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Supplementary Data

Supplementary Appendix 1: Supplementary methods for NAICS classification

The North American Industry Classification System (NAICS)-2017 is a hierarchical classification system developed by Canada, The United States, and Mexico [1]. For our study objective, we classified workplace outbreaks using the 2-digit NAICS industry sectors (N=20), with some modifications (see table below).
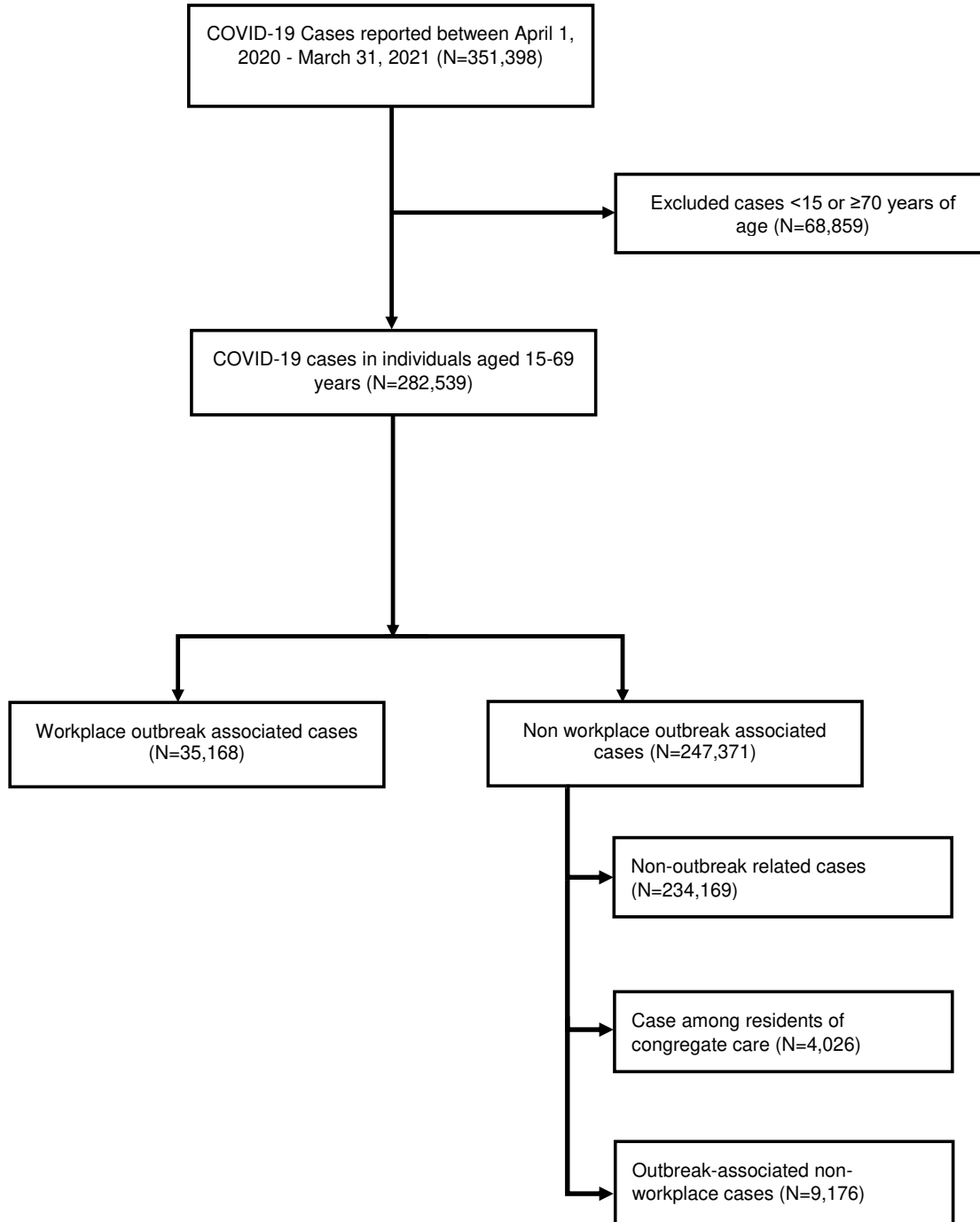
First, we separated the NAICS-2017 industry sector 31-33 - manufacturing into 2 distinct groups: food manufacturing (i.e., NAICS-2017 industry subsectors: 311 - food manufacturing and 312 - beverage and tobacco product manufacturing) and other manufacturing. Second, we combined sectors with few outbreaks, including 'mining and utilities' (i.e., NAICS-2017 industry sector codes: 21 - mining, quarrying, and oil and gas extraction and 22 – utilities) and 'other services industries' (i.e., NAICS-2017 industry sector codes: 51 - information and cultural, 52 - finance and insurance, 53 - real estate, rental and leasing, 54-professional, scientific and technical services, 55- management of companies and enterprises, 56- administrative and support, waste management and remediation services, 71 - arts, entertainment and recreation and 81 - other services (except public administration)). For consistency, we excluded workers from our denominators from industries that were ineligible for our workplace outbreak-associated case definition, including NAICS-2017 industry groups: 6116 - other schools and instruction, 7111 - performing arts companies, 7112 - spectator sports, 7113 - promoters (presenters) of performing arts, sports and similar events, 7114 - agents and managers for artists, athletes, entertainers and other public, 7115 - independent artists, writers and performers, 7131 - amusement parks and arcades 7132 - gambling industries, 7139 - other amusement and recreation industries, and 8131 - religious organizations. Overall, 13 sector categories were examined: agriculture, forestry, fishing and hunting; mining and utilities; construction; manufacturing – food; manufacturing – other; wholesale trade; retail trade; transportation and warehousing; educational services; health care and social assistance; accommodation and food services; public administration; and, other service industries.

North American Industry Classification System (NAICS) 2017 industry sectors and modifications for study objectives.

North American Industry Classification System (NAICS) 2017: 2-digit Industry Sector	Final Industry Sectors in Analysis (N=13)
11 Agriculture, forestry, fishing and hunting	Agriculture, forestry, fishing and hunting
21 Mining, quarrying, and oil and gas extraction	Mining and utilities
22 Utilities	Mining and utilities
23 Construction	Construction
31-33 Manufacturing	Manufacturing - food Includes: 311 - Food manufacturing and 312 - Beverage and tobacco product manufacturing
	Manufacturing - other
41 Wholesale trade	Wholesale trade
44-45 Retail trade	Retail trade

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48-49 Transportation and warehousing	Transportation and warehousing
51 Information and cultural industries	Other service industries
52 Finance and insurance	Other service industries
53 Real estate and rental and leasing	Other service industries
54 Professional, scientific and technical services	Other service industries
55 Management of companies and enterprises	Other service industries
56 Administrative and support, waste management and remediation services	Other service industries
61 Educational services	Educational services Excludes: 6116 - other schools and instruction
62 Health care and social assistance	Health care and social assistance
71 Arts, entertainment and recreation	Other service industries Excludes: 7111 - performing arts companies, 7112 - spectator sports, 7113 - promoters (presenters) of performing arts, sports and similar events, 7114 - agents and managers for artists, athletes, entertainers and other public, 7115 - independent artists, writers and performers, 7131 - amusement parks and arcades 7132 - gambling industries, 7139 - other amusement and recreation industries
72 Accommodation and food services	Accommodation and food services
81 Other services (except public administration)	Other service industries Excludes: 8131 - religious organizations
91 Public administration	Public administration

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Supplementary Appendix 2. Flow diagram of study cohort

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Supplementary Appendix 3: Socio-demographic characteristics of case and hospitalizations workplace outbreak-associated cases, non-outbreak related cases, residents in congregate care cases and outbreak-associated non-workplace cases among 15-69 year olds in Ontario, Canada
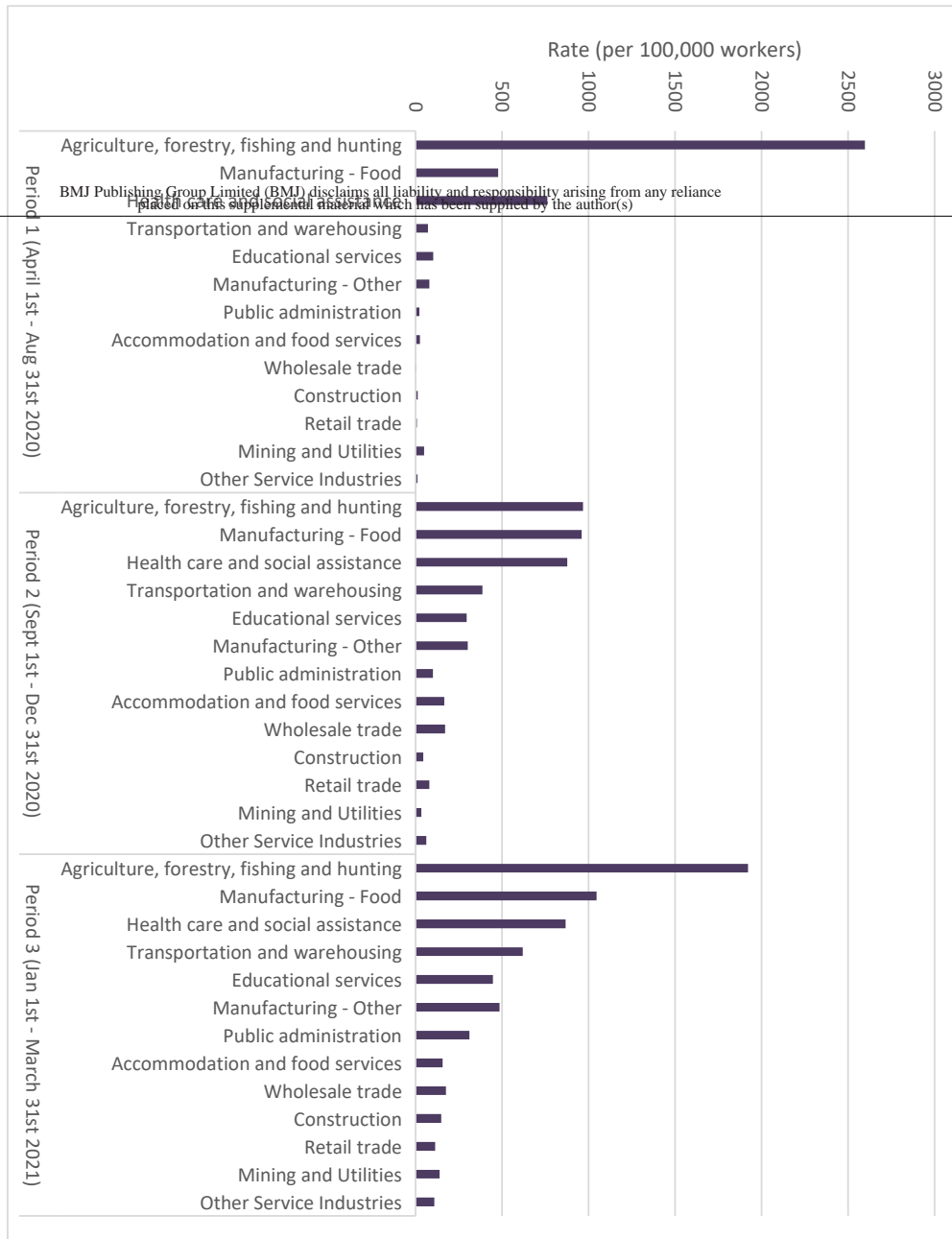
	Cases				Hospitalizations			
	Workplace outbreak-associated	Non-outbreak related	Residents in congregate care	Outbreak-associated non-workplace	Workplace outbreak-associated	Non-outbreak related	Residents in congregate care	Outbreak-associated non-workplace
Total (Ontario)	35,168	234,169	4,026	9,176	557	6,122	456	798
Time								
Period 1 (April 1st - Aug 31st 2020)	6,648	20,488	1,214	1,019	187	1,457	236	188
Period 2 (Sept 1st - Dec 31st 2020)	12,995	100,860	931	3,334	130	1,882	97	226
Period 3 (Jan 1st - March 31st 2021)	15,525	112,821	1,881	4,823	240	2,783	123	384
Gender								
Female	19,534	113,355	1,268	4,584	243	2,564	188	298
Male	15,397	119,668	2,721	4,493	311	3,540	268	497
Other*	237	1,146	37	99	3	18	0	3
Age (years)								
15-24	4,245	50,264	232	2,085	9	217	5	17
25-34	8,400	55,643	590	1,769	48	555	19	55
35-44	7,544	41,394	537	1,449	72	738	26	75
45-54	8,089	40,692	569	1,626	183	1,352	59	156
55-64	6,023	35,859	1,150	1,670	206	2,141	172	280
65-69	867	10,317	948	577	39	1,119	175	215
Material Deprivation Quintile**								
1 - low	4,419	34,990	8	1,360	57	731	0	100
2	5,800	37,155	6	1,529	110	846	1	118
3	6,765	43,960	4	1,405	115	1,007	1	121
4	7,424	48,008	6	1,620	115	1,187	0	158
5 - high	8,607	56,411	9	2,224	145	2,011	1	223
Missing	2,153	13,250	2	1,032	15	291	0	78

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Diversity Quintile**								
1 - low	2,700	11,040	9	844	36	327	0	64
2	4,045	16,031	3	1,127	74	421	0	111
3	4,445	25,135	4	1,433	75	655	1	130
4	6,550	46,199	7	1,822	116	1,126	0	173
5 - high	15,275	122,119	10	2,912	241	3,235	2	242
Missing	2,153	13,250	2	1,032	15	291	0	78
Public Health Unit								
Algoma District	16	142	2	35	1	1	0	0
Brant County	187	1,518	19	72	1	24	1	5
Chatham-Kent	295	968	3	50	2	20	0	2
City Of Hamilton	1,344	7,998	208	527	23	213	33	82
City Of Ottawa	1,703	10,427	447	438	37	291	50	42
Durham Region	1,592	9,381	145	203	31	256	10	18
Eastern Ontario	275	1,962	33	104	4	66	3	11
Grey Bruce	81	535	5	17	4	10	0	1
Haldimand-Norfolk	448	797	14	35	11	24	0	0
Haliburton, Kawartha, Pine Ridge	126	630	22	46	3	17	2	0
Halton Region	909	6,882	292	207	15	130	12	10
Hastings & Prince Edward Counties	82	327	3	15	3	8	0	0
Huron Perth	186	780	33	24	1	14	0	1
Kingston, Frontenac, Lennox & Addington	121	571	1	46	3	6	0	1
Lambton County	235	1,819	56	91	2	25	1	2
Leeds, Grenville And Lanark District	193	547	16	71	7	20	0	3
Middlesex-London	896	4,456	97	425	7	127	11	36
Niagara Region	1,748	4,920	142	517	31	113	15	27
North Bay Parry Sound District	16	161	3	57	0	14	0	4
Northwestern	26	295	3	208	1	15	0	10
Southwestern	498	1,582	33	40	6	39	4	5
Peel Region	7,272	50,803	248	708	74	860	32	41

Peterborough County-City	61	558	7	82	0	15	1	1
Porcupine	43	181	14	11	1	9	3	1
Renfrew County And District	85	224	1	8	0	5	0	0
Simcoe Muskoka District	1,123	4,874	66	210	35	145	3	23
Sudbury And District	203	728	6	131	3	25	2	7
Thunder Bay District	216	1,415	159	455	3	71	1	23
Timiskaming	22	70	2	8	0	4	2	2
Toronto	7,933	76,322	1,360	2,334	158	2,520	192	301
Waterloo Region	1,445	7,576	112	533	16	178	22	37
Wellington-Dufferin-Guelph	852	3,107	44	226	11	78	5	11
Windsor-Essex County	2,724	7,851	295	335	25	227	29	26
York Region	2,212	23,762	135	907	38	552	21	65

*Includes individuals for which gender was not reported or missing, as well as individuals reporting transgender or non-binary gender

**Quintile 5 represents the highest quintile of deprivation or diversity. The material deprivation measure combines information on income, quality of housing, educational attainment and family structure characteristics to assess the ability of individuals and communities to access and attain basic material needs. The ethnic concentration dimension is based on the proportion of non-white and non-Indigenous residents and/or the proportion of immigrants that arrived in Canada within the past five years.

Supplementary Appendix 4: Cumulative case rate (per 100,000 workers) of COVID-19 among Ontario workers aged 15-69 by time and industry

Supplementary Appendix 5: Supporting data for Figure 1 and Supplementary Appendix 4

Time period & Industry	Cases	Total Number of Hours		Average Number of Workers	
		Total Number of Hours Worked (majority hours outside the home)	Case rate per 100,000,000 hours worked (majority hours outside the home)	Average number of workers (majority hours outside the home)	Case rate per 100,000 workers (majority hours outside the home)
Period 1 (April 1st - Aug 31st 2020)					
Agriculture, forestry, fishing and hunting	1,339	48,153,959	2,781*	51,556	2,597
Manufacturing - Food	474	84,207,299	563	99,273	477
Health care and social assistance	4,050	390,015,763	1,038	531,731	762
Transportation and warehousing	164	187,868,797	87	230,425	71
Educational services	45	33,429,083	135	44,098	102
Manufacturing - Other	313	341,111,765	92	392,149	80
Public administration	32	115,840,750	28	143,596	22
Accommodation and food services	49	123,507,904	40	193,549	25
Wholesale trade	6	104,561,653	6	125,528	5
Construction	43	293,157,284	15	346,412	12
Retail trade	42	377,679,497	11	548,037	8
Mining and Utilities	21	39,578,589	53	42,343	50
Other Service Industries	70	471,204,619	15	620,155	11
Period 2 (Sept 1st - Dec 31st 2020)					
Agriculture, forestry, fishing and hunting	532	39,126,580	1,360*	54,942	968
Manufacturing - Food	861	58,594,099	1,469	89,695	960
Health care and social assistance	5,862	394,230,318	1,487	668,834	876
Transportation and warehousing	1,153	190,001,785	607	298,357	386
Educational services	923	194,025,987	476	312,211	296
Manufacturing - Other	1,577	364,638,983	432	523,169	301
Public administration	130	81,801,155	159	128,973	101
Accommodation and food services	528	145,406,278	363	318,445	166

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Wholesale trade	233	89,878,386	259	135,895	171
Construction	192	290,645,426	66	424,963	45
Retail trade	528	339,150,494	156	660,874	80
Mining and Utilities	19	41,960,750	45	56,759	33
Other Service Industries	457	450,104,813	102	741,174	62
Period 3 (Jan 1st - March 31st 2021)					
Agriculture, forestry, fishing and hunting	705	18,796,210	3,751*	36,672	1,922
Manufacturing - Food	991	47,740,439	2,076	94,744	1,046
Health care and social assistance	5,471	280,224,605	1,952	630,463	868
Transportation and warehousing	1,739	135,208,416	1,286	280,578	620
Educational services	1,138	114,756,384	992	254,875	446
Manufacturing - Other	2,450	257,680,749	951	504,841	485
Public administration	376	61,268,514	614	120,701	312
Accommodation and food services	391	89,073,950	439	249,135	157
Wholesale trade	221	64,267,322	344	125,874	176
Construction	562	187,336,542	300	377,017	149
Retail trade	718	245,766,795	292	629,478	114
Mining and Utilities	75	30,452,374	246	53,814	139
Other Service Industries	688	290,377,823	237	629,961	109

* Two sensitivity analyses related to the Agriculture, forestry, fishing and hunting industry were performed. 1) Accounting for temporary foreign workers (TFWs) decreased the COVID-19 incidence rates in the agriculture industry from 2,781 to 1,858 (period 1), 1360 to 927 (period 2), and from 3,751 to 2,208 (period 3) cases per 100,000,000 hours in those who worked mostly outside the home. 2) When we reclassified the hours of those self-employed (with employees) on farms to working outside the home (i.e., to ensure their exposure to others was enumerated), the incidence decreased across all time periods (to 2,275, 1,175, and 3,118 per 100,000,000 hours in periods 1-3, respectively).

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Reference

1 Statistics Canada. North American Industry Classification System (NAICS) Canada 2017 Version 3.0. 2021.https://www23.statcan.gc.ca/imdb/p3VD.pl?Function=getVD&TVD=1181553 (accessed 23 Jun 2021).