Northwestern Medicine®
Feinberg School of Medicine

# Strengthening Data Integrity in Digital Health Studies: A Layered Approach to Combating Fraud in Online Recruitment

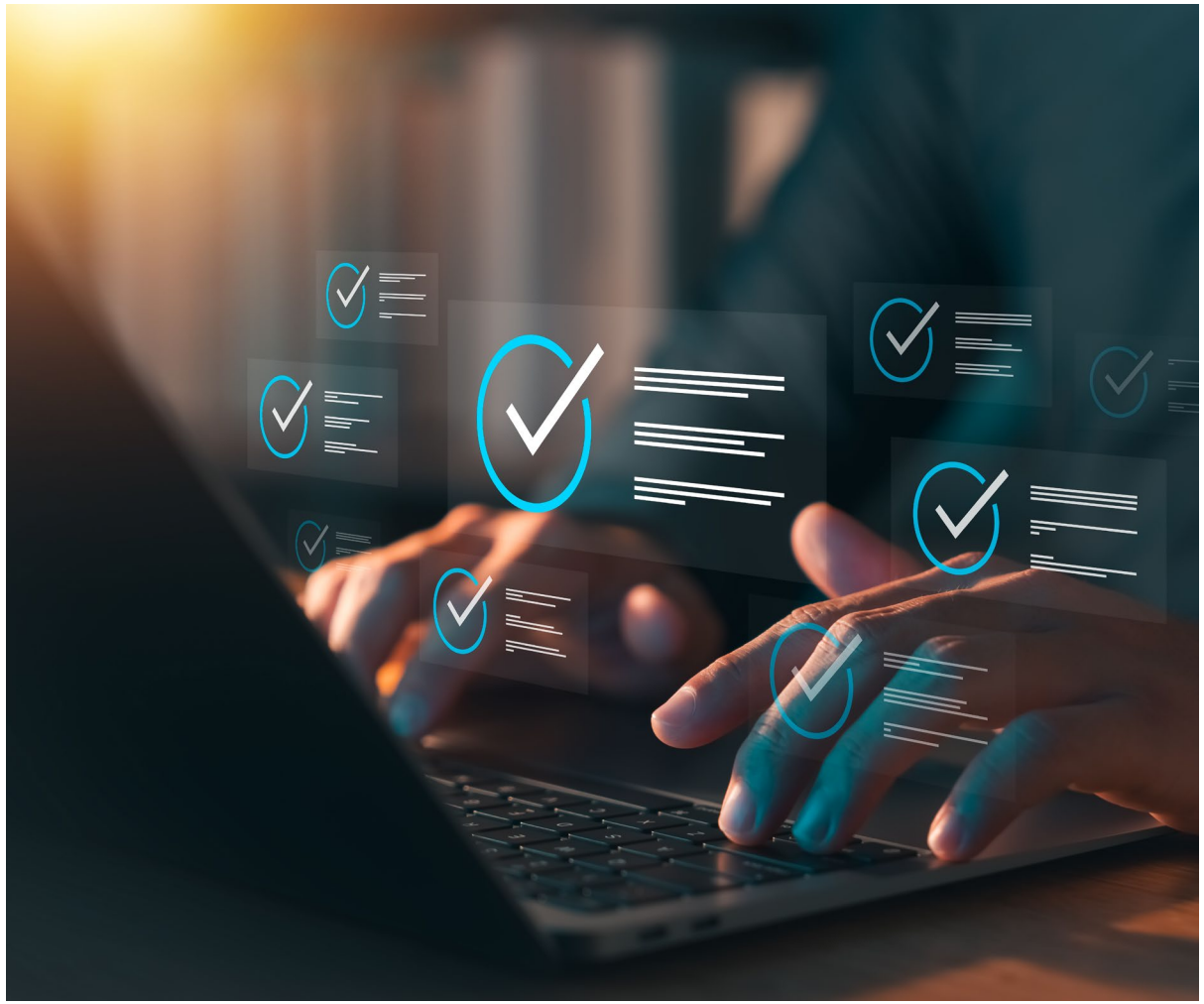
Kathryn Macapagal, PhD &
Andrés Alvarado Avila, MPH

August 4th, 2025

# The benefits and pitfalls of remote recruitment & digital research studies

Online research and recruitment is becoming increasingly popular, but it is not without risks

- **Opportunities**
  - Expands access to geographically diverse, hard to reach populations
  - Cost-effective
  - Streamlines enrollment
- **Costs / risks**
  - “Illusion of ease”, desire for bigger Ns
  - Potential for fraudulent participation, bad actors, poor quality data
    - Excluded responses due to fraud range from 3% to 94% (Comachio et al., 2024)
- **Why It Matters:**
  - Drains research resources ($ and time)
  - Poses risks to participant safety in some studies
  - Undermines data quality and study validity
  - Biases findings



# Dealing with fraud, data quality, bad actors in research isn't new, and it has gotten more complex over time

From "careless responding" and "mischievous responders" to bots and imposters

Educational Researcher
Volume 43, Issue 4, May 2014, Pages 171-185
© 2014 AERA, Article Reuse Guidelines
https://doi.org/10.3102/0013189X14534297

*Feature Article*

**Inaccurate Estimation of Disparities Due to Mischievous Responders: Several Suggestions to Assess Conclusions**

**Joseph P. Robinson-Cimpian**

ANNUAL REVIEWS

*Annual Review of Psychology*

Dealing with Careless Responding in Survey Data: Prevention, Identification, and Recommended Best Practices

M.K. Ward[1] and Adam W. Meade[2]

[1]Tacoma, Washington, USA; email: mk@neatquestion.com
[2]Department of Psychology, North Carolina State University, Raleigh, North Carolina, USA; email: awmeade@ncsu.edu

**Beyond Bot Detection: Combating Fraudulent Online Survey Takers***

Ziyi Zhang
University of Wisconsin-Madison
USA

Shuofei Zhu
The Pennsylvania State University
USA

Jaron Mink
University of Illinois at Urbana-Champaign
USA

Aiping Xiong
The Pennsylvania State University
USA

Linhai Song
The Pennsylvania State University
USA

Gang Wang
University of Illinois at Urbana-Champaign
USA

Sharma *et al. BMC Health Services Research* (2024) 24:724
https://doi.org/10.1186/s12913-024-11166-x

BMC Health Services Research

RESEARCH Open Access

Navigating the challenges of imposter participants in online qualitative research: lessons learned from a paediatric health services study

Pakhi Sharma[1*], Steven M McPhail[1,2], Sanjeewa Kularatna[1,3], Sameera Senanayake[1,3] and Bridget Abell[1]

2024 IEEE Symposium on Visual Languages and Human-Centric Computing (VL/HCC)

Challenges and Opportunities for Survey Research in the Age of Generative AI: An Experience Report

Fairuz Nawer Meem
*Department of Computer Science*
*George Mason University*
Virginia, USA
fmeem@gmu.edu

Justin Smith
*Department of Computer Science*
*Lafayette College*
Pennsylvania, USA
smithjus@lafayette.edu

Brittany Johnson
*Department of Computer Science*
*George Mason University*
Virginia, USA
johnsonb@gmu.edu

# Our Experience Doing Online Recruitment

10+ years in online recruitment and translational online research in sexual health, HIV, relationships, substance use, mental health, and COVID

| Study | Design | Enrolled | Underrepresented (%) | Retention (%) |
|---|---|---|---|---|
| 2gether* | RCT | 636 | 44% | 90% |
| Fab400 | 4-yr cohort | 488 | 72% | 85% |
| Keep it Up!* | RCT | 901 | 63% | 86% |
| RADAR | >10-yr cohort | 1,200 | 75% | 80% |
| SMART* | Adaptive RCT | 1,289 | 50% | 83% |
| SCAN | Observational cross-sectional | 7,935 | 52% | n/a |

**Current studies:**

**Cross-sectional**

SCRIPT: Understanding biomedical HIV prevention perspectives in adolescents (two surveys, N = 700 and N=200)

PrEP4Teens: Adolescents' perspectives on HIV prevention campaigns (one survey, target N = 1000, $5 incentive)

**Interventional/Implementation**

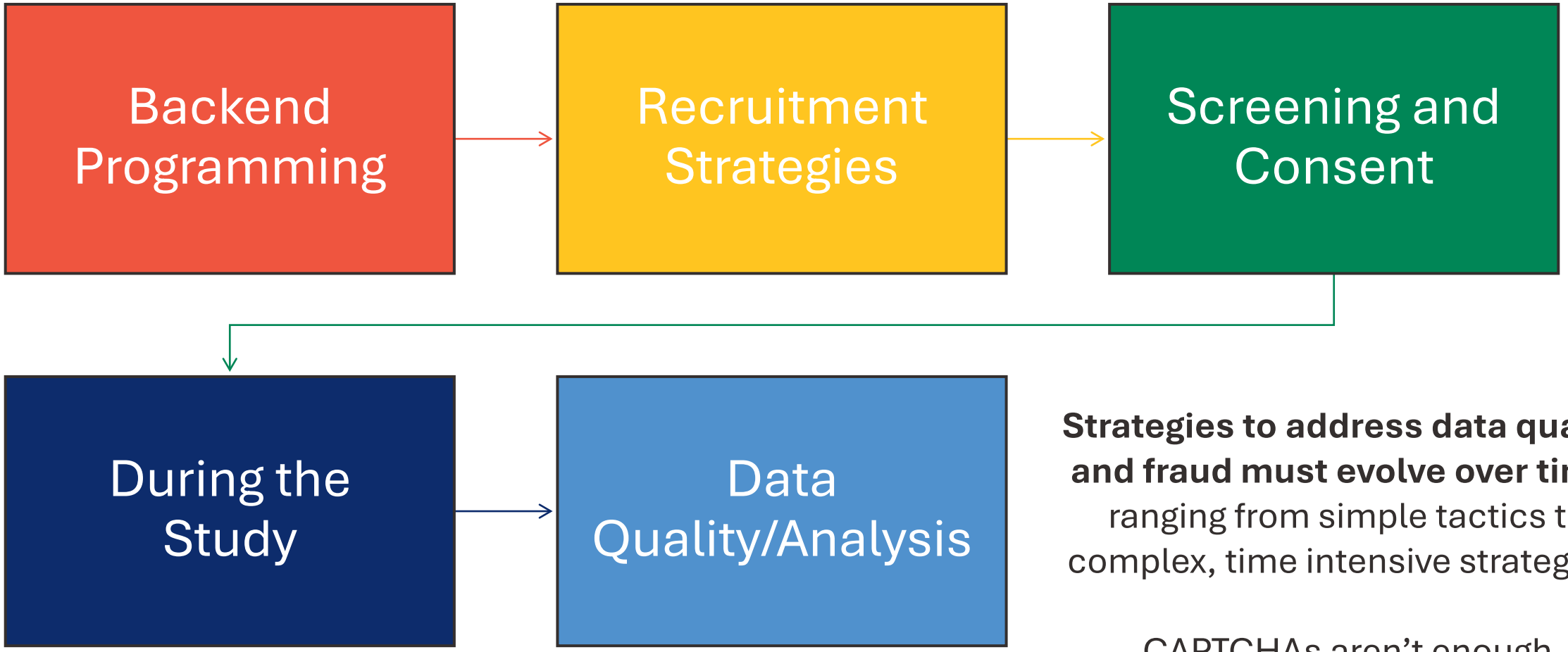
SHER: A nationwide RCT to increase HIV testing in LGBTQ+ adolescents via a text messaging intervention (N = 360; $250 total for completing seven surveys)

# Why we spend SO much time focusing on fake participants and data quality

Some cautionary tales from our experience

# A Multilayered Approach to Preventing and Addressing Fraud

Using “end to end” approaches across the research lifecycle can mitigate concerns about data quality and fraud




**Strategies to address data quality and fraud must evolve over time,** ranging from simple tactics to complex, time intensive strategies.

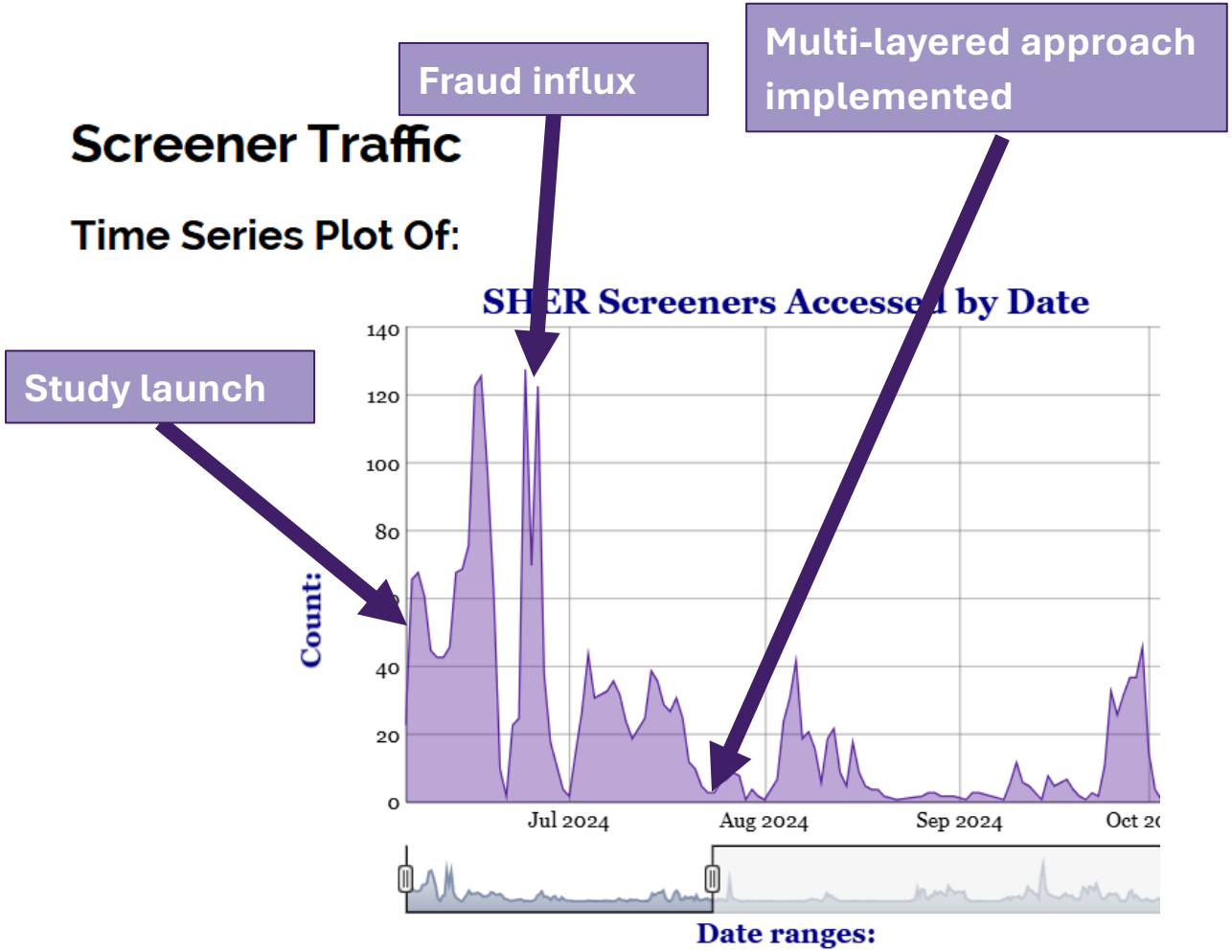
CAPTCHAs aren’t enough

# Backend Programming

An opportunity to optimize resources that help set your study up for success

**Set yourself up for success by automating fraud detection**

- Program ability to use unique source links
  - Switch out links routinely
  - Use unique links for each recruitment source
  - Program reports to help you visualize the problem
- Use data capture software to automatically detect suspicious activity
  - Collect at least two identifiers that help detect duplicate entries (e.g., email and phone number)
  - Set up timestamps
  - Use a data capturing software that allows collection of IP address



# Recruitment Strategies

Where you place your advertisements matters

**Be intentional and strategic about where you place your advertisements**

- Consider what platforms your population is using BUT assess risk of placing advertisements on certain platforms
  - Placing advertisements on Facebook has resulted in higher rate of fraudulent participants but Facebook may be an appropriate placement if you are recruiting older individuals
- Collaborate with trusted organizations or labs to promote your study
  - Ask organizations to email their registry or post on social media
- Clearly state participants who are found to provide fraudulent information will not be compensated

## Hi there

**SHER** is a text messaging program that will provide LGBTQ+ teens and young adults with sexual and mental health education that meets their needs in a way that is quick and interactive. Our team at Northwestern University is looking to improve **SHER** and **we need your help to do it.**

With **SHER**, you can earn up to **$150** for completing surveys. Start by answering the questions on the next page to see if SHER is right for you. **It takes just a couple minutes!** We will reach out if you are eligible. Your information, including contact details, will remain secure. You can request we delete your information at any time by reaching out to teenhealth@northwestern.edu. **Cases determined to have fake information will not be paid for study participation.**

Sign up here!

# Screening and Consent Fraud Prevention Strategies

Balance need to protect data integrity while considering participant burden

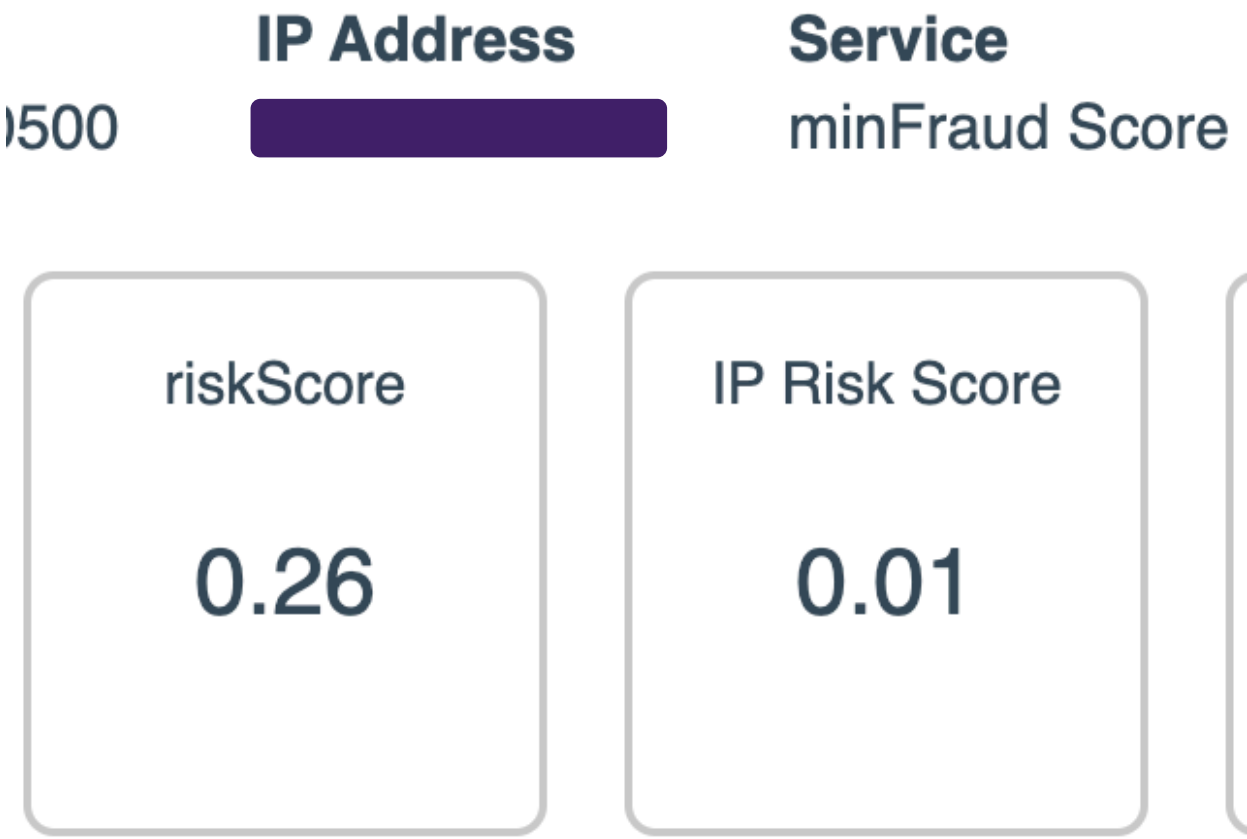
| Strategy | Purpose | Participant Burden Level | Staff Burden Level |
|---|---|---|---|
| MinFraud | Uses IP address to deliver a “IP Risk score”. | None | Minimal |
| Qualitative questions pre-consent | Analyze responses to determine use of AI. | Minimal | Moderate-High (depending on sample size) |
| Video recording | Determine it is a real participant and can be combine with other strategies like asking participant to hold up X fingers or show their ID. | Minimal-Moderate (depending on age) | Minimal |
| Photo Identification Upload | Determines it is a real participant and can determine place of residence. | Moderate-High (depending on age and immigration status) | Minimal |
| Video chats | Determines it is a real participant and can determine place of residence. | Moderate-High (depending on age) | Minimal-Moderate |

# MinFraud

## A tool with no participant burden

MaxMind's minFraud uses IP addresses to detect fraud risks, flagging things like proxies, high-risk locations, or connections tied to past fraud.

- Cost of $0.005 per query
- Provides an IP risk score
  - The IP risk score is a percentage from 0.01 to .99. For example, a score of 15.4 means a 15.4% chance the IP is linked to fraud.
- Adds no participant burden and requires minimal staff effort.



# Qualitative Questions

A tool with minimal participant burden

Open ended questions allow you to look for patterns typical with AI answering questions created for research participants.

- Design the questions to “trick AI”
- Use simple questions that focus on lived experience
- Use this as an opportunity to collect additional data while adding an extra layer of fraud prevention

| Question | Typical Participant Response | AI response |
|---|---|---|
| How many "r"s are there in "strawberry? | 3 | The word "strawberry" contains two "r"s. |
| How many words are in your answer to this question? | One | There are six words in my answer to this question. |
| Prompt E: LGBTQ+ people are regularly forced to come out of the closet. How does this pattern of coming out impact you? | I don't tell my parents that I'm gay, and I tell my friends to not tell them that I'm gay. | As a queer person, I’ve experienced both the liberating and exhausting sides of coming out.... (answer was multiple paragraphs) |

# Screening and Consent

Utilize screening and consent procedures to create additional safeguards

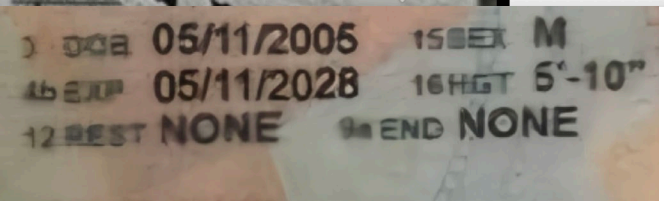
**During the screening and consent process collect information that can help you determine fraudulent cases**

- Look out for patterns in screening questions
- Consider additional methods of identity verification while considering participant burden
  - Examples include Video chats, ID checks
- Document patterns to facilitate identifying fraudulent cases

| Screener Question | Trends among fraudulent participants |
|---|---|
| First and last name | Both names are most commonly first names (e.g. Henry Adam) |
| | Name in all caps |
| “What are your pronouns?” | Singular pronoun, e.g. “he” rather than “he/him”* |
| “How did you hear about this study?” | "Friend” |
| | Platform where study was not being advertised |
| “Why are you interested in taking part in this research study?” | Duplicate answers across multiple screeners |
| | Unusual syntax/vocabulary choices |
| | Unusual use of terminology common within the research population (e.g., gay, queer) |
| | “To learn” about HIV/prevention |

# Screening and Consent

Utilize screening and consent procedures to create additional safeguards




| Method | Trends among fraudulent participants | |
|---|---|---|
| Video Call | Hesitation answering simple questions | |
| | Poor connection, used to justify a delay in answering questions | |
| | Visible darkness outside which did not match the time of day in the time zone the participant had listed | |
| ID Upload | Digitally Fabricated | Flat, digital images; not 3-dimensional |
| | Digitally Altered IDs | Inconsistent pixelation across image |
| | | Inconsistent fonts |
| | | Inconsistent lighting or reflections |
| | | Missing watermarks or holograms |
| | | Incorrect coloring in ID photo |
| | AI Generated IDs | Text that is incoherent or distorted, especially when zoomed in |
| | | Inconsistent lighting or lack of reflections |
| | | An overly “smooth” or airbrushed appearance |
| | Un-edited ID photos (Obtained Online or purchased) | ID photo found online |
| | | Name listed incorrectly in screener (name listed as Last, First)* |

# Videochats

Videochats can serve as an additional data point to determine fraud, while also serving as an onboarding or consent tool

Use the videochat to ask participant conversational questions that help build rapport while helping determine eligibility

- Example questions include:
  - What is your high school mascot?
  - What is your favorite local restaurant?
  - What is the weather like where you are at?
- Create a detailed protocol to help staff conduct these videochats.
- Use this as an opportunity to provide additional information about the study and answer participant questions.

# During the Study and Data Analysis

Ongoing monitoring during the study and at the data analysis phase.

Monitor your data to detect unusual patterns in activity

- Monitor enrollment trends to detect spikes in activity
  - Increased enrollment rate without modifications to study may signal fraudulent cases
- Implement data quality checks to identify fraudulent cases that may have passed initial checks

Know your population

- How is your target population likely to answer questions?
  - For example, are they likely to use American English syntax/grammar or have knowledge of specific cultural references?
- Community Advisory Boards can help!

# Real World Application of Strategies

The application of a multi-tiered strategy to deter fraudulent participation

**Advertisements**

- Webpage with language to deter fraudulent participation

**Screener**

- Variables to detect duplicate responses
- IP address collection
- Timestamp

**Consent**

- Photo ID at consent
- Mandatory videochat
- Conversational prompts to confirm U.S residence

**During Study**

- Ongoing monitoring of enrollment trends
- Staff check-ins
- Data cross-referencing between surveys

**Publication**

- Disclose strategies
- Publish/present on strategies used

# Final Recommendations

A review of some of the lessons learned and implications

It takes a village to address the issue of fraudulent participation in online studies

- Account for this issue in your study timeline, staff effort, and budget
- Implement multiple strategies along the research study pipeline while aiming to reduce participant burden
- Disclose strategies used in publications and presentations
- Reviewers: Assess if methods used in empirical papers are sufficient to protect integrity of data/results

No method is perfect and this issue will require solutions that evolve over time.

**Caveats:** money, staffing are rate limiting factors. Ask whether you really need to recruit online and whether you need a very large N

# An incomplete list of references

Comachio J, Poulsen A, Bamgboje-Ayodele A, Tan A, Ayre J, Raeside R, Roy R, O'Hagan E. Identifying and counteracting fraudulent responses in online recruitment for health research: a scoping review. BMJ Evid Based Med. 2025 May 20;30(3):173-182. doi: 10.1136/bmjebm-2024-113170. PMID: 39715631; PMCID: PMC12171401.

French B, Babbage C, Bird K, Marsh L, Pelton M, Patel S, Cassidy S, Rennick-Egglestone S. Data Integrity Issues With Web-Based Studies: An Institutional Example of a Widespread Challenge. JMIR Ment Health 2024;11:e58432 URL: https://mental.jmir.org/2024/1/e58432

Pinzón N, Koundinya V, Galt RE, Dowling WO, Baukloh M, Taku-Forchu NC, Schohr T, Roche LM, Ikendi S, Cooper M, Parker LE, Pathak TB. AI-powered fraud and the erosion of online survey integrity: an analysis of 31 fraud detection strategies. Front Res Metr Anal. 2024 Dec 2;9:1432774. doi: 10.3389/frma.2024.1432774. PMID: 39687573; PMCID: PMC11646990.

**https://theconversation.com/imposter-participants-challenge-research-integrity-in-the-digital-age-246126**

Ziyi Zhang, Shuofei Zhu, Jaron Mink, Aiping Xiong, Linhai Song, and Gang Wang. 2022. Beyond Bot Detection: Combating Fraudulent Online Survey Takers∗. In Proceedings of the ACM Web Conference 2022 (WWW '22). Association for Computing Machinery, New York, NY, USA, 699–709. https://doi.org/10.1145/3485447.3512230

# Thank you

Kathryn Macapagal, PhD
Kathryn.Macapagal@northwestern.edu

Andrés Alvarado Avila, MPH
Andres.avila@northwestern.edu

Thank you to the entire Teen Health Lab staff and the research Participants who have made this work possible!

Northwestern Medicine®
Feinberg School of Medicine

This work was supported by the Northwestern University Clinical and Translational Sciences Institute (UM1TR0045121, D'Aquila, Yancy, Becker) and grants from NIMH (R01MH129207, Macapagal; R01MH132414, Macapagal, Hill, Walter).