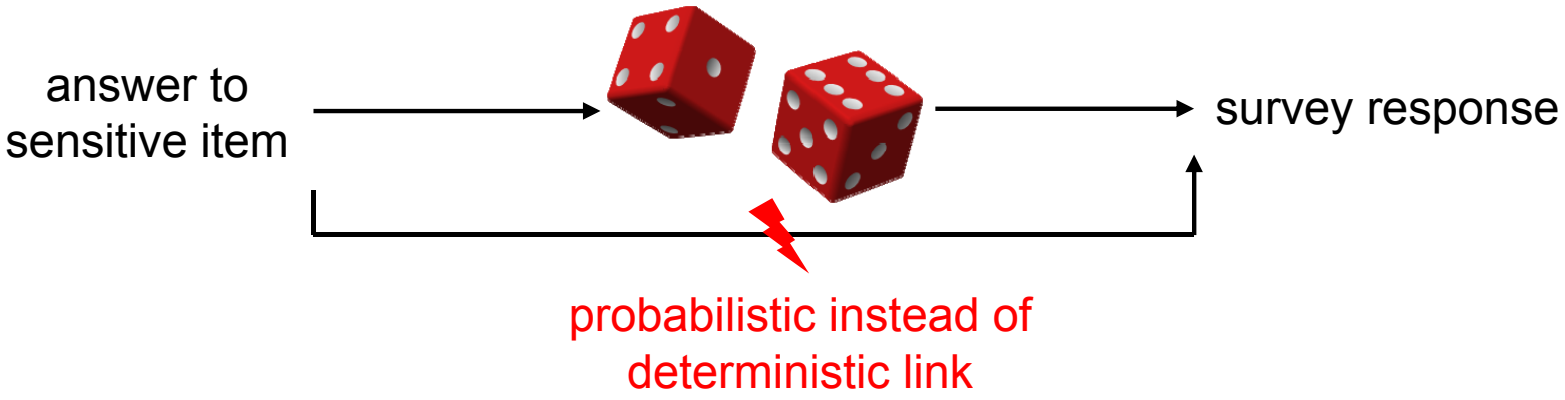



Results from validation studies:

[1] Wolter and Preisendörfer (2013)
[2] van der Heijden et al. (2000)
[3] Locander, Sudman, and Bradburn (1976)
[4] Kreuter, Presser, and Tourangeau (2008)

# The Randomized Response Technique (RRT)

- The RRT (Warner 1965) protects individual's answers with a randomization procedure.
  - random error is introduced in respondents' answers
  - no inference possible from an individual's survey response to her actual answer to the sensitive question
- in turn, respondents should answer (more) honestly




- To analyze RRT data the systematic error is taken into account by adjusting the response variable accordingly.

calculation

# The Crosswise-Model RRT (CM)

A recently proposed and seemingly promising new RRT variant (Yu, Tian, and Tang 2008)

**Question A:**

Is your mother's birthday in January or February?

*(If you do not know, please use the birth date of someone else you know.)*

**Question B:**

Have you ever received a donated organ (kidney, heart, part of a lung or liver, pancreas)?

Compare your responses to question A & B. Are they identical or different?

- identical
- different

# But, Does it Work? Validation Approaches

- Comparative validation
  - Prevalence estimates are compared under the more-is-better assumption: higher estimates are interpreted as more valid estimates
  - Tenable, if under-reporting, i.e. false negatives, is the only type of misreporting
  - Not tenable, if false positives occur, i.e. if respondents falsely admit sensitive behavior
- Aggregate validation
  - Prevalence estimates are compared to a known aggregate criterion such as official turnout rates (Rosenfeld, Imai, and Shapiro 2015)
  - No DQ as benchmark needed, but also relies on on-sided-lying assumption
- Individual-level validation
  - Self-reports are compared to observed/known behavior or traits at the individual level
  - Preferable, as it can identify false positives as well as false negatives
  - Very difficult to carry out.

# CM Judged Favorably in a Series of Comparative Validations:

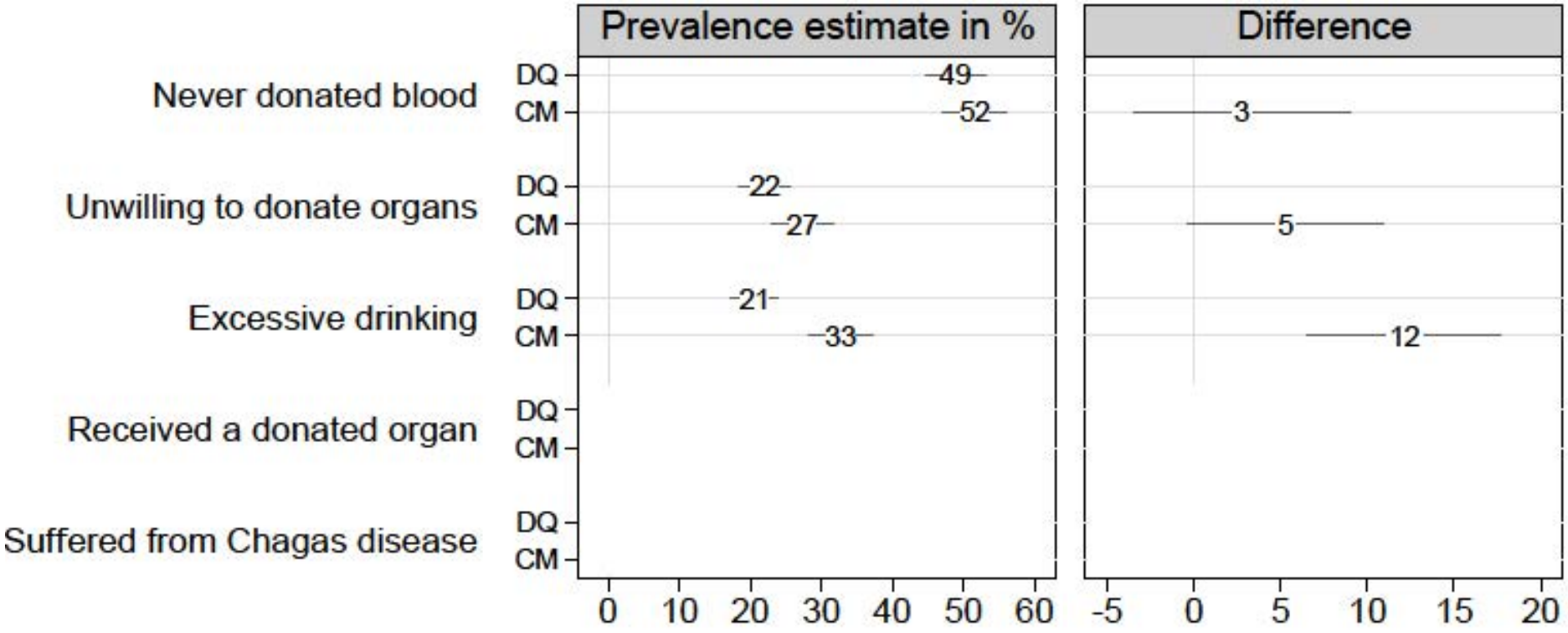
- Adrian Hoffmann and Jochen Musch. 2015. "Assessing the Validity of Two Indirect Questioning Techniques: A Stochastic Lie Detector versus the Crosswise Model". *Behav Res* (online first)
- Marc Höglinger, Ben Jann, and Andreas Diekmann. Forthcoming. "Sensitive Questions in Online Surveys: An Experimental Evaluation of the Randomized Response Technique and the Crosswise Model". *Survey Research Methods*
- Ben Jann, Julia Jerke, and Ivar Krumpal. 2012. "Asking Sensitive Questions Using the Crosswise Model. An Experimental Survey Measuring Plagiarism". *Public Opinion Quarterly* 76:32–49
- Martin Korndörfer, Ivar Krumpal, and Stefan C. Schmukle. 2014. "Measuring and Explaining Tax Evasion: Improving Self-Reports Using the Crosswise Model". *Journal of Economic Psychology* 45:18–32
- Mansour Shamsipour et al. 2014. "Estimating the Prevalence of Illicit Drug Use Among Students Using the Crosswise Model". *Substance Use & Misuse* 49:1303–1310
- Adrian Hoffmann et al. 2015. "A Strong Validation of the Crosswise Model Using Experimentally-Induced Cheating Behavior". *Experimental Psychology* 62:403–414
- Daniel W. Gingerich et al. 2015. "When to protect? Using the crosswise model to integrate protected and direct responses in surveys of sensitive behavior". *Political Analysis*: online first

# An Enhanced Comparative Validation Design That Detects Systematic False Positives

- Simple design, able to detect systematic false positives without the need of an individual-level criterion.
- Test for false positives with (near) zero-prevalence items:
  - *Have you ever received a donated organ (kidney, heart, part of a lung or liver, pancreas)?*
  - *Have you ever suffered from Chagas disease (Trypanosomiasis)?*
- If a sensitive question technique produces a non-zero estimate $\rightarrow$ false positives, "more-is-better" must be refuted
- Implemented in an online survey on organ donation and health in Germany ($N = 1,685$)

# Higher CM Estimates, But More-Is-Better Not Tenable

Crosswise-model produced clearly incorrect estimates for the two zero-prevalence items.



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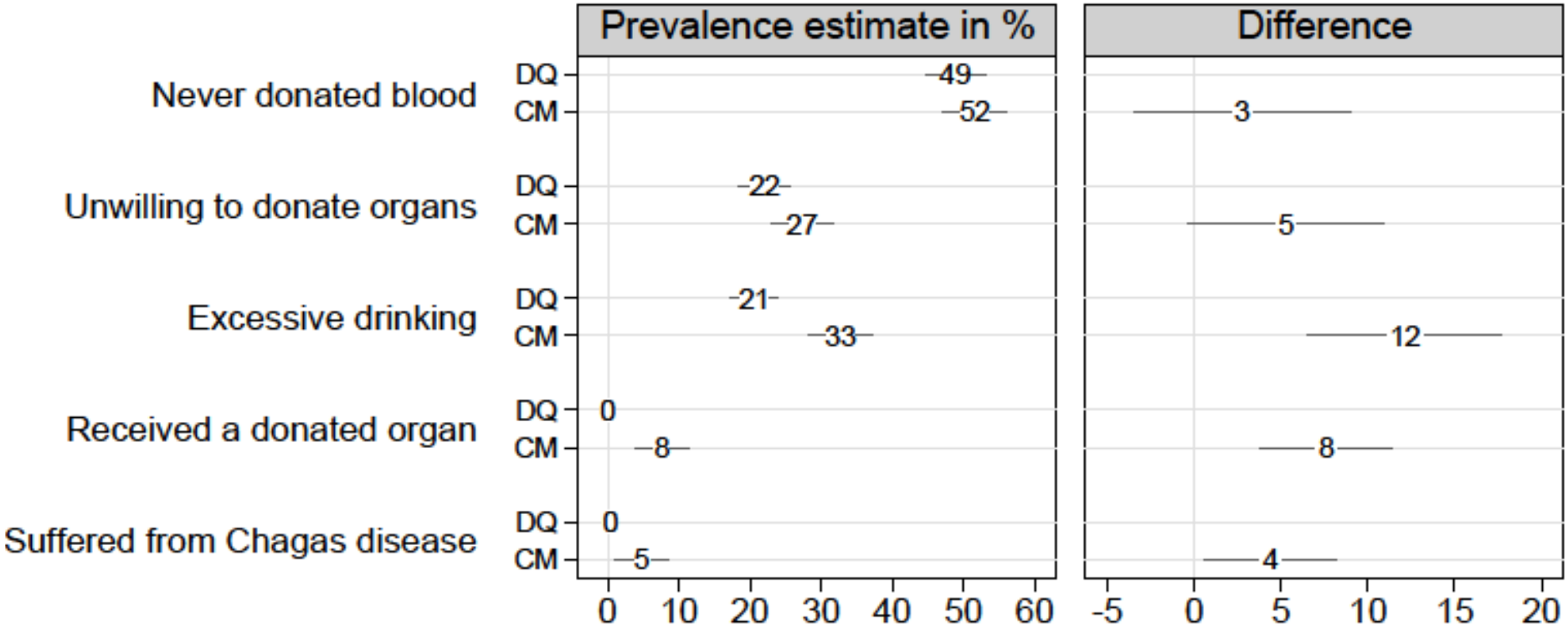


# Exploring Causes of False Positives

Not clearly related to any of our experimental manipulations. Correlates Simulations

Effects of CM implementation details on false positive rate

| | Percentage points change | SE |
|---|---|---|
| With "don't know" response option | -4.48 | (2.79) |
| Response order different - identical (vs. inverse) | -1.18 | (2.79) |
| Unrelated question on father (vs. mother) | -2.82 | (2.87) |
| Unrelated question on acquaintance (vs. mother) | 2.69 | (2.91) |
| Unrelated question on birthday (vs. birth month) | 2.04 | (2.73) |
| Yes-probability unrelated question .82 (vs. .18) | -2.10 | (2.79) |
| Item position (linear) | 0.09 | (0.96) |
| Item position 1st or 2nd (vs. 4th or 5th) | -1.54 | (3.77) |

*Notes:* Bivariate regressions on pooled responses to zero-prevalence items. Standard errors corrected for clustering in respondents. $N = 2,243$. $^{*}p < 0.05$

# Exploring Correlates of False Positives

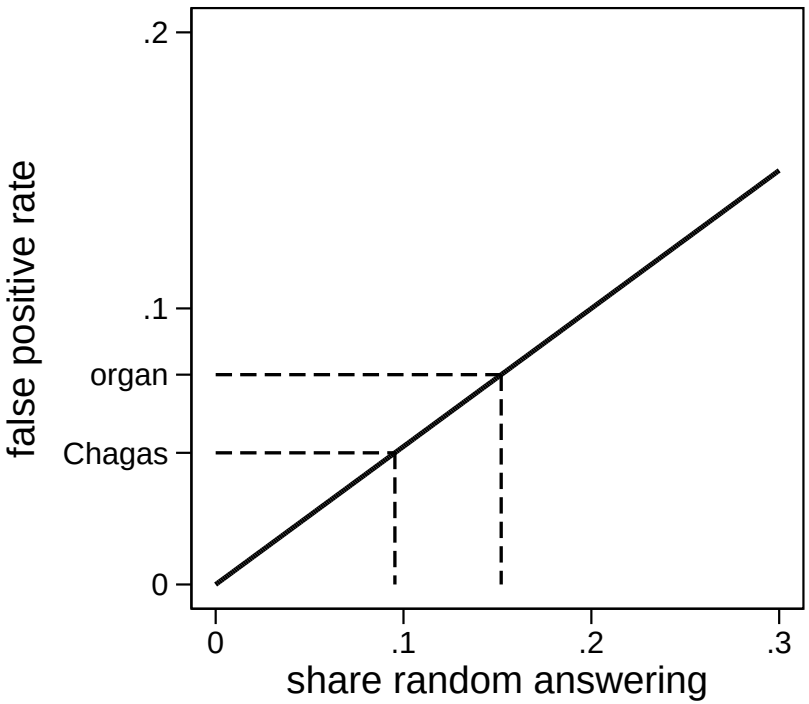
Positively associated with speeding through the CM explanation and with socially desirable responding (MC-scale).

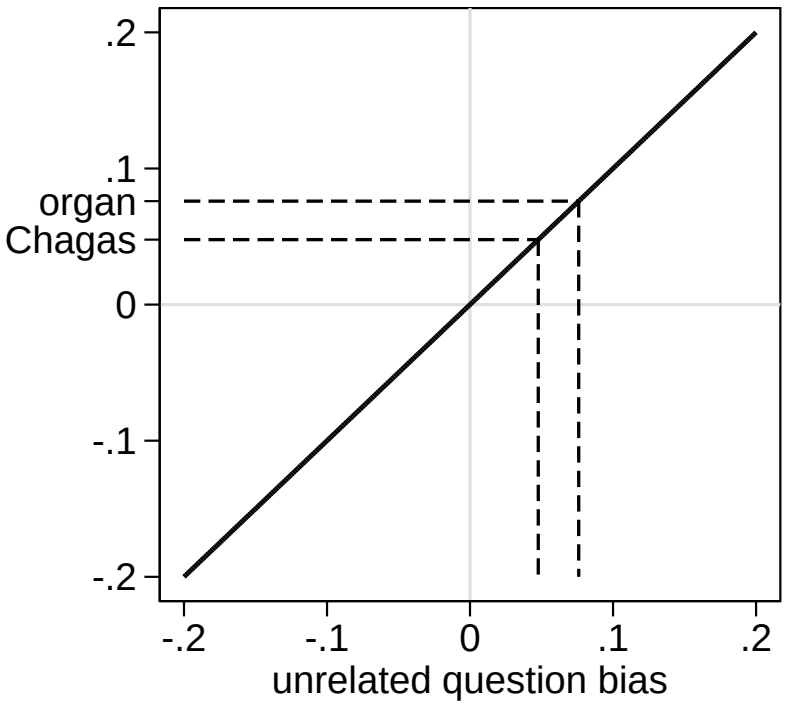
Bivariate associations between respondents' behavior and personal characteristics and false positive rate

| | Percentage points change | SE |
|---|---|---|
| Among fastest 10% on CM introduction screen | 9.05 | (4.87) |
| Among fastest 10% answering sensitive items (without intro) | -4.33 | (4.46) |
| Clicked button referring to RRT Wikipedia link | 6.05 | (3.90) |
| Social desirability (Crown-Marlowe scale) | 1.62* | (0.80) |
| Accomplished the university entrance qualification | -5.17 | (3.53) |
| Age | -0.03 | (0.10) |
| Female | -1.73 | (2.95) |

*Notes:* Bivariate regression on pooled zero-prevalence items. Standard errors corrected for clustering in respondents. $N$ from 2,208 to 2,243. $^{*}p < 0.05$

# Effect of random answering and unrelated question bias on false positive rate for zero-prevalence items




Dashed lines indicate false positive rates found and the corresponding extent of error necessary to generate them.

*Notes*: With an expected "yes"-probability for the unrelated questions of 0.18 as in the CM implemented. If the "yes"-probability is inverted to 0.82 (half the sample) random answering has the same effect, but the effect of the unrelated question bias goes in the opposite direction.

# Conclusions

- An up-and-coming implementation of the crosswise-model RRT produced false positives to a non-ignorable extent. This corroborates the finding from Höglinger and Jann (2016).
- The crosswise-model's defect could not have been revealed by several previous validations which points to a serious weakness in past research.
- This has also implications for other sensitive question techniques (e.g., other RRT variants, Item Count) that so far have been only validated with the same flawed strategies that rely on the "more-is-better" assumption.
- Conclusive assessments of special sensitive question techniques are only possible with validation designs considering false negatives as well as false positives.

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# Analyzing RRT Data

- To analyze RRT data the systematic error is taken into account by using the adjusted response variable $\tilde{Y}$.
- For the crosswise-model:

$$\tilde{Y} = \Pr(S = 1) = \frac{Y + p^{yes,u} - 1}{(2p^{yes,u} - 1)}$$

$Y$ = observed response variable with $Y = 1$ for "identical"
$S$ = actual answer to the sensitive item with $S = 1$ for "yes"
$p^{yes,u}$ = known probability of a "yes" answer to the unrelated question

- This follows from solving the probability of the response "identical" for $\Pr(S = 1)$

$$\Pr(Y = 1) = \Pr(S = 1) \cdot p^{yes,u} + (1 - \Pr(S = 1)) \cdot (1 - p^{yes,u})$$

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| | | *unrelated question* | |
|---|---|---|---|
| | | no | yes |
| *sensitive item* | no | identical | different |
| | yes | different | identical |

# Sensitive Items Surveyed

| Item | Wording |
|---|---|
| Copying from other students in exam | In your studies, have you ever copied from other students during an exam? |
| Using crib notes in exam | In your studies, have you ever used illicit crib notes in an exam (including notes on mobile phones, calculators or similar)? |
| Taking drugs to enhance exam performance | In your studies, have you ever used prescription drugs to enhance your performance in an exam? |
| Including plagiarism in paper | In your studies, have you ever handed in a paper containing a passage intentionally adopted from someone else's work without citing the original? |
| Handing in someone else's paper | In your studies, have you ever had someone else write a large part of a submitted paper for you or have you handed in someone else's paper as your own? |

# Estimates as displayed in the figure (SE in parenthesis)

| | Never donated blood | Unwilling to donate organs | Excessive drinking | Received a donated organ | Suffered from Chagas disease |
|---|---|---|---|---|---|
| *Levels* | | | | | |
| Direct questioning (DQ) | 48.82 | 22.01 | 20.58 | 0.00 | 0.37 |
| | (2.14) | (1.82) | (1.73) | (.) | (0.26) |
| Crosswise model (CM) | 51.58 | 27.30 | 32.71 | 7.60 | 4.77 |
| | (2.33) | (2.23) | (2.28) | (1.95) | (1.91) |
| *Difference* | | | | | |
| CM – DQ | 2.76 | 5.29 | 12.13 | 7.60 | 4.40 |
| | (3.16) | (2.88) | (2.86) | (1.95) | (1.92) |
| *N* | 1669 | 1641 | 1672 | 1669 | 1669 |

# Individual-Level Validation of Abitur-Item

results are corroborated: the crosswise-model implemented produced false positives