

Supplementary materials

Infodemic pathways: Evaluating the role that traditional and social media play in cross-national information transfer

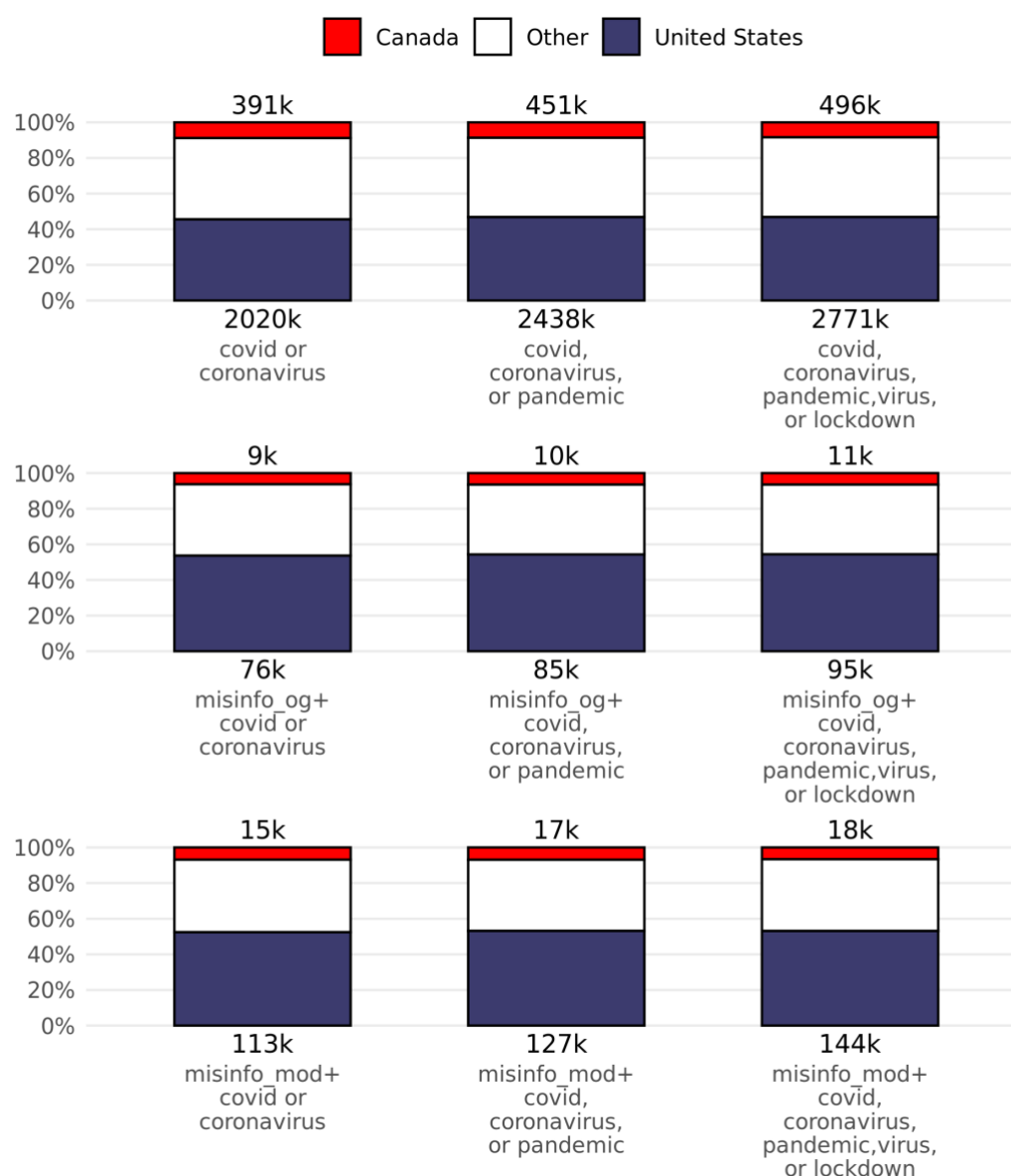
1. Dictionary employed to identify misinformation tweets

We employed a modified dictionary from Evanega et al. (2020), that associates misinformation with the following terms: ("lab leak", "hazardous event", "biowarfare", "population control", "eugenics", "depopulation", "plandemic", "mikki willis", "judy mikovits", "new world order", "deep state", "deep-state", "soros", "clinton foundation", "globalist", "illuminati", "freemasons", "5g", "acute radiation syndrome", "bioweapon", "bat soup", "q-anon", "qanon", "illuminati", "drink bleach", "trump bleach", "pirbright", "killer vaccine", "sterilization", "micro chip", "microchips", "event 201", "5g coronavirus", "misinformation", "fauci fraud", "faucifraud", "firefauci", "infodemic", "fact-check", "jewish plot", "fact check", "fact checking", "false claim", "umbrella corporation", "conspirac", "snopes", "factcheck", "colloidal silver", "genesis ii church", "truth-o-meter", "miracle cure", "miracle mineral", "chloroquine", "inject bleach", "disinfectant", "jim bakker", "consume bleach", "inject bleach", "uv light", "ultraviolet", "bogus cure", "peddling", "miracle mineral", "bleachgate", "drink sanitizer", "consume sanitizer", "inject sanitizer", "didier raoult", "azithromycin", "dexamethasone", "vitamin d", "false cure", "fake cure", "snake oil", "herbal cure", "herbal remedy", "madagascar cure", "coronavirus oil", "bogus remedies", "bogus remedy", "artemisia", "mainstream media", "mark grenon", "garlic", "chlorine dioxide", "steven novella", "alternative medicine", "chemical exposure", "oregano", "saline nose", "jennings ryan staley", "fraudster", "fraudsters", "covid-organics", "swindler", "sanitizer", "quack medicine", "health fraud", "healing microbes", "hand dryers", "silver colloid", "fish tank cleaner", "burning sage", "unproven", "fraudulent", "vital silver", "quinessence aromatherapy", "xephyr", "n-ergetics", "gurunanda", "vivify holistic clinic", "herbal amy", "influenza complex", "arsenicum album", "pete evans", "biocharger", "shuanghuanglian", "kyriakos velopoulos", "cow urine", "happy science", "abbas tabrizian", "poisonous", "faucifraud", "fauci lied", "fauci liar", "fire fauci", "bribed", "2020 election", "bill gates", "melinda gates", "gates foundation", "antisemitism", "antisemitic", "jew world order", "kevin barrett", "jews", "anti-semitism", "anti-semetic", "zionism virus", "nwo", "new world order", "scamdemic", "lockdownlies", "great reset", "greatreset", "weaponizedvaccines", "weaponized vaccines", "casedemic", "vaccineskill", "hoax", "sheep", "covidots").

We ran this dictionary over all tweets and retweets using a string search function `stringr::str_detect` in R (Wickham 2019). For inclusion, a tweet also had to contain one of the following terms: ("covid", "coronavirus", "pandemic"). This offered a conservative estimate of overall misinformation. We validated this dictionary through manual coding of a random

selection of 500 tweets that the dictionary classified as misinformation, with 44% being misinformation, 39% being about misinformation (including debunking it), and only 17% not concerning misinformation at all.

As dictionaries can be sensitive to word inclusions (Guo et al. 2016), we tested a variety of permutations for identifying COVID-19 related tweets and tested both the original dictionary and our modified version (although we removed the condition from the original dictionary where "soros" and "trump" appeared as that generated a large number of false positives). Figure 1 below shows the results of this sensitivity analysis, with the number of originally Canadian-based tweets identified on the top and the number of originally U.S.-based tweets on the bottom. The two versions of the dictionary and the inclusion or exclusion of specific COVID-19 related terms do not substantively impact the results.



2. Survey sample and variables

Table S1. Sample characteristics

Wave		9	10	11	12	13	14	15
Fielding		June 15-18	June 22-29	June 29-July 6	July 7-13	July 14-21	July 22-29	July 30-August 9
Female		50.7	50.8	51.3	52.3	53.4	49.9	51.2
Age	18-34	25.3	27.0	27.3	23.3	24.8	26.7	19.4
	35-54	33.9	33.3	34.0	35.4	35.0	35.1	37.6
	55+	40.8	39.7	38.7	41.3	40.2	38.2	43.0
University educated		38.3	39.8	39.0	39.2	37.6	43.1	40.4
French		20.4	20.6	20.4	20.7	20.5	20.7	20.4
Region	Atlantic	6.9	7.2	6.9	6.8	6.9	6.9	6.9
	Quebec	23.1	23.4	23.4	23.1	23.4	23.5	23.4
	Ontario	38.6	38.1	38.0	38.2	38.2	38.3	38.2
	West	31.5	31.3	31.7	31.8	31.5	31.4	31.5
N		2,552	2,548	2,495	2,539	2,526	2,536	2,535

Table S2. Variable description

Measure	Description
Misperceptions	Rate truthfulness of following claims: 1) The coronavirus is no worse than the seasonal flu; 2) Drinking water every 15 minutes will help prevent the coronavirus; 3) The Chinese government developed the coronavirus as a bioweapon; 4) Homeopathy and home remedies can help manage and prevent the coronavirus; 5) The coronavirus was caused by the consumption of bats in China; 6) The coronavirus will go away by the summer; 7) Vitamin C can ward off the coronavirus; 8) There is a vaccine for the coronavirus that national governments and pharmaceutical companies won't release; 9) High temperatures, such as from saunas and hair dryers, can kill the coronavirus (definitely false, probably false, probably true, definitely true, unsure)
U.S. news exposure	Logged sum of exposure to following outlets in past week: 1) the New York Times; 2) Washington Post; 3) Wall Street Journal; 4) ABC; 5) NBC; 6) CBS; 7) Fox News; 8) CNN; 9) MSNBC; 10) Breitbart News; 11) Daily Kos; 12) NPR; 13) Politico; 14) The Atlantic; 15) Bloomberg; and 16) None of the above
Domestic news exposure	Logged sum of exposure to following outlets in past week: 1) CBC; 2) CTV; 3) Global; 4) CityNews; 5) Globe and Mail; 6) National Post; 7) Toronto Star; 8) Local newspaper; 9) TVA (French-only); 10) TV5 (French-only); 11) La Presse (French-only); 12) Journal de Montreal (French-only); 13) Journal de Quebec (French-only); 14) Le Devoir (French-only); 15) Radio-Canada (French-only); 16) Rebel Media; 17) National Observer; 18) Toronto Sun; 19) The Tyee; 20) Post Millennial; 21) APTN; 22) True North News; 23) Press Progress; 24) Huffington Post; 25) Other; 26) None of the above

Measure	Description
Social media exposure	Logged sum of exposure to the following social media applications in the past week: 1) Twitter; 2) Facebook; 3) Instagram; 4) YouTube; 5) Reddit; 6) LinkedIn; 7) Tumblr; 8) WhatsApp; 9) Snapchat; 10) WeChat; 11) Other
Political discussion	How often in the past week did you talk about politics or public affairs with the following people? (Never, once, a few times, almost every day, daily, don't know) <ul style="list-style-type: none"> • Your family • Your friends • Your co-workers
Political knowledge	0-1; Correct answers to the following: 1) Party second in seats after the 2015 election; 2) the unemployment rate; 3) placement of the Liberal Party to the left of the Conservatives on 0-10 scale; 4) placement of NDP to the left of Liberals on 0-10 scale
Political interest	0-1; How interested are you in politics generally? Use a scale from 0 to 10, where zero means no interest at all, and ten means a great deal of interest.
Education	Highest level of education: no schooling; some elementary school; completed elementary school; some secondary/high school; completed secondary/high school; Some technical, community college, CEGEP, College Classique; Completed technical, community college, CEGEP, College Classique; Some university; bachelor's degree; master's degree; professional degree or doctorate; don't know
Age	Age in years
Gender	1= female
Region	Province of residence: Atlantic = Newfoundland and Labrador, Prince Edward Island, Nova Scotia, New Brunswick; Quebec; Ontario; West = Manitoba, Saskatchewan, Alberta, British Columbia

3. Survey robustness

Table S3. Robustness tests, binned ordinal social media and U.S. news exposure measures

	H1B	H2
U.S. news exposure	0.033** (0.005)	-0.033** (0.006)
Social media exposure		0.071** (0.007)
Social media * U.S. news		0.100** (0.012)
Domestic news exposure	-0.089** (0.010)	-0.124** (0.010)
Political discussion	0.133** (0.008)	0.101** (0.008)
Political knowledge	-0.145** (0.006)	-0.130** (0.006)
Political interest	0.020** (0.008)	0.005 (0.007)
Education	-0.149** (0.008)	-0.142** (0.008)
Age	-0.058** (0.002)	-0.038** (0.002)
Female	-0.024** (0.003)	-0.024** (0.003)
Quebec	0.028** (0.006)	0.028** (0.006)
Ontario	0.025** (0.006)	0.025** (0.006)
West	0.019** (0.006)	0.018** (0.006)
Constant	0.518**	0.471**
R ²	0.18	0.22
N	16216	16216

Standard errors in parentheses; * 0.05, ** p<0.01

Table S4. Robustness tests, social media frequency measure

	H1B	H2
U.S. news exposure	0.053** (0.008)	-0.005 (0.011)
Social media exposure		0.034** (0.006)
Social media * U.S. news		0.088** (0.018)
Domestic news exposure	-0.091** (0.010)	-0.105** (0.010)
Political discussion	0.133** (0.008)	0.115** (0.008)
Political knowledge	-0.145** (0.006)	-0.140** (0.006)
Political interest	0.019* (0.008)	0.005 (0.008)
Education	-0.149** (0.008)	-0.145** (0.008)
Age	-0.058** (0.002)	-0.053** (0.002)
Female	-0.024** (0.003)	-0.024** (0.003)
Quebec	0.029** (0.006)	0.031** (0.006)
Ontario	0.025** (0.006)	0.026** (0.006)
West	0.019** (0.006)	0.019** (0.006)
Constant	0.518**	0.508**
R ²	16216	16216
N	0.18	0.19

Standard errors in parentheses; * 0.05, ** p<0.01

Table S5. Extended analyses

	Social media → misperceptions	Social media → U.S. news exposure
Social media exposure	0.187** (0.007)	0.166** (0.007)
Domestic news exposure	-0.119** (0.009)	0.480** (0.010)
Political discussion	0.100** (0.008)	0.125** (0.007)
Political knowledge	-0.132** (0.006)	0.011 (0.006)
Political interest	0.001 (0.007)	0.078** (0.007)
Education	-0.141** (0.008)	0.032** (0.007)
Age	-0.038** (0.002)	-0.009** (0.002)
Female	-0.025** (0.003)	-0.036** (0.003)
Quebec	0.027** (0.006)	-0.136** (0.006)
Ontario	0.025** (0.006)	-0.006 (0.006)
West	0.019** (0.006)	-0.011 (0.006)
Constant	0.455**	-0.015
R ²	0.22	0.42
N	16216	16216

Note: Standard errors in parentheses; * 0.05, ** p<0.01. Column 1 presents model estimating relationship between social media usage and COVID-19 misperceptions. Column 2 presents model estimating relationship between social media usage and U.S. news exposure.

References

- Evanega, Sarah, Mark Lynas, Jordan Adams, and Karinne Smolenyak. 2020. "Coronavirus Misinformation: Quantifying Sources and Themes in the COVID-19 'Infodemic.'"
- Guo, Lei, Chris J. Vargo, Zixuan Pan, Weicong Ding, and Prakash Ishwar. 2016. "Big Social Data Analytics in Journalism and Mass Communication: Comparing Dictionary-Based Text Analysis and Unsupervised Topic Modeling." *Journalism & Mass Communication Quarterly* 93 (2): 332–59. <https://doi.org/10.1177/1077699016639231>.
- Wickham, Hadley. 2019. "Package 'Stringr.'"