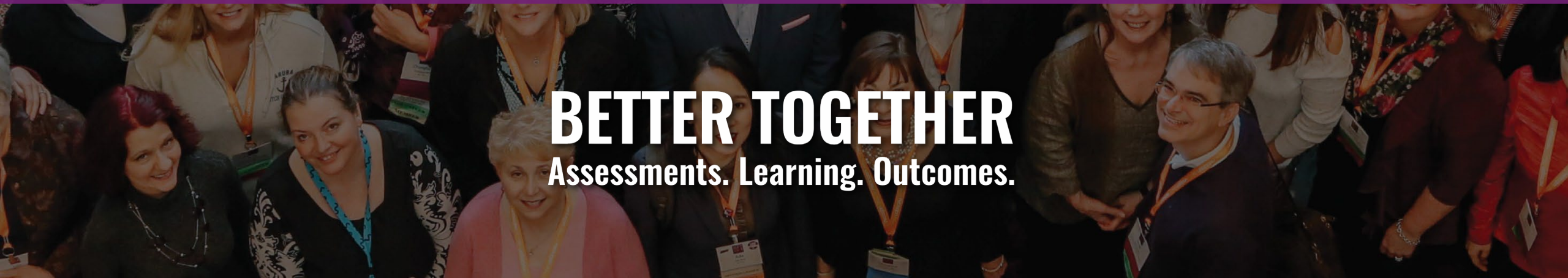
Real World Implementations of Two Data Forensics Indices:

Approximation Response and Score Similarity Analyses



Panel Introductions

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Agenda

- Introduction of Approximation Score Similarity Index and Response Similarity Index (aSSI & aRSI)
- Importance of a Security Policy
- 3-4 Real World Scenarios
- Panel Q&A
- General Q&A

Approximation Score and Response Similarity

Actionable

Near real-time

Because we can

aSSI/aRSI

- **Collusion** statistics designed to identify **pairs of test takers** with unusually high number of matching scores or responses
- They **approximate "true"** score similarity and response similarity index
  - Do not require IRT or item level data
  - They use:
    - test taker percent correct scores,
    - item count,
    - a weight,
    - the count of matching scores or responses…

      …that's it!
  - Near real time

Math stuff…

aSSI = z-score (for persons 1 and 2)

$$z_{12} = \frac{(M_{12} - E^*_{12})}{\sqrt{npq}}$$, where

M is count of observed matches

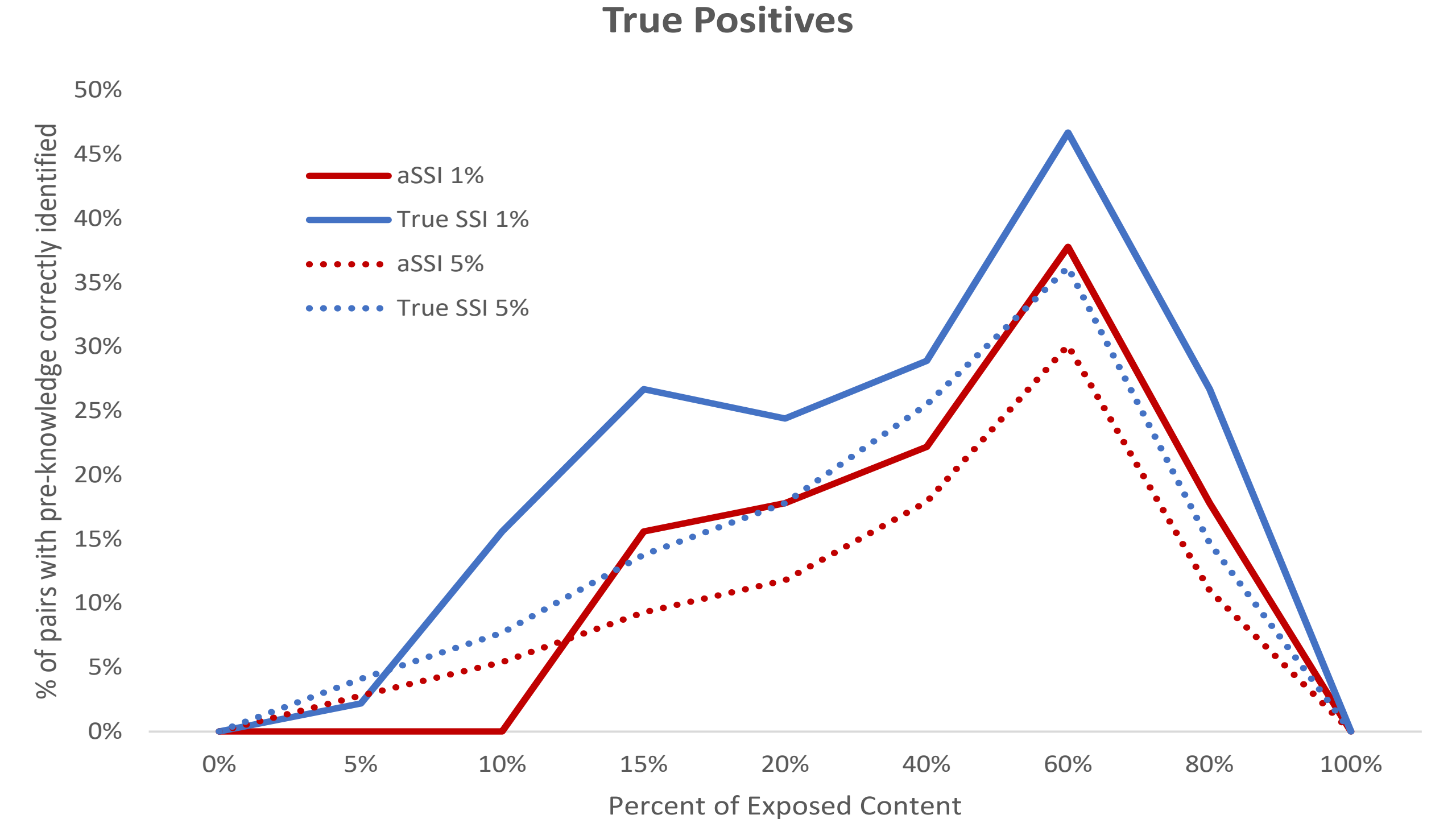
n is the number of items

p is E^*_{12} **/n** and **q** is **(1 – p)**

E^*_{12} is the adjusted expected value:

$$E^*_{12} = n \cdot [s_1 s_2 + (1 - s_1)(1 - s_2)] + n \cdot b(1 - |s_1 - s_2|)(1 - |s_1 + s_2 - 1|)$$

where, s_i is proportion correct score for person *i*, b is an adjustment to the magnitude of the correction set at 12.5%


True Positives
50%
45%
40%
35%
30%
25%
20%
15%
10%
5%
0%
% of pairs with pre-knowledge correctly identified
aSSI 1%
True SSI 1%
aSSI 5%
True SSI 5%
0%
5%
10%
15%
20%
40%
60%
80%
100%
Percent of Exposed Content

Prevention

Mitigation

Detection

Enforcement

Systematic Security

Enforcement

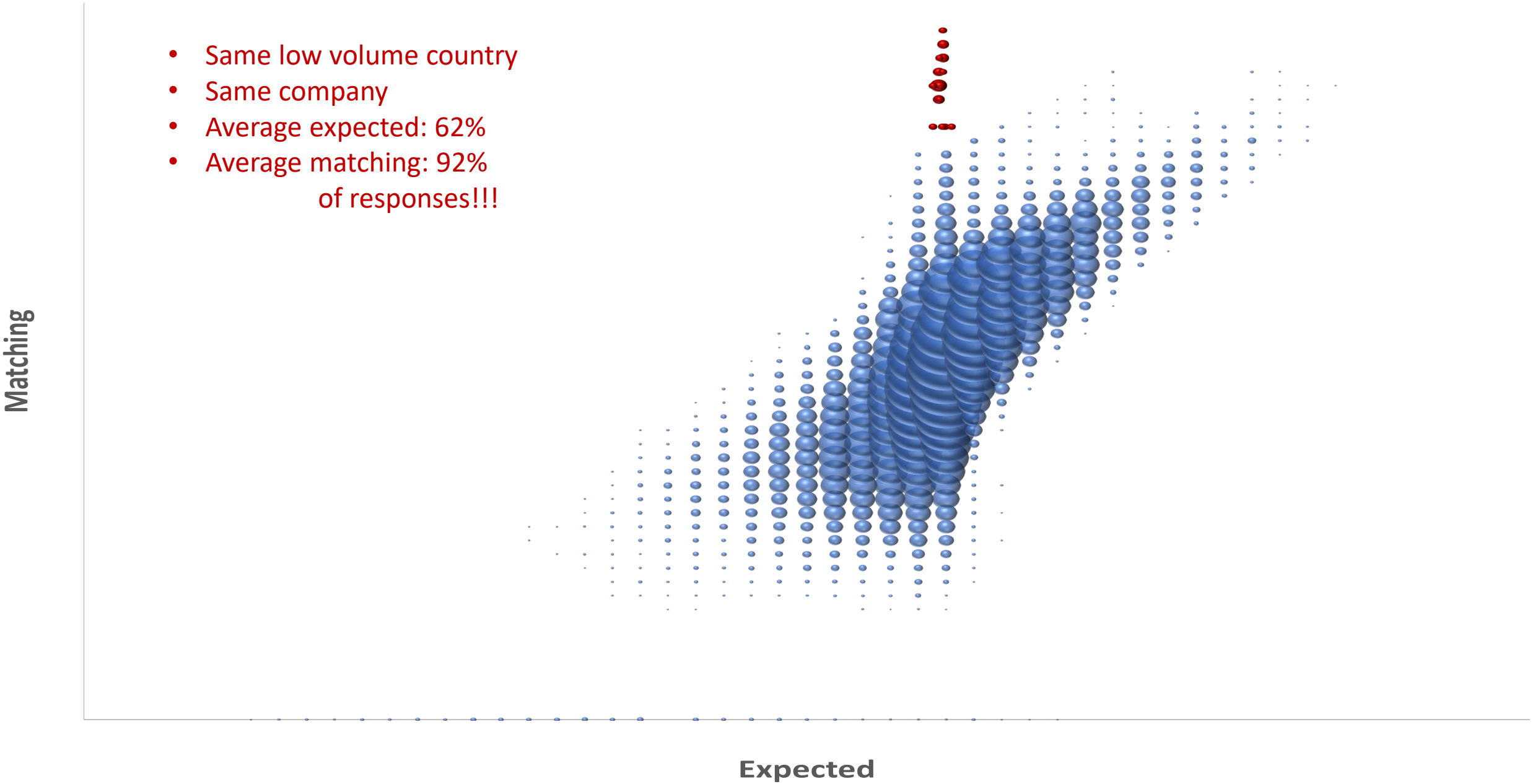
- Written security policy
- Candidate agreements
- Non-disclosures
- Appeals process
- Multiple sources evidence
- Legal

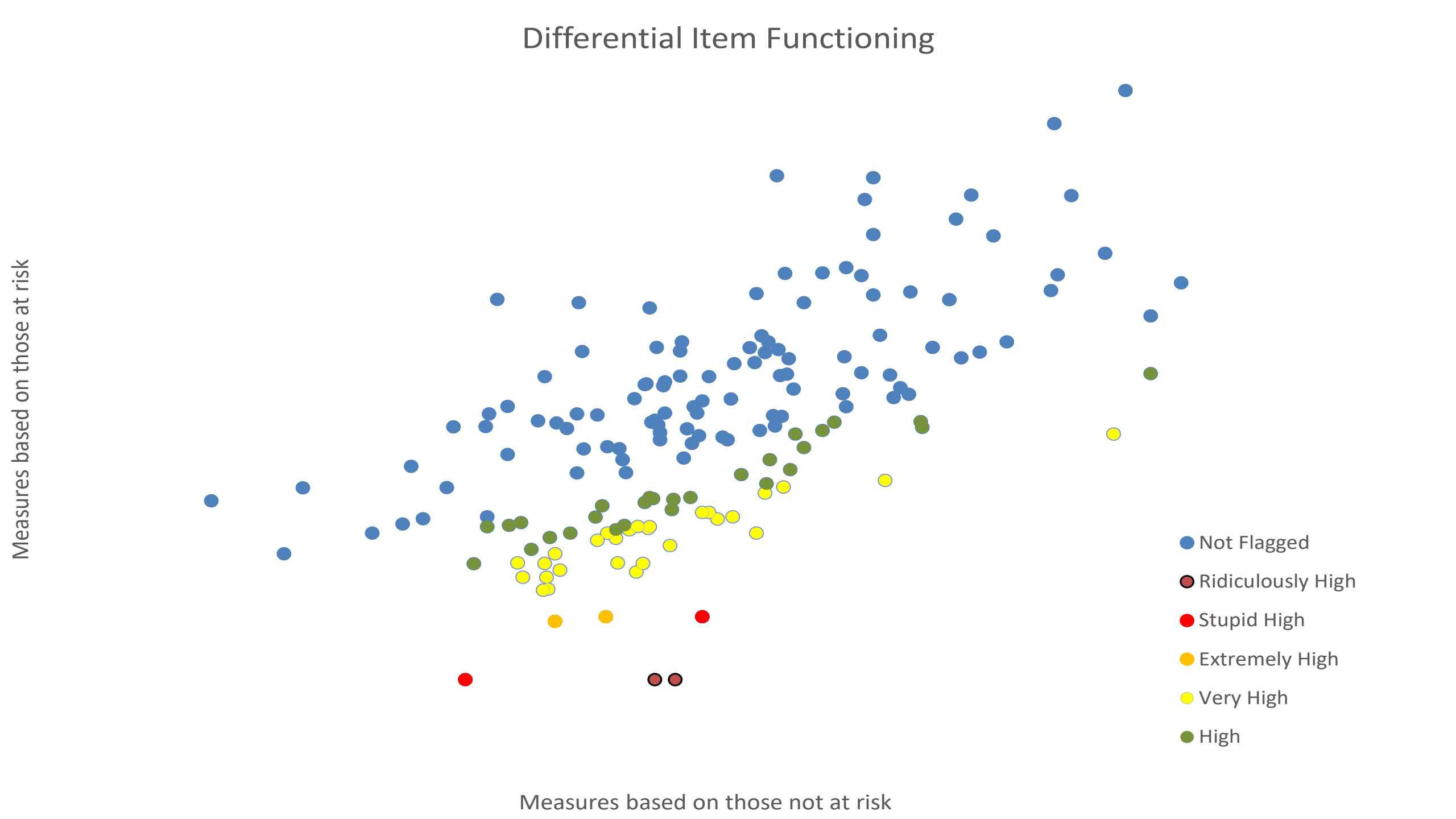
Scenario 1 – Potential breach with a Group of Test Takers

- CertMetrics flags 7 candidates for aSSI and aRSI
  - 5 who took the exam **on the same day**
  - 2 who took the exam form the prior week
- 5 of 7 flagged for passing in under 10 mins
- All 7 were placed in a Review queue

Response Similarity Index

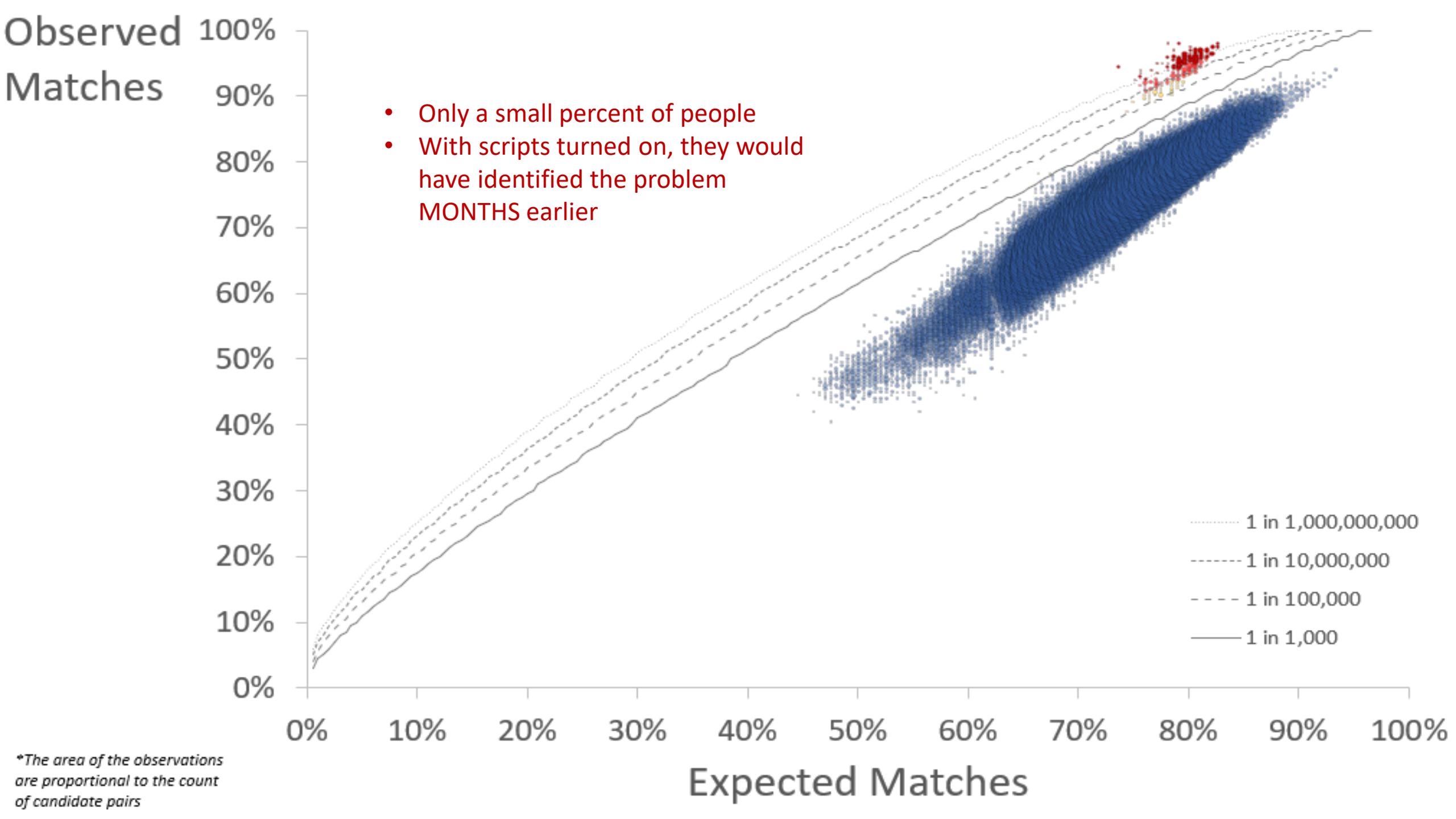
- Same low volume country
- Same company
- Average expected: 62%
- Average matching: 92%
  of responses!!!




Differential Item Functioning
Measures based on those at risk
Measures based on those not at risk
Not Flagged
Ridiculously High
Stupid High
Extremely High
Very High
High

Scenario 2 – Found Content Exposed on the Internet

- Received an internal tip from an employee
  - *"I was direct messaged on the WeAllChatt App claiming that this person could guarantee I would pass the exam if I purchased their materials"*
- Conducted an investigation
  - Identified several items on a current live form
- **Did not have security scripts.**

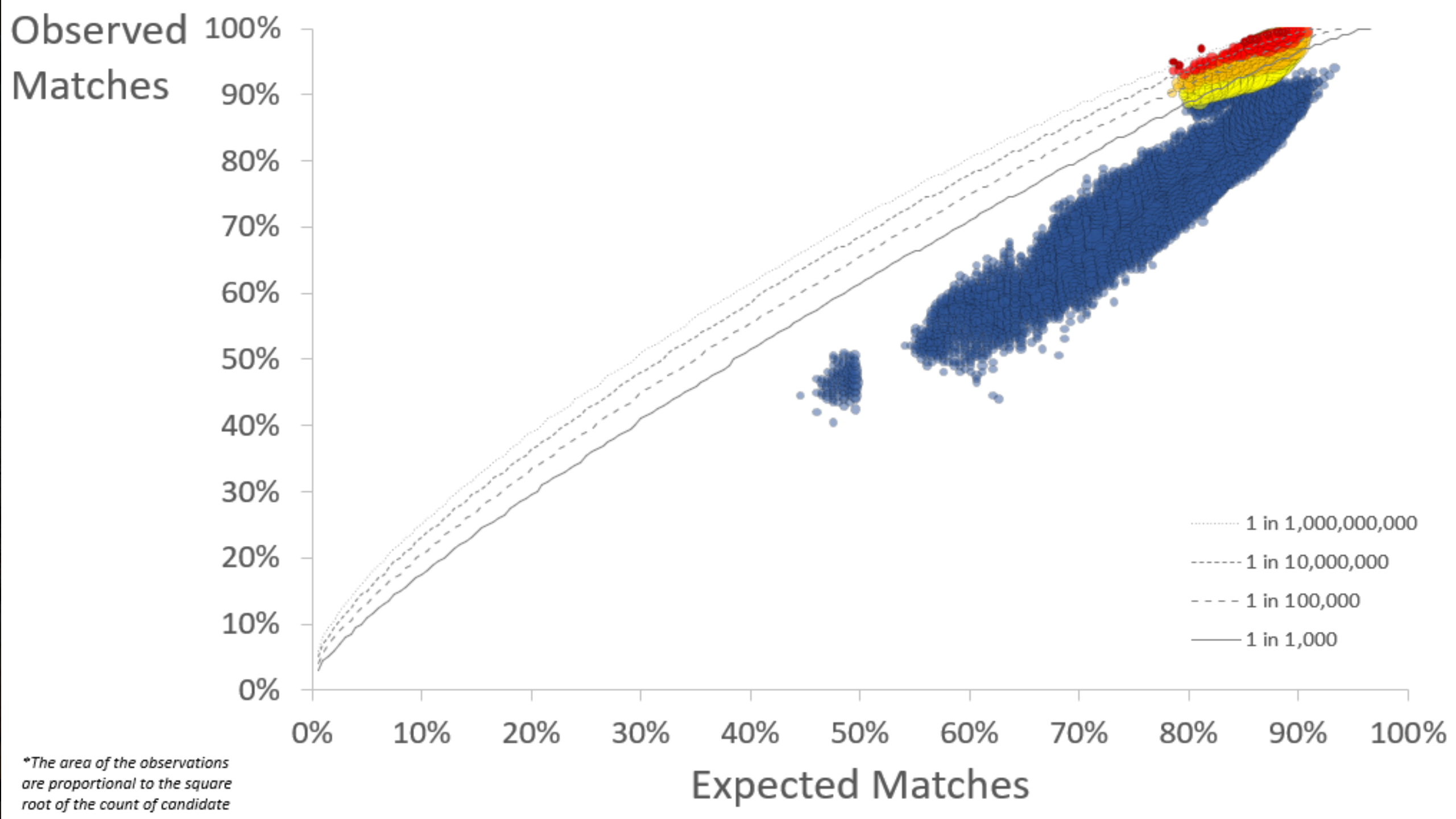


- Only a small percent of people
- With scripts turned on, they would have identified the problem MONTHS earlier

**The area of the observations are proportional to the count of candidate pairs*

Scenario 3 – Mass Exposure Issue

- Three-day testing event held at conference in Las Vegas
- ¼ of the candidates identified as anomalous behavior
  - **Flagged for aSSI and aRSI**
  - Clustered into subsets
  - Flagged too little time
  - Flagged for Differential Person Functioning (DPF)



**The area of the observations are proportional to the square root of the count of candidate*

General Panel Questions

Panel Questions

What do you think is the biggest security concern right now?

Panel Questions

Where do you see the future of exam security going?

Panel Questions

CertMetrics can run **aSSI and aRSI**, daily, on import of exam data. How does the use of these statistics run daily impact you, your program, and the industry?

Panel Questions

We have all been in the certification space for a while now but if we could give our younger selves some advice on exam security what would be your number one piece of advice?

Questions??

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