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Short communication

The epidemiology of infectious diseases in Europe in 2020 versus 2017–2019 and the rise of tick-borne encephalitis (1995–2020)

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ABSTRACT

Health control measures instituted in 2020 to mitigate the COVID-19 pandemic decreased the case numbers of many infectious diseases across Europe. One notable exception was tick-borne encephalitis (TBE). In Austria, Germany, Switzerland, Lithuania, and the Czech Republic, the upturn was significantly higher compared to the average of the three years previously ($P<0.05$), with increases of 88%, 48%, 51%, 28%, and 18%, respectively. Six countries reported TBE incidences of ≥5 cases/100,000, defined as highly endemic by the World Health Organization (WHO). Possible factors contributing to this surge may include increased participation in outdoor activities in endemic regions and increased tick counts/tick activity. In highly endemic regions, the WHO recommends that vaccination be offered to all age groups, including children.

1. Introduction

The emergence in December 2019 of the new coronavirus SARS-CoV-2, the causative agent of COVID-19, quickly swept around the globe, and on 11th March 2020 the World Health Organization (WHO) declared the COVID-19 pandemic (WHO, 2020). Consequently, parts of Europe put in place public health policies to contain the spread of the virus. Recent reports from Switzerland (Steffen et al., 2020) and Germany (Ulrich et al., 2021) documented substantial reductions in almost all recorded infectious diseases in 2020 as compared to earlier years. In these countries, one of the only infectious diseases to see an increase during this period was tick-borne encephalitis (TBE) (Steffen et al., 2020; Ulrich et al., 2021). In this report, we used data from the health departments of various European countries to investigate the prevalence of select infectious diseases under surveillance during 2020, and further explored the trend in TBE cases from 1995 through 2020.

2. Materials and methods

Data were sourced from the websites of health departments of the countries listed in Table 1. For the calculation of disease incidences per country, population denominator data were obtained from the Statistical Office of the EU (Eurostat) https://appsso.eurostat.ec.europa.eu (data extracted on 10 December 2021). The reported incidences for the year 2020 and the mean for the combined years 2017, 2018, and 2019 were compared using a chi-square test, with no adjustment made for multiple comparisons.

3. Results

3.1. Cases of TBE in select European countries (January 2020-December 2020)

The number of cases of TBE were found to have increased in 2020 compared to the average of the three years previously in thirteen select European countries: Austria, Germany, Switzerland, Finland, Norway, Lithuania, and the Czech Republic (Table 2) as well as in Slovakia, Slovenia, Belgium, Denmark, the United Kingdom and the Netherlands (Table 3). In five countries, the increases were significantly ($P<0.05$) higher — Austria (88%), Germany (48%), Switzerland (51%), Lithuania (28%) and the Czech Republic (18%). Significant ($P<0.05$) decreases in TBE were found in Poland (−36%) and Sweden (−27%).

3.2. Case numbers and incidence of TBE (1995–2020)

The year 2020 saw the highest ever number of TBE cases since 1995

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Table 1
Source Data.

Country	Data source	Web Addresses
TBE Data 1995 - 2010	Süss 2011	Süss J., 2011. Tick-borne encephalitis 2010: epidemiology, risk areas, and virus strains in Europe and Asia-an overview. Ticks Tick. Borne. Dis. 2, 2–15.
TBE data ECDC	Tick-borne encephalitis - Annual Epidemiological Report for 2019- 2014	https://www.ecdc.europa.eu/en/tick-borne-encephalitis/surveillance-and-disease-data/annual-epidemiological-report
Austria	The Ministry of Health: Annual statistics of notifiable infectious diseases	https://www.sozialministerium.at/Themen/Gesundheit/Uebertragbare-Krankheiten/Publikationen.html
Belgium	Épidémiologie des maladies infectieuses	https://epidemio.wiv-isp.be/ & https://wwwnc.cdc.gov/eid/article/27/8/21–1175_article
Czech Republic	The State Institute of Public Health: Infectious Disease Information System	http://www.szu.cz/publikace/data/infekce-v-cr
Denmark	Statens Serum Institut: Annual reports on disease incidence	https://en.ssi.dk/surveillance-and-preparedness/surveillance-in-denmark/annual-reports-on-disease-incidence
Estonia	Health board: Incidence of infectious diseases	https://www.terviseamet.ee/et/nakkus-haigused/tervishoiutootajale/nakkushaigustesse-haigestumine
Finland	National Institute for Health and Welfare: Statistical database of the Communicable Diseases Register	https://sampo.thl.fi/pivot/prod/fi/ttr/shp/fact_shp
France	Santé publique france	https://www.santepubliquefrance.fr/maladies-et-traumatismes/maladies-a-prevention-vaccinale/encephalite-a-tiques/le-scan/#tabs
Germany	Robert Koch Institut: Infection epidemiological yearbook	https://www.rki.de/DE/Content/Infekt/Jahrbuch/jahrbuch_node.html
Hungary	State Public Health and Medical Officer Service: annual reports, data on infectious diseases	https://www.antsz.hu/felso_menu/temaink/jarvany/Fertozo_betegsegek/Fertozo_eves_jelentesk & http://www.oek.hu/oek.web?to=2561&nid=1308&pid=1&lang=hun
Ireland	Health Protection Surveillance centre	https://www.hpsc.ie/a-z/vectorborne/tick-borneencephalitis/
Italy	Epidemiology for public health: National arbovirus surveillance system: periodic bulletins	https://www.epicentro.iss.it/arbovirosi/bollettini
Latvia	Center for Disease Prevention and Control: Epidemiology bulletins	https://www.spkc.gov.lv/lv/epidemiologijas-bileteni
Lithuania	Institute of Hygiene: Summaries of annual health statistics reports	https://www.hi.lt/sveikatos-statistika.html
Netherlands	National Institute for Public Health and the Environment Ministry of Health, Welfare and Sport	https://www.rivm.nl/en/news/spread-of-tick-borne-encephalitis-virus-in-netherlands
Norway	National Institute of Public Health: Communicable Diseases Notification System (MSIS), NIPH	https://statistikk.fhi.no/msis/sykdomshendelser?etter=diagnose&fordeltPaa=aar
Poland	National Institute of Public Health: Department of epidemiology and surveillance of infectious diseases	http://wwwold.pzh.gov.pl/oldpage/epimeld/index_a.html
Slovakia	Public Health Office of the Slovak Republic: Epidemiological information system	https://www.epis.sk/AktualnyVyskyt/PrenosneOchorenia/Grafy/Sezonalita.aspx
Slovenia	National Institute of Public Health: Health Statistical Yearbook of Slovenia	https://www.nijz.si/sl/nijz/revije/zdravstveni-statisticni-letopis-slovenije
Sweden	The Public Health Authority (Fohm): Statistics on infectious diseases	https://www.folkhalsomyndigheten.se/folkhalsorapportering-statistik/statistik-a-o/sjukdomsstatistik/?letter=ABC#listing
United Kingdom	Gov.uk Tick-borne encephalitis: epidemiology, diagnosis and prevention	https://www.gov.uk/guidance/tick-borne-encephalitis-epidemiology-diagnosis-and-prevention
Switzerland	Federal Office of Public Health FOPH: BAG-Bulletin	https://www.bag.admin.ch/bag/de/home/das-bag/publikationen/periodika/bag-bulletin.html

Web links last accessed July 2021.

for eight countries (Austria, Switzerland, Germany, Slovakia, Finland, Norway, Belgium, and the Netherlands) (Table 3). The highest notification rates of TBE in 2020 occurred in Lithuania, Latvia, Slovenia, and the Czech Republic, with incidences of 23.94, 11.01, 8.92, and 7.99 cases/100,000 population, respectively (Table 3 and Fig. 1). These four countries as well as Estonia (incidence of 5.12) and Switzerland (incidence of 5.31) reported incidences of $\geq$5 per 100,000/year. Incidences of TBE per country per 100,000 inhabitants in 2020 is shown in Fig. 1.

3.3. Trends in other infectious diseases in twelve European countries (2017 – 2020)

With few exceptions, the number of cases of a range of infectious diseases, including airborne diseases such as *Haemophilus influenzae*, Meningococcal disease, and *Streptococcus pneumoniae*, were significantly decreased in 2020 compared to the average of the three years previously (Table 2). The largest and most consistent decrease was seen in rotavirus, where seven (Germany, Finland, Estonia, Latvia, Lithuania, Hungary, and Poland) of eight countries reporting on rotavirus recorded reductions of 53–93%. Other than TBE, pertussis, influenza, gonorrhea, and chlamydia were the only other infectious diseases to have seen significant ($P<0.05$) increases in 2020 vs. the mean of the three previous years, and only in select countries. Influenza increased by 4% in Germany, gonorrhea by 11% in Switzerland, chlamydia by 7% in Finland, and pertussis by 176% in Lithuania.

4. Discussion

Over a 25-year period from 1995 to 2020, the number of cases of TBE across many European countries has trended upwards. Specifically comparing 2020 to the mean number of cases of 2017–2019, countries in the alpine regions demonstrated significant increases of 48–88% in TBE, with record number of cases reported in Switzerland and Germany. Other countries that saw a significant increase in TBE cases during this period were the Czech Republic (18%) and Lithuania (28%). In contrast, the changes in total TBE cases in other Northern and Eastern European countries were non-significant when compared to data from 2017-2019, with the exception of Sweden and Poland where a significant decrease in cases was reported.

Other notifiable diseases, including airborne diseases such as *Haemophilus influenzae*, Meningococcal disease, and *Streptococcus pneumoniae*, were decreased in 2020 in Europe and other countries (Steffen

Table 2
Number of cases of notifiable infectious diseases in European countries (2017 – 2020).

infectiousdisease	2017	2018	2019	2020	Mean2017 – 19	%change2020 vsMean	*P*value	2017	2018	2019	2020	Mean 2017 – 19	%change2020 vsMean	*P*value	2017	2018	2019	2020	Mean 2017 – 19	%change2020 vsMean	*P*value
	AUSTRIA							**GERMANY**							**SWITZERLAND**						
Influenza								95,943	274,242	193,879	194,731	188,021	4	<0.0001	9098	13,986	13,768	11,347	12,284	−8	<0.0001
Pertussis	1411	2202	2233	665	1949	−66	<0.0001	16,834	12,907	10,302	7084	13,348	−47	<0.0001							
Haemophilus influenzae	39	49	64	28	51	−45	0.0086	811	851	954	468	872	−46	<0.0001	113	138	124	80	125	−36	0.0012
Meningococcal disease	20	30	24	8	25	−68	0.0028	283	295	256	138	278	−50	<0.0001	55	63	44	20	54	−63	<0.0001
Streptococcus pneumoniae	545	611	615	356	590	−40	<0.0001								945	966	873	558	928	−40	<0.0001
Tuberculosis	570	480	474	402	508	−21	0.0003	5486	5429	4791	4194	5235	−20	<0.0001	534	509	431	366	491	−26	<0.0001
Norovirus	1173	1572	1900	868	1548	−44	<0.0001	73,273	77,583	78,665	43,627	76,507	−43	<0.0001							
Rotavirus	203	181	184	203	189	7	0.5348	38,251	23,603	36,874	7852	32,909	−76	<0.0001							
Hepatitis A	242	80	76	37	133	−72	<0.0001	1232	1043	873	1011	1049	−4	0.3615	113	104	78	72	98	−27	0.0368
HIV								3144	2818	3093	2206	3018	−27	<0.0001	466	407	430	283	434	−35	<0.0001
Gonorrhea															2559	2936	3941	3501	3145	11	0.0002
Chlamydia															11,100	11,147	12,410	11,298	11,552	−2	0.0057
TBE (tick-borne encephalitis)	123	171	106	250	133	88	<0.0001	485	583	445	748	504	48	<0.0001	269	375	262	457	302	51	<0.0001
	FINLAND							**NORWAY**							**SWEDEN**						
infectious disease	2017	2018	2019	2020	Mean 2017 - 19	% change 2020 vs Mean	*P* value	2017	2018	2019	2020	Mean 2017 - 19	% change 2020 vs Mean	*P* value	2017	2018	2019	2020	Mean 2017 - 19	% change 2020 vs Mean	
2020 vs Mean	*P* value																				
Influenza	13,260	35,823	19,825	10,190	22,969	−56	<0.0001								10,851	20,855	13,253	6797	14,986	−55	<0.0001
Pertussis	402	481	557	288	480	−40	<0.0001	2424	2476	2536	812	2479	−67	<0.0001	805	739	782	270	775	−65	<0.0001
Haemophilus influenzae	73	89	77	41	80	−49	0.0004	120	91	98	38	103	−63	<0.0001	229	201	259	92	230	−60	<0.0001
Meningococcal disease	16	16	16	5	16	−69	0.0161	18	26	16	5	20	−75	0.0024	49	56	66	28	57	−51	0.0012
Streptococcus pneumoniae	822	761	748	315	777	−59	<0.0001	560	581	599	295	580	−49	<0.0001	1367	1408	1345	650	1373	−53	<0.0001
Tuberculosis	10	15	12	5	12	−59	0.0885	261	208	165	177	211	−16	0.0643	533	504	491	355	509	−30	<0.0001
Norovirus	3874	2336	3392	865	3201	−73	<0.0001														
Rotavirus	269	359	206	131	278	−53	<0.0001														
Hepatitis A	29	28	18	12	25	−52	0.0319	50	32	37	15	40	−62	0.0006	110	123	90	57	108	−47	<0.0001
HIV	159	151	149	132	153	−14	0.2055	213	191	172	137	192	−29	0.0017							
Gonorrhea	604	501	607	482	571	−16	0.0053	1399	1659	1704	1047	1587	−34	<0.0001	2531	2712	3244	2731	2829	−3	0.0478
Chlamydia	14,535	14,911	16,179	16,225	15,208	7	<0.0001								33,754	31,995	34,742	33,316	33,497	−1	0.0026
TBE (tick-borne encephalitis)	85	79	69	92	78	18	0.2906	16	26	35	41	26	60	0.0749	391	385	358	275	378	−27	<0.0001

(*continued on next page*)

Table 2 (*continued*)

infectious disease	2017	2018	2019	2020	Mean 2017 - 19	% change 2020 vs Mean	*P* value	2017	2018	2019	2020	Mean 2017 - 19	% change 2020 vs Mean	*P* value	2017	2018	2019	2020	Mean 2017 - 19	% change 2020 vs Mean	*P* value
	ESTONIA							**LATVIA**							**LITHUANIA**						
infectious disease	2017	2018	2019	2020	Mean 2017 - 19	% change 2020 vs Mean	*P* value	2017	2018	2019	2020	Mean 2017 - 19	% change 2020 vs Mean	*P* value	2017	2018	2019	2020	Mean 2017 - 19	% change 2020 vs Mean	*P* value
Influenza	7408	14,300	11,668	4198	11,125	−62	<0.0001														
Pertussis	56	69	135	44	87	−49	0.0002	95	159	720	342	325	5	0.3995	21	27	26	68	25	176	<0.0001
Haemophilus influenzae	53	75	69	36	66	−45	0.0027	2	4	4	1	3	−70	0.3242	8	14	3	1	8	−88	0.0201
Meningococcal disease	4	9	4	4	6	−29	0.5213	9	8	9	6	9	−31	0.4551	81	40	37	12	53	−77	<0.0001
Streptococcus pneumoniae	160	195	220	82	192	−57	<0.0001	75	76	83	69	78	−12	0.5119	76	65	66	44	69	−36	0.0203
Adenovirus																					.
Tuberculosis	144	120	147	100	137	−27	0.0144								896	779	779	7	818	−99	<0.0001
Norovirus															861	1457	1240	351	1186	−70	<0.0001
Rotavirus	586	543	558	146	562	−74	<0.0001	1643	1301	1432	256	1459	−82	<0.0001	3901	3474	2912	253	3429	−93	<0.0001
Hepatitis A	45	15	20	30	27	13	0.7067	75	67	37	21	60	−65	<0.0001	57	22	17	9	32	−72	0.0004
HIV	219	190	178	147	196	−25	0.0070	371	326	259	257	319	−19	0.0158	190	84	70	36	115	−69	<0.0001
Gonorrhea	58	49	81	23	63	−63	<0.0001	184	170	128	67	161	−58	<0.0001	70	72	56	32	66	−52	0.0007
Chlamydia	1139	983	1090	935	1071	−13	0.0016	1512	1306	1249	828	1356	−39	<0.0001	397	257	248	175	301	−42	<0.0001
TBE (tick-borne encephalitis)	87	85	83	70	85	−18	0.2151	214	169	250	210	211	0	0.9223	474	384	711	669	523	28	<0.0001
	CZECH REPUBLIC							**HUNGARY**							**POLAND**						
infectious disease	2017	2018	2019	2020	Mean 2017 - 19	% change 2020 vs Mean	*P* value	2017	2018	2019	2020	Mean 2017 - 19	% change 2020 vs Mean	*P* value	2017	2018	2019	2020	Mean 2017 - 19	% change 2020 vs Mean	*P* value
Influenza															5043,491	5239,293	4790,033	3164,446	5024,272	−37	<0.0001
Pertussis	667	752	1347	696	922	−25	<0.0001	15	23	7	13	15	−13	0.7111	3061	1548	1629	743	2079	−64	<0.0001
Haemophilus influenzae								21	32	15	10	23	−56	0.0241	108	115	99	60	107	−44	0.0003
Meningococcal disease	68	52	51	24	57	−58	0.0002	41	43	51	33	45	−27	0.1783	225	200	193	99	206	−52	<0.0001
Streptococcus pneumoniae								270	341	297	200	303	−34	<0.0001	1192	1355	1541	545	1363	−60	<0.0001
Adenovirus																					
Tuberculosis															5787	5487	5321		5532		
Norovirus															3501	5358	5636	1485	4832	−69	<0.0001
Rotavirus								5299	2949	3906	746	4051	−82	<0.0001	32,995	23,263	34,019	5962	30,092	−80	<0.0001
Hepatitis A	772	211	240	183	408	−55	<0.0001	367	182	104	28	218	−87	<0.0001	2590	1455	1067	109	1704	−94	<0.0001
HIV								223	229	238	151	230	−34	<0.0001	1462	1351	1763	934	1525	−39	<0.0001
Gonorrhea								1030	1249	1348	208	1209	−83	<0.0001	321	332	524	250	392	−36	<0.0001
Chlamydia	2261	2041	2343	1571	2215	−29	<0.0001	923	780	913	102	872	−88	<0.0001	258	308	421	168	329	−49	<0.0001
TBE (tick-borne encephalitis)	687	715	774	854	725	18	0.0018	16	32	18	18	22	−18	0.5330	283	197	265	158	248	−36	<0.0001

* P-value derived from the comparison of reported incidences for 2020 vs the mean of years 2017, 2018 and 2019 using a chi-square test, with no adjustment made for multiple comparisons.

Table 3
Number of tick-borne encephalitis cases in European countries (1995 – 2020).

	1995	1996	1997	1998	1999	2000	2001	2002	2003	2004	2005	2006	2007	2008	2009	2010	2011	2012	2013	2014	2015	2016	2017	2018	2019	2020	Mean 2017 – 2019	2020incidence
Austria	109	128	99	62	41	60	54	60	82	54	100	84	45	86	79	63	103	49	100	81	79	95	123	171	106	250	133	2.81
Belgium*																								2	0	3	1	0.03
Czech Republic	744	571	415	422	490	719	633	647	606	507	643	1029	546	631	816	589	861	573	625	410	355	565	687	715	774	854	725	7.99
Denmark*				1	4	3	1	1	4	8	4	?	2	2	2	4	1	1	1	1	1	1	1	4	5	4	3	0.07
Estonia	175	177	404	387	185	272	215	90	237	182	164	171	140	90	179	201	250	178	114	83	116	81	87	85	83	68	85	5.12
Finland	5	8	19	16	12	42	33	38	16	29	16	18	20	23	25	38	43	39	38	47	68	61	85	79	69	92	78	1.67
Germany	226	114	211	148	115	133	225	239	278	274	431	547	238	285	313	260	422	195	420	265	223	348	485	583	445	748	504	0.90
Hungary	234	224	99	84	51	45	76	80	114	89	52	56	62	70	64	50	43	44	53	31	24	19	16	32	18	18	22	0.18
Ireland																									1		0	0.00
Italy	6	8	8	11	5	15	19	6	14	23	22	14	4	34	32	21	26	34	42	22	14	53	24	39	24	21	29	0.04
Latvia	1341	716	874	1029	350	544	303	153	365	251	142	170	171	181	328	494	429	367	265	173	169	230	214	169	250	210	211	11.01
Lithuania	426	309	645	548	171	419	298	168	763	425	243	462	234	220	617	612	365	495	501	353	336	633	474	384	711	669	523	23.94
Luxembourg	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0.00
Netherlands*	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	2	1	2	2	5	2	0.03
Norway				1	1	1	0	2	1	2	3	3	13	9	10	11	14	7	6	13	9	12	16	26	35	41	26	0.76
Poland	267	257	201	208	101	170	210	126	339	262	177	317	233	202	351	294	221	189	227	195	149	283	283	197	265	158	248	0.42
Portugal	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0.00
Slovakia	89	82	76	54	63	92	75	62	74	70	50	91	57	79	76	90	108	107	162	117	88	174	75	156	161	176	131	3.22
Slovenia	260	406	274	136	150	190	260	262	282	204	297	373	199	246	307	166	247	164	309	100	62	83	102	153	87	187	114	8.92
Sweden	68	44	76	64	53	133	128	105	105	174	138	163	185	224	210	174	284	287	209	178	268	238	391	385	358	275	378	2.66
United Kingdom*																									1	1	0	0.00
Switzerland	60	62	123	68	112	91	107	53	116	138	206	259	113	127	118	90	175	95	205	113	121	206	269	375	263	457	302	5.31

* suspected autochthonous cases only

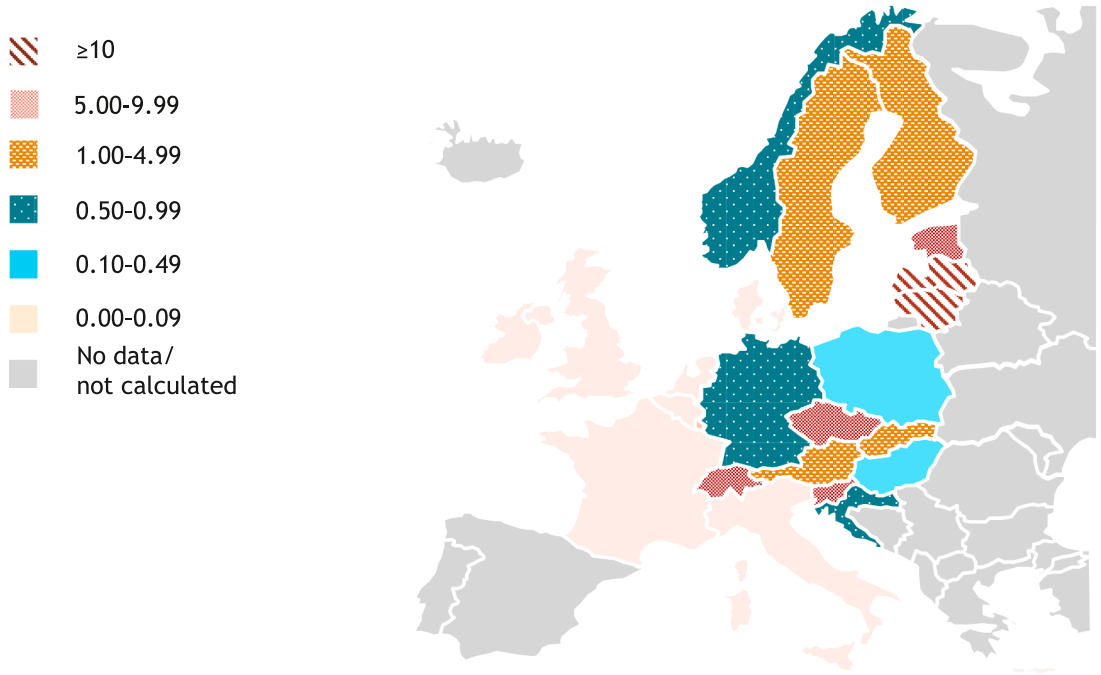

Fig. 1. TBE incidence per 100,000 inhabitants in 2020.

et al., 2020; Sullivan et al., 2020; Ulrich et al., 2021). The reduction in these infections may be linked to mitigation efforts (including social distancing, school closures, travel restrictions, and mask wearing, and an emphasis on hand washing) put in place to prevent the spread of COVID-19 (Steffen et al., 2020; Sullivan et al., 2020; Ulrich et al., 2021). Furthermore, day-care closures were likely responsible for the consistently large decline in rotavirus, as interactions between infants and young children were reduced. A potential explanation for the rise in pertussis in Lithuania could be increased health seeking behaviours and subsequent pertussis diagnosis.

TBE, an infectious disease of the central nervous system caused by the tick-borne encephalitis virus (TBEV), is endemic in Eastern, Central, and Northern Europe as well as in northern China, Japan, Mongolia, and the Russian Federation (World Health Organization, 2011). Transmission usually occurs via the bite of an infected tick. Infrequently, though, humans also can be infected by consuming unpasteurised dairy products (Brockmann et al., 2018; Kohlmaier et al., 2021).

Factors driving TBE incidence can be classified into three areas: (i) tick abundance, (ii) population at risk, and (iii) surveillance characteristics (Martin et al., 2020; Ocias et al., 2019; Ulrich et al., 2021; World Health Organization, 2011). Tick abundance is related to environmental conditions, including land use, weather, host reservoirs, and climate change, and can be very focal (Süss et al., 2008). An earlier occurrence of spring can accelerate tick development (Jaenson et al., 2012). Additionally, milder winters permit winter activity of ticks and may increase population of hosts to sustain greater tick populations (Süss et al., 2008). The weather conditions in Switzerland during winter months of late 2019/early 2020 were suitable to meet these conditions and may explain the high number of TBE cases in 2020. Indeed, the national average winter temperature rose to 0.7 °C (MeteoSchweiz, 2020). Unusually high winter temperatures, with a national average over 0 °C, have occurred only four times in Switzerland since 1864, when temperature record-keeping began (MeteoSchweiz, 2020). Complimenting this was the arrival of a very early spring 2020, as classified by the spring index (Federal Office of Meteorology and Climatology MeteoSwiss, 2021).

Changes in human behaviour (e.g., increase of at-risk outdoor recreational activities) can put people at greater risk of exposure to ticks and thus TBE. This is one factor that may have contributed to the increase of TBE during the COVID-19 lockdown, as shown by the actual versus predicted numbers in Austria and Germany. The predicted number of TBE cases for 2020 based on negative binomial regression models ranged from 142 to 156 for Austria (vs 250 actual), 663–670 for Germany (actual 748), and 465–472 for Switzerland (actual 457) (Rubel and Brugger, 2020, 2021). Interestingly, a 225% increase in visitor frequency to public green spaces, including national parks and public gardens, was reported in the Google Mobility Report of May 2020 for Germany (Schweizer et al., 2021).

Underreporting to surveillance systems in 2020 may have been a factor in some countries where there was a decrease in TBE. One analysis from Poland suggested that access to specialised diagnostic testing for TBE may have been limited during the pandemic due to overburdened healthcare resources (Sulik et al., 2021).

A limitation of this study is that mandatory reporting of infectious diseases varied across countries; as such, the data found on the websites of health departments were not uniformly available for all countries. In addition, changes in health care seeking behaviours and the number of laboratory tests conducted during the pandemic may have altered compared to the previous years, and these factors may have led to reporting bias for 2020 (Simões et al., 2020).

5. Conclusions

The overall trend in number of TBE cases across Europe is on an upward trajectory, although with regional and temporal variations. Several factors may be involved, including global warming and social behaviours. Long-lasting morbidity from TBE, limiting function and quality of life, are seen in up to 30% of those hospitalised with TBE (Bogovič et al., 2018; Kohlmaier et al., 2021). With no curative treatment available, vaccination remains the most effective method to prevent infection, with reported effectiveness rates of 95–99% (Heinz et al., 2013; Erber et al., 2022). The WHO recommends TBE vaccination for adults and children in highly endemic (≥5 cases/100,000 population/-year) areas and targeted vaccination in specific geographical locations or when participating in at-risk outdoor activities (World Health Organization, 2011). Compliance with TBE vaccination is low in many

European countries (Erber and Schmitt, 2018). Thus, increasing awareness and education regarding vaccination against TBE for those travelling to or residing in endemic areas are critical interventions for addressing this growing public health issue.

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Declaration of Competing Interest

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