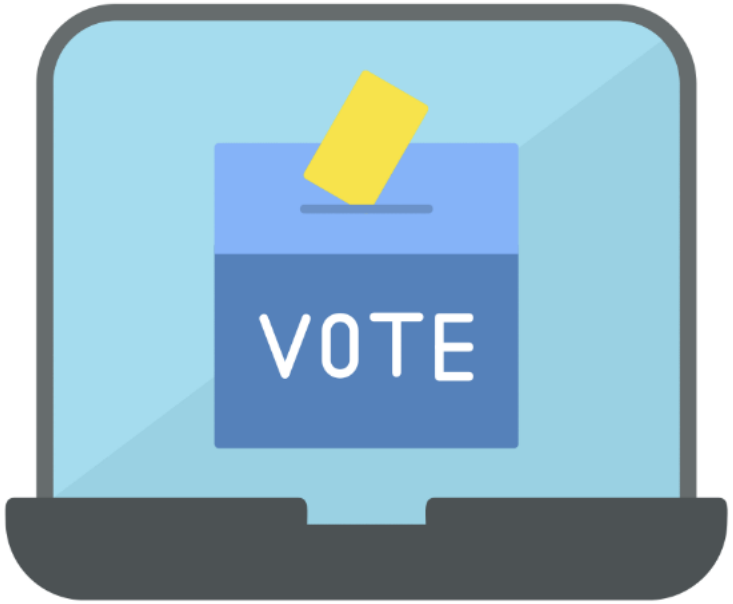
WHAT HAS GONE WRONG WITH DIGITAL ELECTIONS?

Nicole Goodman, Brock University
Aleksander Essex, Western University
Holly Ann Garnett, Royal Military College

Research Question(s)

- **What *is* and *has* gone wrong with digital elections?**
- What technical incidents have occurred in elections in Canada and the US?
  - *(Chapter just focuses on Canada right now, need advice for what to do with the US please ☺).*
- What was the cause, who was to blame, and what was their severity?
- Are certain levels of government more affected than others?
- What can predict more severe incidents?



BOOM: President Trump Tweets that Dominion Attempted to Alter Our Election and Got Caught

POLITICS ›

U.S. finds no evidence flaws in Dominion voting machines were ever exploited

BY NICOLE SGANGA

JUNE 3, 2022 / 7:10 PM / CBS NEWS

CNN

ive TV

'The horse and buggy era': Attacks on voting machines set off fresh worries about election subversion

PERSONAL | PRIVACY

Election season raises fears for nearly a third of people who worry their vote could be leaked

America's new voting machines bring new fears of election tampering

Literature

- Political science literature mostly focused on questions of participation and governance.
- Computer science literature predominately discusses risks.

- Overall, literature falls into three categories:
  - (1) Examinations of single jurisdictional cases or incidents (poli and computer sci);
  - (2) Discussions about future risks or technical vulnerabilities (computer sci), and;
  - (3) More systematic reviews of problems that focus on an entire county or state (poli sci).
    - ✓ 2006 Ohio county primary finds that nearly 90% of precincts reported an incident (Kiewiet et al., 2008) .
    - ✓ Four Wisconsin elections logged more than 66,000 incidents (Burden et al., 2017).
    - ✓ November 2021 election in Idaho finds a total of 50 incidents (Parker et al., 2023).
    - ✓ **All frame incidents broadly.**
    - ✓ **None track elections in an entire country overtime at all levels of government.**

Data & Methods

- **Data set of technical incidents in elections in Canada from 2008 to 2024 across e-poll books, tabulators, online voting, telephone voting and election websites (i.e. online registration).**
- Collected between June 3, 2022, and February 10, 2025.

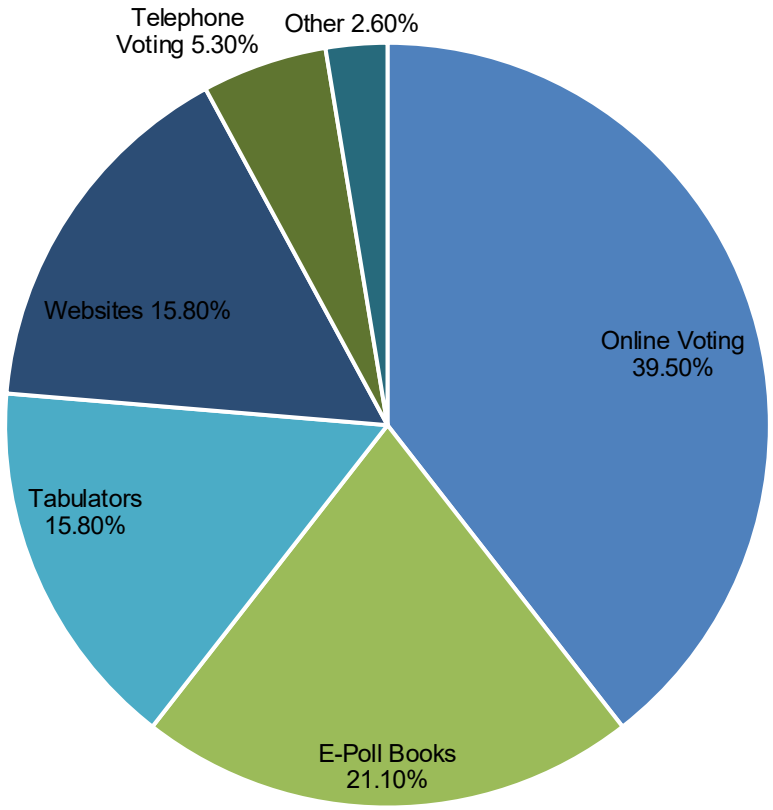
1. Media and document searches using the following terms:
    - incident, issue, problem, delay, glitch, outage, slowdown, voting extension, emergency, online voting, Internet voting, tabulator, e-poll book, electronic poll book, Canada, province name, municipality, municipal election, municipality name, provincial election.
    - Used snowballing where relevant for specific incidents.
2. Discussions with election officials and vendors to confirm details and obtain voter data.

- All incidents are verified with reports or written evidence.
- 17 variables for 38 technical events: affected 612 locations and nearly 5 million voters.

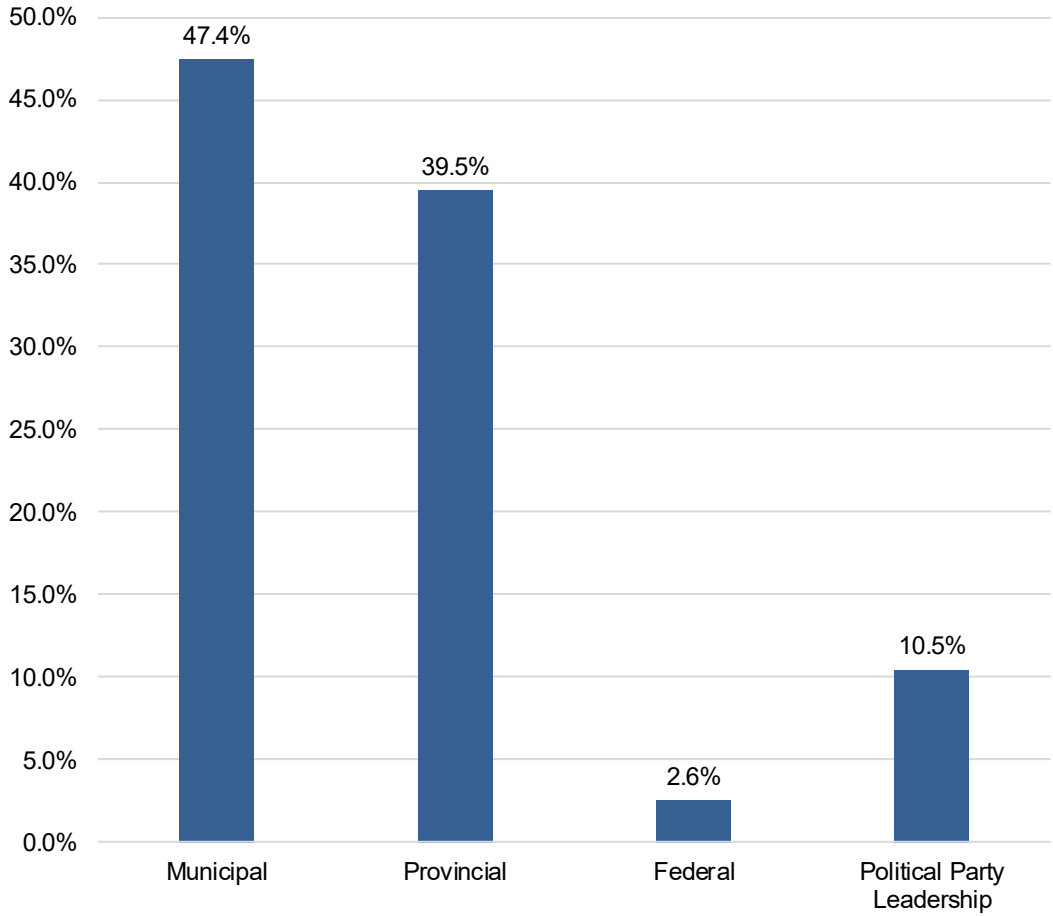
Limitations: underreporting incidents - only what could be authenticated, certain issues more likely to be publicized (small towns, behind the scenes etc).

Analysis

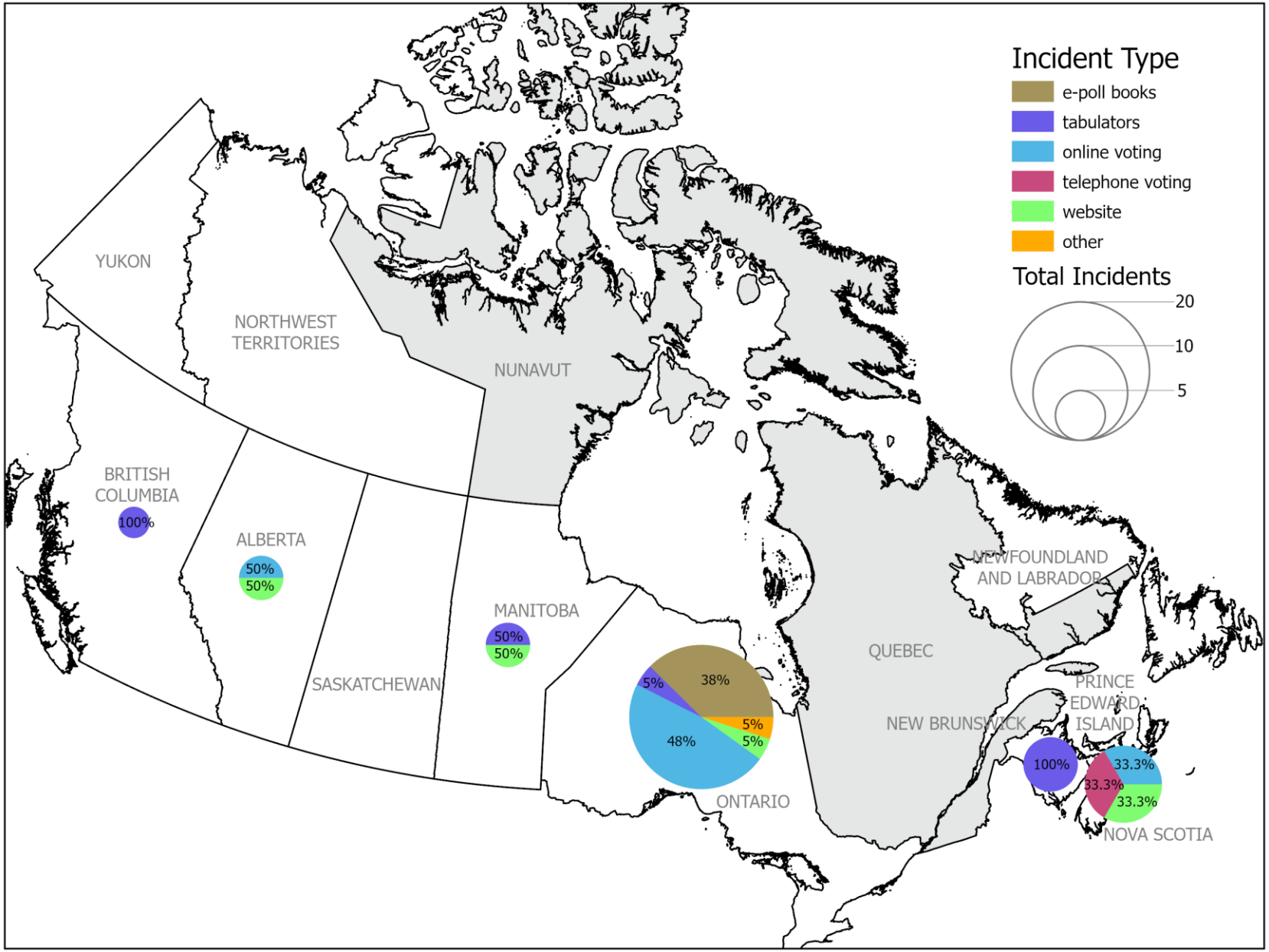
Incidents by Technology



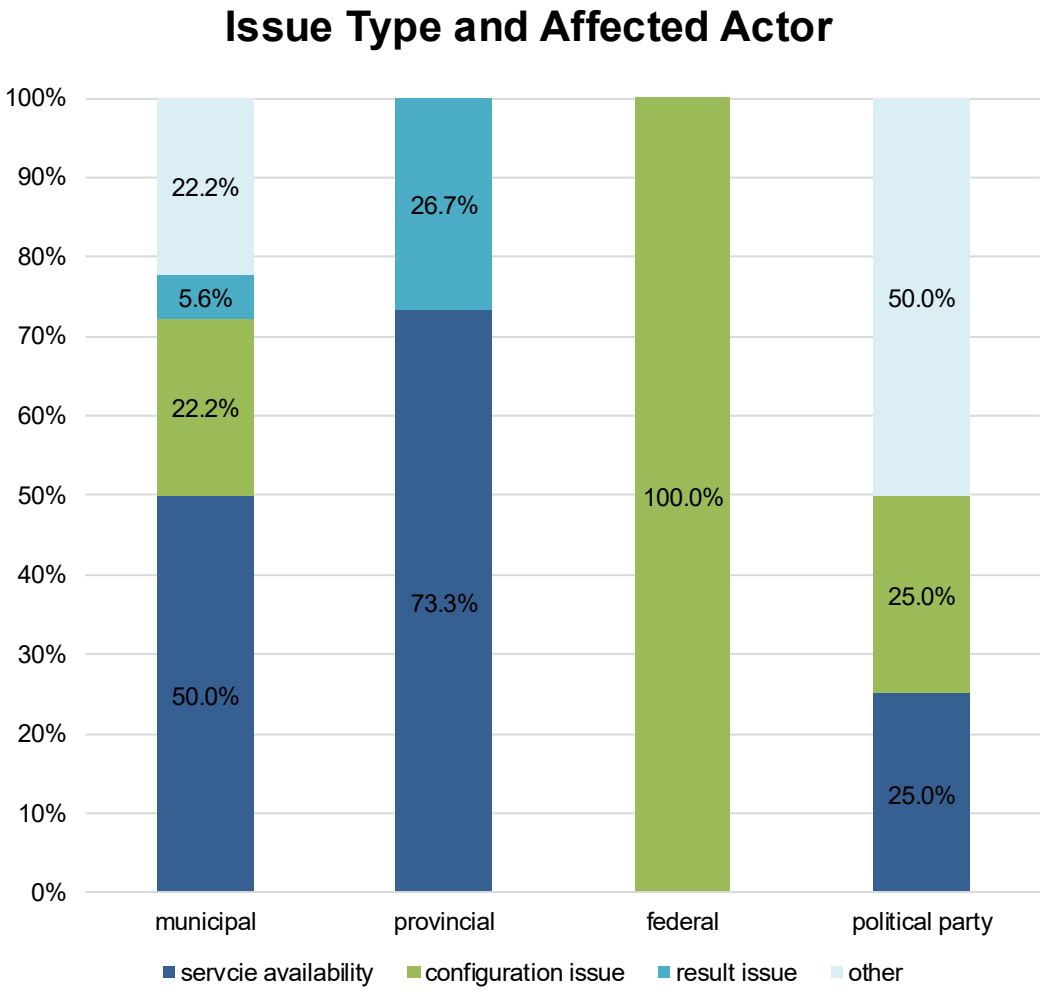
Level of Government Affected

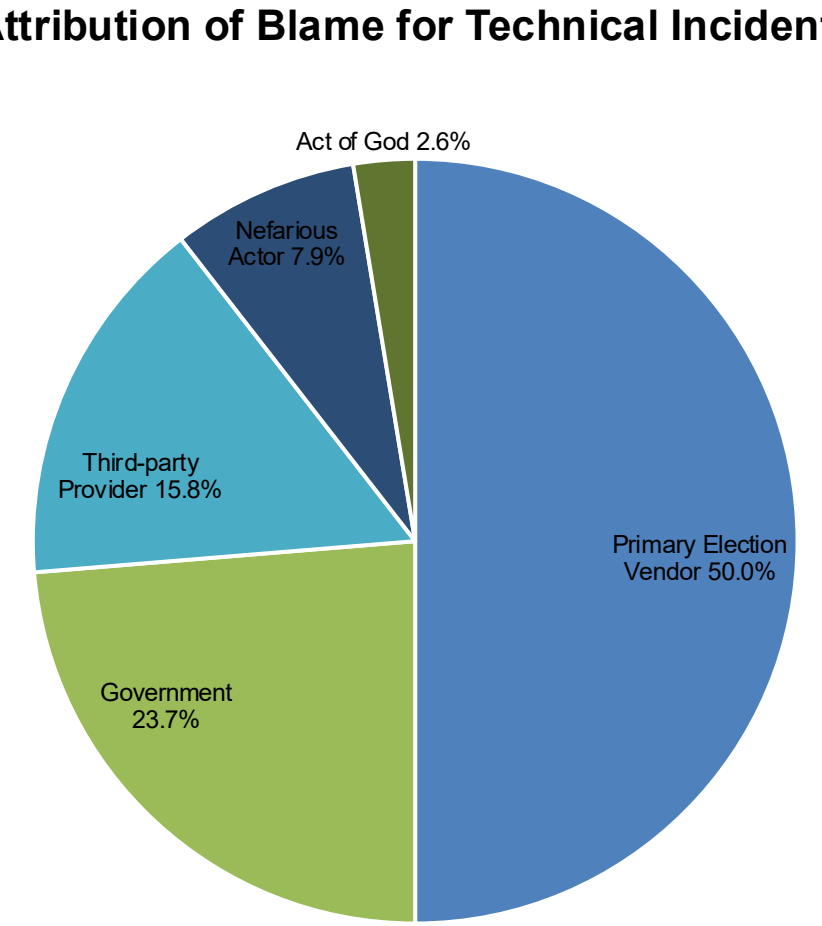


Incidents by Province & Technology Type

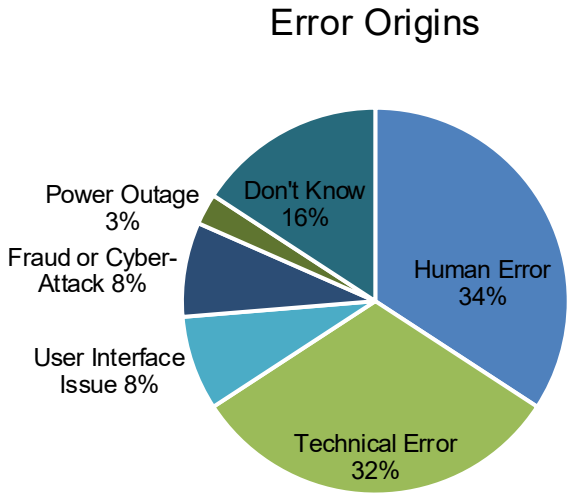


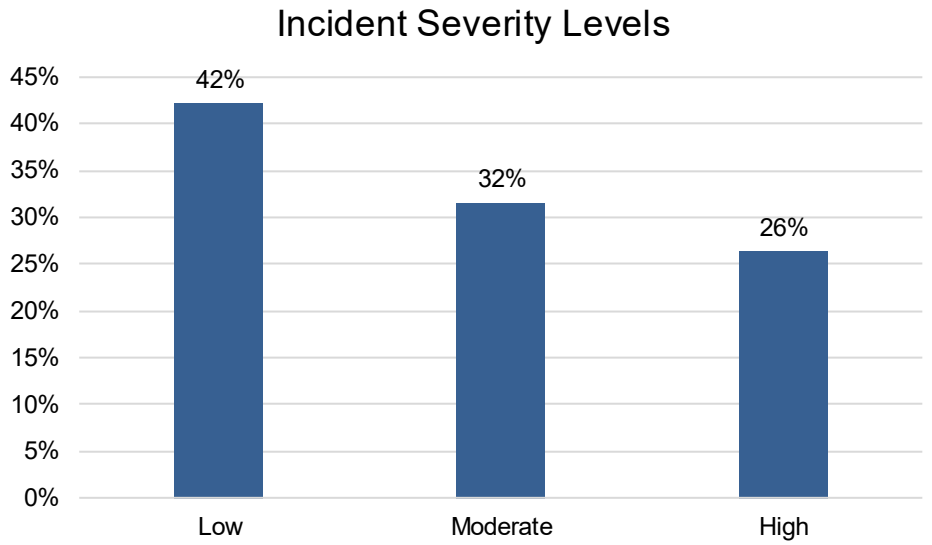
Analysis

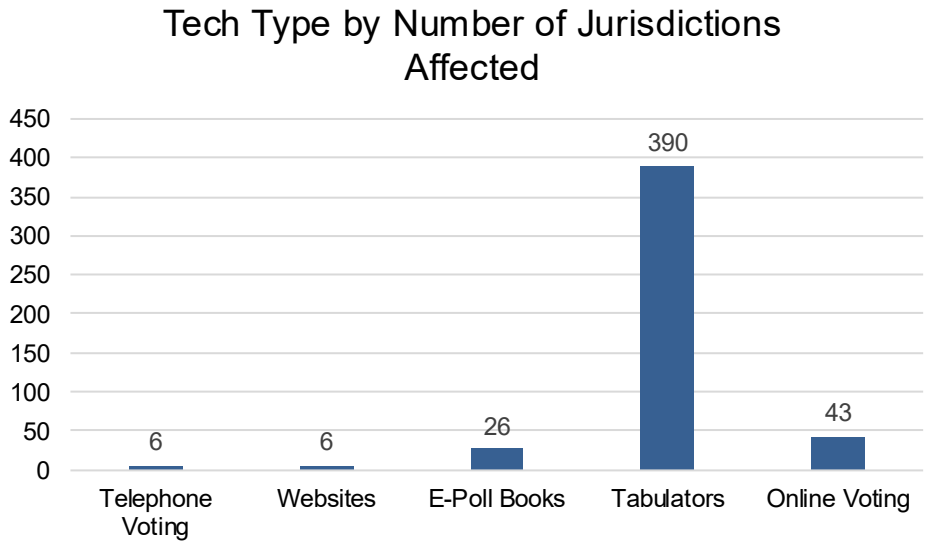

Issue Type and Affected Actor
100%
90%
80%
70%
60%
50%
40%
30%
20%
10%
0%
22.2%
5.6%
22.2%
50.0%
26.7%
73.3%
100.0%
50.0%
25.0%
25.0%
municipal
provincial
federal
political party
servcie availability
configuration issue
result issue
other

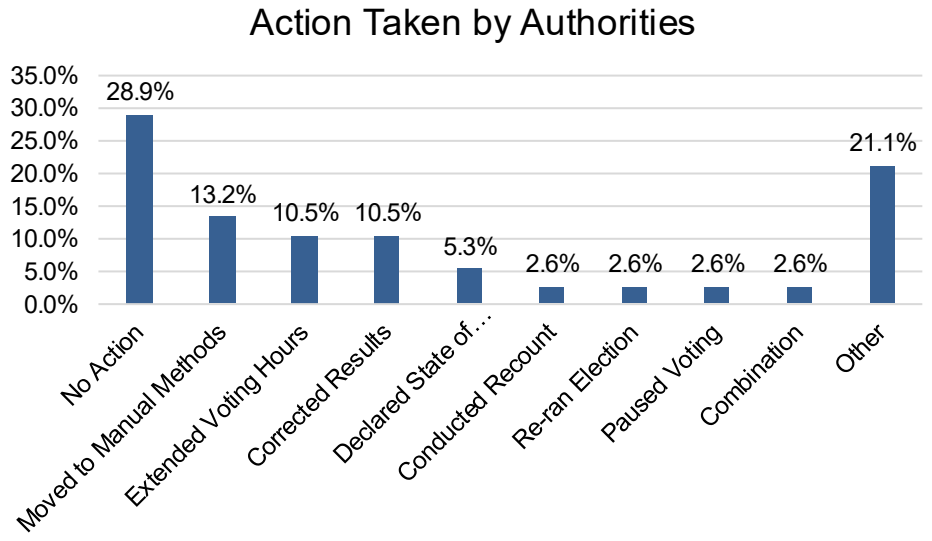

Attribution of Blame for Technical Incidents
Act of God 2.6%
Nefarious Actor 7.9%
Third-party Provider 15.8%
Primary Election Vendor 50.0%
Government 23.7%

Analysis


Error Origins
Power Outage 3%
Don't Know 16%
Fraud or Cyber-Attack 8%
Human Error 34%
User Interface Issue 8%
Technical Error 32%


Incident Severity Levels
45%
40%
35%
30%
25%
20%
15%
10%
5%
0%
42%
32%
26%
Low
Moderate
High


Tech Type by Number of Jurisdictions Affected
450
400
350
300
250
200
150
100
50
0
6
6
26
390
43
Telephone Voting
Websites
E-Poll Books
Tabulators
Online Voting


Action Taken by Authorities
35.0%
30.0%
25.0%
20.0%
15.0%
10.0%
5.0%
0.0%
28.9%
13.2%
10.5%
10.5%
5.3%
2.6%
2.6%
2.6%
2.6%
21.1%
No Action
Moved to Manual Methods
Extended Voting Hours
Corrected Results
Declared State of…
Conducted Recount
Re-ran Election
Paused Voting
Combination
Other

Predicting the Odds of a Med-High Severity Incident

Factors predicting a medium to high severity technical incident

	Dependent variable: med-high severity
Variable	**Odds Ratio (SE)**
Service availability	1.629 (1.204)
Vendor not to blame	82.100 (2.025)**
Municipality	0.024 ↓ (1.671)**
Outside of Ontario	39.765 (1.972)*
E-poll books	0.357 ↓ (1.773)
Online voting	1.327 (1.885)
Constant	0.317 ↓ (1.597)
Nagelkerke R^2	0.603

*(N=38) *Denotes significance at 0.1 level, ** significance at 0.05 level*
Note: Odds ratios less than 1 indicate a negative relationship (i.e., reduced odds of a more severe incident).

What factors can predict the odds a medium to high severity incident occurring?

- Odds of a medium to high severity issue occurring are 82 times higher when the vendor is responsible for the election incident.
- Actors that are not municipalities have 98% lower odds of experiencing a medium to high severity election incident compared to municipalities.
- Actors in Ontario have 40 times the odds of experiencing a more severe technical incident than being outside of Ontario.

Takeaways

- Instead of speculating this chapter highlights what IS going wrong with digital elections.
  - Largest # of incidents at the municipal level and these are more severe.
  - Ontario is the nucleus of technical events in Canada.
  - Incidents more prevalent for online voting, e-poll books systems, and tabulators in that order.
  - Largest cause is service outages. Vendors the most frequent responsible party.
  - Largest proportion of incidents attributable to human error. No evidence of bad state actors: worst attacks have been on party leadership races.
  - Odds of a medium-severity incident greater in Ontario and if a vendor is to blame. Odds of an incident decrease outside of the municipal level.

Good news: The headlines don't correspond with reality. Many of these incidents can be prevented through improved testing and polices.

Need to open the black box: vendor oversight and accountability mechanisms are crucial.

Ontario has the most work to do. There are standards but they won't be enough.

Thank you!

Questions?

Nicole Goodman: ngoodman2@brocku.ca
Aleksander Essex: assex@uwo.ca
Holly Ann Garnett: holly-ann.garnett@rmc-cmr.ca