



Since January 2020 Elsevier has created a COVID-19 resource centre with free information in English and Mandarin on the novel coronavirus COVID-19. The COVID-19 resource centre is hosted on Elsevier Connect, the company's public news and information website.

Elsevier hereby grants permission to make all its COVID-19-related research that is available on the COVID-19 resource centre - including this research content - immediately available in PubMed Central and other publicly funded repositories, such as the WHO COVID database with rights for unrestricted research re-use and analyses in any form or by any means with acknowledgement of the original source. These permissions are granted for free by Elsevier for as long as the COVID-19 resource centre remains active.



The effect of the COVID-19 pandemic on non-COVID respiratory ED visits in Israel



Ziona Haklai, MSc^a, Yael Applbaum, MD^a, Vicki Myers, PhD^{b,*}, Mor Saban, PhD^b, Ethel-Sherry Gordon, PhD^a, Osnat Luxenburg, MD^d, Rachel Wilf-Miron, MD^{b,c}

^a Division of Health Information, Ministry of Health, Jerusalem, Israel

^b Gertner Institute of Epidemiology & Health Policy Research, Sheba Medical Center, Ramat Gan, Israel

^c School of Public Health, Tel Aviv University, Tel Aviv, Israel

^d Medical Technology, Health Information and Research Directorate, Ministry of Health, Jerusalem, Israel

ARTICLE INFO

Article history:

Received 25 July 2021

Received in revised form 4 January 2022

Accepted 4 January 2022

Keywords:

COVID-19

Respiratory disorders

Emergency department (ED) visits

Admissions

URTI

Asthma

Pneumonia

ABSTRACT

Background: The COVID 19 pandemic has had a crucial effect on the patterns of disease and treatment in the healthcare system. This study examines the effect of the COVID-19 pandemic on respiratory ED visits and admissions broken down by age group and respiratory diagnostic category.

Methods: Data on non-COVID related ED visits and hospitalizations from the ED were obtained in a retrospective analysis for 29 acute care hospitals, covering 98% of ED beds in Israel, and analyzed by 5 age groups: under one-year-old, 1–17, 18–44, 45–74 and 75 and over. Diagnoses were classified into three categories: Upper respiratory tract infections (URTI), pneumonia, and COPD or asthma. Data were collected for the whole of 2020, and compared for each month to the average number of cases in the three pre-COVID years (2017–2019).

Results: In 2020 compared to 2017–2019, there was a decrease of 34% in non-COVID ED visits due to URTI, 40% for pneumonia and a 35% decrease for COPD and asthma. Reductions occurred in most age groups, but were most marked among infants under a year, during and following lockdowns, with an 80% reduction. Patients over 75 years old displayed a marked drop in URTI visits. Pediatric asthma visits fell during lockdowns, but spiked when restrictions were lifted, accompanied by a higher proportion admitted. The percent of admissions from the ED visits remained mostly stable for pneumonia; the percent of young adults admitted with URTI decreased significantly from March to October.

Conclusions: Changing patterns of ED use were probably due to a combination of a reduced rate of viral diseases, availability of additional virtual services, and avoidance of exposure to the ED environment. Improved hygiene measures during peaks of respiratory infections could be implemented in future to reduce respiratory morbidity; and continued provision of remote health services may reduce overuse of ED services for mild cases.

© 2022 Elsevier Inc. All rights reserved.

1. Introduction

During the first year of the COVID-19 pandemic, reductions in seasonal flu and other respiratory viruses have been noted in different parts of the world, potentially due to social distancing, use of masks and improved hygiene, as well as school closures and restricted travel. [1–4] A systematic review including multiple countries concluded that the introduction of non-pharmaceutical interventions, aimed to reduce COVID transmission, also resulted in reduced flu burden. [5] Reductions in overall ED visits have also been reported following the pandemic and the public health measures in place, in Japan [6] and in the US. [7] Such reduction was also documented in pediatric ED visits. [8]

Respiratory infections are transmitted in a similar way to COVID, so visits and admissions related to non-COVID respiratory infections are likely to be affected by public health measures.

Since different age groups were differentially affected by COVID burden, and by public health measures (e.g. workplace or school closures), it is prudent to investigate whether there was also a differential effect on acute respiratory illnesses requiring urgent care.

In Israel, the first COVID-19 case was confirmed at the end of February 2020. The first wave of disease was observed in mid-March and April 2020, with up to 550 new confirmed COVID-19 cases per day. With rising numbers of new cases, a national lockdown was imposed in April. In May and June, the number of new cases decreased dramatically, and restrictions were gradually removed. In July 2020, the number of new infections started to rise, creating a second disease wave and reaching a peak of 9000 new cases per day in late September to early

* Corresponding author.

E-mail address: vickimg@gertner.health.gov.il (V. Myers).

October, when a second national lockdown was implemented. Based on the overall population of 9.135 million citizens on 31/12/2019, [9] the figures of the first and second waves represent a rate of 6.0 and 76.6 daily cases per 100,000 population in the first and second waves, respectively.

Public health measures, including the enforcement of mask wearing, social distancing, and closing schools differentially by grade were the main strategy to tackle the spread of infection throughout these months, until the national vaccination effort began in late December 2020. Patients were encouraged to forgo physical appointments and choose telemedicine (telephone or video appointments) where possible.

Study question: The aim of this study was to compare the effect of the COVID-19 pandemic on non-COVID respiratory visits to the ED and the percent of ED patients admitted in different age groups and by types of respiratory diagnostic category.

2. Methods

We extracted data on ED visits and hospitalizations from the ED from the National Emergency Department Visits Database (NEDVD) maintained in the Health Information Division in the Ministry of Health (MOH), and conducted a retrospective analysis. The NEDVD includes all visits to ED in 29 acute care hospitals in Israel (covering 98% of ED beds). The database includes demographic characteristics, time of admission and discharge, destination following discharge and diagnosis according to ICD-9-CM.

Data on ED visits and admissions were analyzed in 5 age groups: under one year old, 1–17, 18–44, 45–74 and 75 and over. Data were collected for 2020 by month, and compared for each month to the number of cases in the corresponding month averaged from 2017 to 2019, in order to overcome potential confounders arising from fluctuations in cases from one year to the next. All patients with diagnosis of COVID-19 were excluded from the study. We chose three categories of acute respiratory diagnoses: Upper respiratory tract infections (URTI) (460–466, 786.01, 786.02 ICD-9-CM codes), pneumonia (480–486 ICD-9-CM codes), and COPD or asthma (491–496, 786.07 ICD-9-CM codes). The number of influenza visits was extremely small and therefore was not included in the analysis. Other respiratory diseases not included in this study were other chronic diseases of the lung and pleura and external harm to the respiratory tract such as pneumothorax and aspirations.

Hospital admissions from ED are reported as the percent of admissions of ED visits for each of the three respiratory diagnostic types. The percent of admissions was compared to that of the percent from average 2017–2019.

We analyzed the data with SAS version 9.4. *P* values were calculated according to the method recommended by Silcocks. [10]

3. Results

3.1. ED visits

During 2020 there were 108,012 ED visits with respiratory related diagnoses compared to 152,526, which was the average number of visits per year in 2017–2019 (Table 1). Of these, there was a decrease

of 32% in the total amount of visits to the ED due to URTI, a decrease of 33% of visits for pneumonia and a 32% decrease for COPD and Asthma. These three groups comprised 85% of all non-Covid19 respiratory related visits.

Reductions were seen in most age groups (Figs. 1 & 2). Fig. 1 presents the ratio of ED visits between 2020 vs the average of 2017–2019 per month; Fig. 2 presents raw number of visits per month. Among infants under a year, this reduction was most marked during and shortly after both lockdowns (April–May and October–December 2020) with an 80% reduction in visits compared to corresponding months in 2017–2019. This reduction was around 40% in July–September when restrictions were relaxed. For infants a reduction occurred in all types of respiratory complaints throughout the year. During the first wave, the reduction was more prominent for asthma and wheezing compared with URTI, and pneumonia (89%, 76% and 72%, respectively).

Among children aged 1–17, the pattern was slightly different. While ED visits were reduced compared to the previous years for all respiratory diseases, asthma behaved differently. Asthma visits dropped during April and May, but peaked in June to a rate almost twice as high as the previous years, subsequently dropping again to the same level as in previous years.

In young adults, aged 18–44, from April till the end of 2020 respiratory ED visits were lower than in previous years for all causes. The 45–74 age group showed a reduction in all causes with a greater reduction in URTI. From mid to end of 2020, pneumonia showed less reduction in the number of ED visits, compared with the other diagnostic categories.

Reductions for persons aged 75 and over were less marked than in younger age groups. The greatest decrease was seen for URTI, reaching a 75% drop in October and December. Visits for pneumonia decreased overall by only 25%.

In most months and in most age groups in all three disease categories, the decrease in number of ED visits in 2020 was statistically significant compared to the average of 2017–2019 ($p < 0.05$) (Table 2).

3.2. Hospital admissions

The percent of admissions from ED to hospital wards was significantly higher for pneumonia ($p < 0.05$) for the total study population from April till the end of 2020 compared to previous years. The decrease in percent of admission for URTI was significant from February till December. The decrease of percent of admission for Asthma or COPD was statistically significant only in March–April and June–August (Fig. 3, Table 3).

Overall, the percentage of admissions from the ED remained more stable in children than in adults (Table 3). The percentage of pneumonia cases admitted among aged 0–44 was similar to the previous year, while for 45 and over there were some fluctuations over the year. The percentage for URTI cases was significantly lower among those aged 18–44 from March till October and December ($p < 0.05$), for other ages there were some fluctuations over the year. Infants under a year old showed a higher admission rate for asthma and wheezing during March, June and December ($p < 0.05$) only, and children aged 1–17 showed a decrease only in April and increase only in November ($p < 0.05$). Among adults percent admitted for asthma or COPD was reduced in some months compared to previous years.

Table 1
ED visits and admission rates by disease category, year and relative change, 2020/average 2017–2019

	ED visits (N, % change)			% of ED visits admitted	
	2020	Average 2017–2019	% change 2020/average 2017–2019	2020	Average 2017–2019
URTI	47,220	69,323	–32%	18%	21%
Pneumonia	26,662	39,749	–33%	67%	63%
COPD & asthma	17,510	25,428	–32%	51%	52%
All respiratory	108,012	152,526	–29%	45%	44%

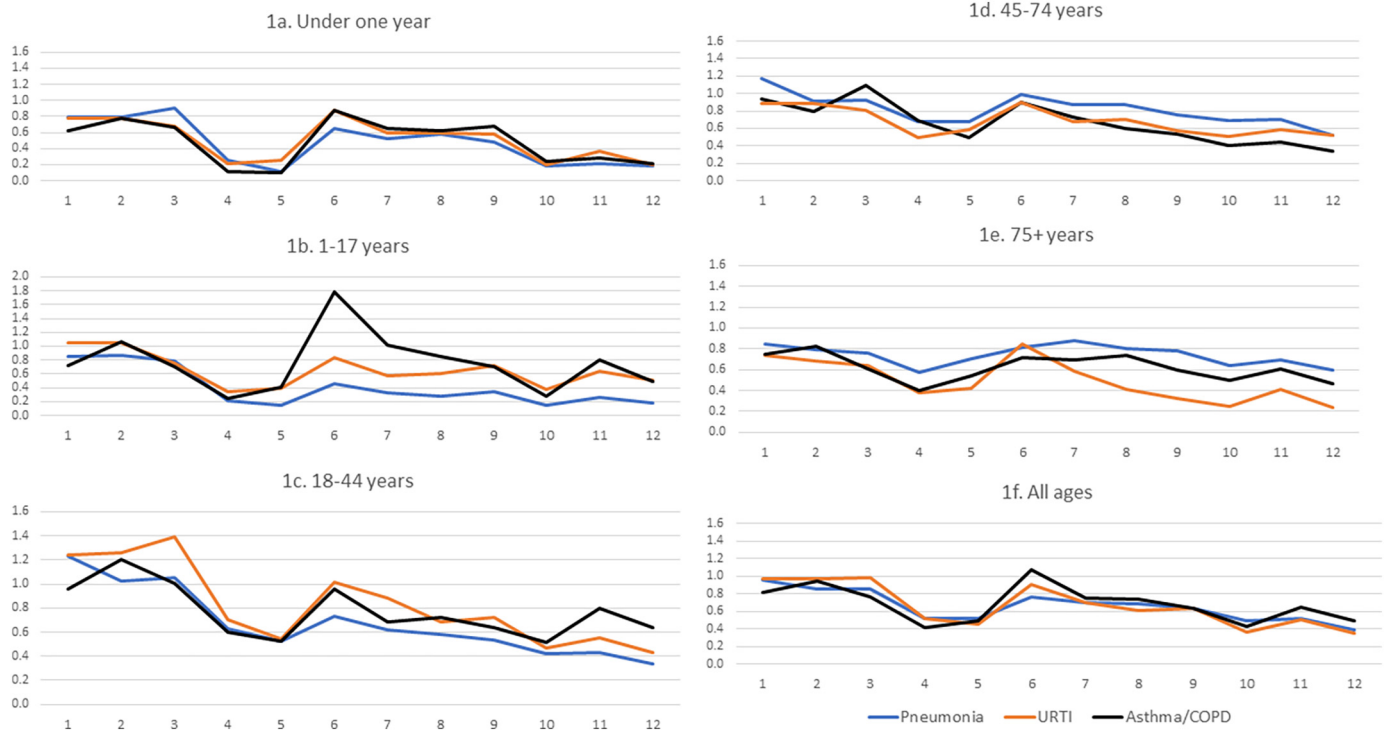


Fig. 1. Ratio of ED visits by disease category and month, 2020/average 2017–2019.

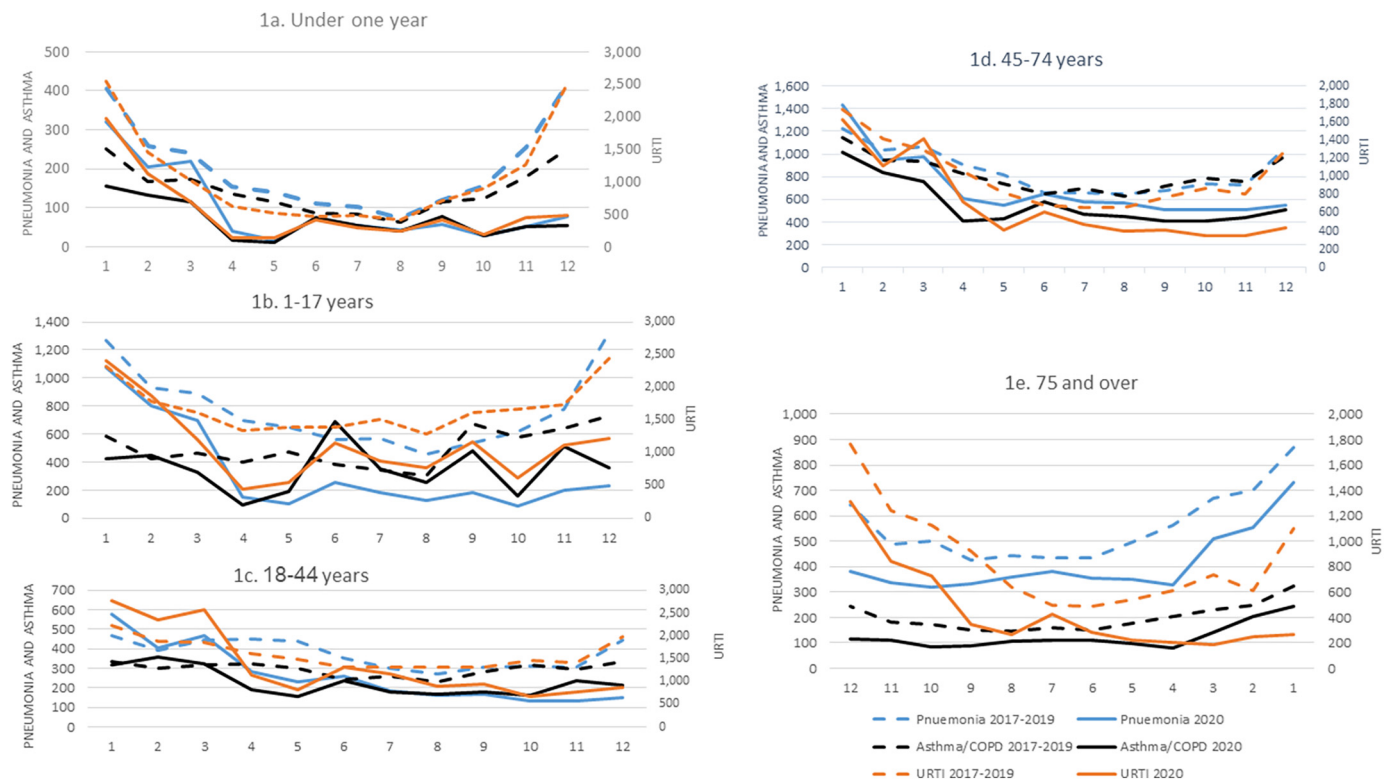


Fig. 2. Number of ED visits by disease category in 2020 and average of 2017–2019.

Table 2
Number of ED visits by disease category in 2020 vs average of 2017–2019.

Age	Month	N-average 2017–2019			N-2020			p value		
		Pneumonia 2017–2019	URTI 2017–2019	Asthma/COPD 2017–2019	Pneumonia 2020	URTI 2020	Asthma/COPD 2020	Pneumonia	URTI	Asthma/COPD
<1 year	1	404	2547	251	320	1968	156	0.002	0.000	0.000
	2	258	1460	167	204	1128	131	0.013	0.000	0.041
	3	241	1014	172	218	688	115	0.297	0.000	0.001
	4	154	622	137	40	129	16	0.000	0.000	0.000
	5	140	512	114	16	132	12	0.000	0.000	0.000
	6	109	466	86	71	407	75	0.005	0.048	0.431
	7	103	490	84	54	293	54	0.000	0.000	0.014
	8	74	409	63	43	244	39	0.006	0.000	0.021
	9	120	714	114	57	412	77	0.000	0.000	0.010
	10	156	897	123	29	183	29	0.000	0.000	0.000
	11	254	1264	180	52	455	51	0.000	0.000	0.000
	12	421	2512	251	78	489	53	0.000	0.000	0.000
1–17 years	1	1271	2314	589	1075	2411	424	0.000	0.163	0.000
	2	931	1785	423	805	1877	450	0.003	0.133	0.379
	3	893	1618	461	699	1206	326	0.000	0.000	0.000
	4	693	1334	396	148	449	95	0.000	0.000	0.000
	5	649	1387	472	99	549	194	0.000	0.000	0.000
	6	562	1384	385	259	1158	690	0.000	0.000	0.000
	7	571	1504	344	185	873	351	0.000	0.000	0.810
	8	459	1283	304	129	776	258	0.000	0.000	0.056
	9	533	1613	672	180	1159	479	0.000	0.000	0.000
	10	613	1664	577	89	617	158	0.000	0.000	0.000
	11	780	1735	639	202	1116	512	0.000	0.000	0.000
	12	1324	2437	728	235	1223	360	0.000	0.000	0.000
18–44 years	1	468	2229	333	575	2759	320	0.001	0.000	0.648
	2	394	1880	300	402	2360	361	0.804	0.000	0.020
	3	442	1852	320	465	2582	323	0.472	0.000	0.948
	4	449	1622	321	281	1139	191	0.000	0.000	0.000
	5	441	1486	299	229	809	157	0.000	0.000	0.000
	6	355	1306	244	259	1323	235	0.000	0.000	0.704
	7	301	1315	260	187	1160	178	0.000	0.002	0.000
	8	275	1306	233	160	895	167	0.000	0.000	0.001
	9	309	1302	284	166	940	181	0.000	0.000	0.000
	10	314	1455	316	133	677	162	0.000	0.000	0.000
	11	304	1411	297	131	774	236	0.000	0.000	0.009
	12	444	1980	338	151	857	216	0.000	0.000	0.000
45–74 years	1	1221	1735	1140	1427	1633	1016	0.000	0.083	0.008
	2	1036	1417	943	942	1123	837	0.036	0.000	0.013
	3	1061	1292	933	975	1415	755	0.061	0.019	0.000
	4	905	1055	826	612	725	408	0.000	0.000	0.000
	5	815	824	735	549	408	430	0.000	0.000	0.000
	6	656	684	650	646	612	581	0.803	0.049	0.053
	7	659	660	695	577	477	467	0.021	0.000	0.000
	8	650	667	631	565	396	447	0.016	0.000	0.000
	9	674	770	715	512	408	405	0.000	0.000	0.000
	10	738	872	790	511	349	405	0.000	0.000	0.000
	11	727	807	755	513	353	438	0.000	0.000	0.000
	12	1057	1289	988	544	437	510	0.000	0.000	0.000
75+ years	1	1735	884	645	1462	656	486	0.000	0.000	0.000
	2	1403	620	495	1107	423	408	0.000	0.000	0.004
	3	1338	565	464	1019	362	280	0.000	0.000	0.000
	4	1129	461	412	652	174	164	0.000	0.000	0.000
	5	991	319	352	700	135	192	0.000	0.000	0.000
	6	866	250	302	709	212	218	0.000	0.085	0.000
	7	867	245	318	760	143	222	0.008	0.000	0.000
	8	889	271	292	716	111	215	0.000	0.000	0.001
	9	853	304	299	666	100	178	0.000	0.000	0.000
	10	1000	370	342	640	91	170	0.000	0.000	0.000
	11	976	307	361	673	126	219	0.000	0.000	0.000
	12	1284	551	488	759	133	227	0.000	0.000	0.000

4. Discussion

Our analysis, extracted from the national ED Visits Database and covering data from all 29 general hospitals in Israel, demonstrated the effect of the waves of pandemic activity on non-COVID ED visits and hospitalizations during the first year of the pandemic,

compared with parallel months in the previous, pre-pandemic years.

The study demonstrates a dramatic reduction in respiratory ED visits in parallel to lockdowns and stay at home orders during both pandemic waves in all age groups and diagnoses. The decrease was more prominent in infants and children (under 1 year and 1–17 olds) compared with adults,

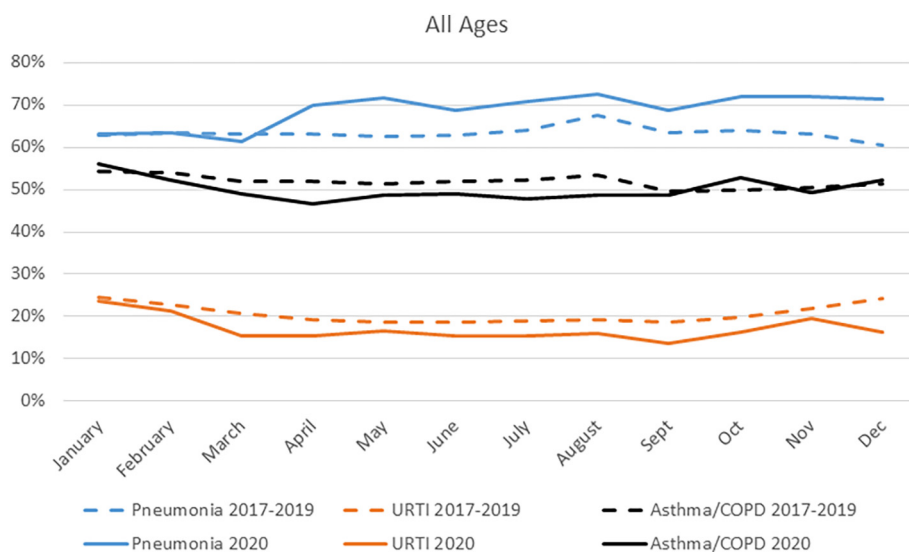


Fig. 3. Percent of ED visits admitted, by disease category and month, 2020 and average 2017–2019.

4.1. What could explain this drop in ED visits?

During the first year of the pandemic, public health measures were the main defence strategy to reduce transmission, in Israel as in other countries. Campaigns urged people to use telemedicine where possible. [11] Paediatrician visits became more available via telephone or video chat through the HMO, which may have relieved burden on urgent care services. Use of telemedicine visits jumped from 15% in 2019 to 29% in 2020 [12], with a marked increase in older patients, and minority groups which had previously low use of digital services. [13] Furthermore, schools were closed for 8 weeks during the first wave and while preschool and younger schoolchildren subsequently returned to the classroom, the majority of older schoolchildren did not return to full in-person classes until after the second wave. Mandatory face masks from April 12, 2020, for children aged 6+ and adults, in public spaces, including schools, probably contributed to the decrease of viral transmission, since masks were associated with a 47% decrease in transmission of respiratory viruses in the general (non-healthcare workers) population. [14] A retrospective analysis of daily viral positive tests, daily ED visits and hospitalizations during a 10-year follow-up in Canada revealed that community respiratory viruses were a major driver of ED visits and hospitalizations due to respiratory tract infections and COPD but hardly contributed to asthma. [15]

Lower incidence of influenza has been reported in Israel [16] as well as in other countries compared to previous years [1–4]. The current findings show variations across age groups for pneumonia, and other acute respiratory disorders. Data from one US medical centre reported a significant drop in pediatric ED visits for acute respiratory illnesses over 3 months (March–May 2020) compared to previous years. [17] This pattern is supported here with national data across a whole year from Israel, and excluding patients ultimately found to be COVID-19 positive, allowing a comprehensive analysis of changing ED use in relation to the timing of the pandemic peaks of increased infection incidence.

Infants had dramatically reduced ED visits for all respiratory causes during the two pandemic waves. This points both to less morbidity due to lockdowns, but also to possible overuse in this population during routine times, in addition to parents' fear of their infants contracting COVID-19 infection while waiting in the ED, or upon admission to the wards. Analysis of hospital admissions can indicate severity of cases, and whether changes in use of ED for respiratory conditions represent underuse or usual overuse. [18] The admission rate for infants and children varied but in general did not increase dramatically in most months. The admission rate remained largely unchanged in older adults,

indicating that cases coming to the ED during 2020 were not more severe than usual. This supports the assumption that the major contributor to decreased ED visits is a true decrease in need – less respiratory infections that cause URTI and pneumonia.

Changes in urgent asthma visits can shed light on changes in overall respiratory morbidity since exacerbation of asthma in infants is related to respiratory viruses in more than 80% of cases. Other reasons are exposure to both indoor and outdoor allergens and pollutants and poor medical control. [19] Asthma visits and proportion of children admitted dropped during the first two COVID waves which involved lockdowns, and then spiked in June 2020, corresponding with relaxation of restrictions and opening of schools. Other cases are seasonal and allergy-related, potentially explaining the peaks in June and October among children. Lockdowns, face-mask wearing and less exposure to other children during remote learning might explain a considerable reduction in asthma related ED visits.

Studies of asthma in the United States during the COVID-19 pandemic have shown reduced hospitalizations, fewer ED visits, and improved asthma control during the pandemic, and have linked these favourable outcomes to lockdowns and school closures [17–21].

In contrast, older groups suffer more from COPD and less from seasonal/allergic asthma. Reductions in COPD were demonstrated throughout the pandemic year, likely influenced by fewer viruses circulating and less air pollution during lockdowns. COPD is correlated with increased risk of severe pneumonia and poor outcomes when patients develop COVID-19. This might divert patients to avoid utilization of healthcare services which require physical contact like ED visits. [20] Older age groups showed smaller reductions in ED visits for pneumonia, which are less affected by outdoor influences in frail older populations.

Different patterns in children and adults may indicate different behaviours, with older adults staying home more, wearing masks and maintaining physical distance from others, while young children were less likely to wear masks (correctly) and to social distance. The greatest change in children's exposure was likely related to school closures. In the summer months when restrictions were relaxed, children were back at school/summer camps and congregating with others, likely to a greater degree than adults. This might explain a 72% increase during June 2020, compared with June 2019, of asthma related ED visits. This contrasts with the US which had consistently lower pediatric asthma-related ED visits throughout the year, but also did not re-open schools during this period. [21]

Strengths of the study include comprehensive data from all ED departments, and exclusion of COVID 19 positive patients in order to

Table 3
Percent of ED patients admitted by disease category in 2020 vs average of 2017–2019.

Age	Month	Pneumonia 2017–2019	Pneumonia 2020	P value	URTI 2017–2019	URTI 2020	P value	Asthma/COPD 2017–2019	Asthma/COPD 2020	P value
<1 year	1	42%	45%	0.375	39%	39%	0.641	33%	30%	0.512
	2	43%	41%	0.633	38%	39%	0.655	32%	39%	0.145
	3	41%	44%	0.434	31%	33%	0.525	33%	44%	0.030
	4	38%	43%	0.612	24%	26%	0.595	34%	19%	0.283
	5	36%	50%	0.296	20%	25%	0.141	33%	25%	0.758
	6	36%	37%	0.892	17%	23%	0.017	33%	48%	0.029
	7	38%	30%	0.286	20%	14%	0.033	35%	44%	0.212
	8	39%	30%	0.307	21%	17%	0.255	40%	38%	1.000
	9	33%	25%	0.223	21%	19%	0.392	33%	44%	0.085
	10	34%	38%	0.687	26%	21%	0.163	35%	45%	0.320
	11	41%	42%	0.885	34%	26%	0.001	37%	47%	0.173
	12	41%	35%	0.288	38%	23%	0.000	32%	53%	0.004
1–17 years	1	32%	31%	0.482	14%	15%	0.329	31%	38%	0.009
	2	34%	35%	0.768	13%	14%	0.458	33%	35%	0.561
	3	35%	33%	0.371	14%	13%	0.369	31%	35%	0.262
	4	34%	29%	0.280	13%	11%	0.450	33%	21%	0.022
	5	35%	33%	0.914	14%	16%	0.267	34%	35%	0.872
	6	33%	34%	0.777	13%	13%	0.961	34%	38%	0.088
	7	32%	37%	0.160	13%	11%	0.135	31%	33%	0.351
	8	33%	35%	0.625	14%	13%	0.494	34%	34%	0.766
	9	32%	26%	0.149	13%	11%	0.070	36%	40%	0.102
	10	34%	36%	0.731	13%	15%	0.383	33%	25%	0.062
	11	34%	37%	0.489	13%	16%	0.005	34%	41%	0.007
	12	33%	36%	0.354	14%	13%	0.399	32%	36%	0.202
18–44 years	1	47%	45%	0.298	14%	14%	0.360	33%	36%	0.417
	2	42%	39%	0.319	14%	14%	0.525	30%	29%	0.540
	3	43%	40%	0.230	15%	8%	0.000	27%	20%	0.015
	4	43%	39%	0.259	15%	9%	0.000	28%	24%	0.184
	5	40%	35%	0.164	17%	11%	0.000	30%	24%	0.182
	6	41%	44%	0.362	18%	9%	0.000	30%	29%	1.000
	7	43%	36%	0.087	18%	12%	0.000	29%	26%	0.521
	8	44%	46%	0.602	16%	11%	0.000	30%	19%	0.003
	9	44%	44%	1.000	16%	9%	0.000	28%	28%	0.928
	10	44%	50%	0.162	16%	12%	0.007	27%	28%	0.924
	11	46%	42%	0.453	16%	14%	0.150	30%	27%	0.337
	12	44%	48%	0.438	16%	12%	0.002	31%	28%	0.567
45–74 years	1	72%	73%	0.444	22%	25%	0.011	66%	65%	0.881
	2	72%	75%	0.080	22%	22%	0.871	64%	64%	0.806
	3	70%	68%	0.264	22%	15%	0.000	63%	60%	0.204
	4	70%	74%	0.031	22%	19%	0.050	63%	56%	0.010
	5	70%	71%	0.718	23%	20%	0.203	63%	57%	0.039
	6	71%	71%	0.803	25%	21%	0.040	63%	61%	0.406
	7	72%	70%	0.208	25%	21%	0.085	63%	56%	0.006
	8	75%	70%	0.044	26%	24%	0.450	63%	59%	0.116
	9	71%	71%	0.827	23%	18%	0.045	62%	60%	0.372
	10	72%	70%	0.385	24%	21%	0.285	63%	65%	0.540
	11	75%	75%	0.821	25%	26%	0.646	63%	61%	0.388
	12	74%	75%	0.634	24%	21%	0.109	66%	64%	0.338
75+	1	87%	88%	0.559	40%	46%	0.007	74%	75%	0.954
	2	86%	88%	0.183	41%	47%	0.014	74%	74%	1.000
	3	87%	88%	0.526	39%	45%	0.024	74%	70%	0.119
	4	87%	90%	0.026	41%	48%	0.103	72%	68%	0.268
	5	88%	90%	0.212	38%	37%	0.850	75%	65%	0.005
	6	89%	91%	0.048	41%	36%	0.205	73%	72%	0.800
	7	89%	91%	0.078	41%	51%	0.042	76%	71%	0.143
	8	90%	89%	0.782	42%	47%	0.358	76%	70%	0.095
	9	88%	88%	1.000	43%	46%	0.524	76%	71%	0.127
	10	88%	85%	0.017	39%	32%	0.217	75%	76%	0.775
	11	89%	88%	0.500	40%	40%	0.923	76%	72%	0.232
	12	89%	88%	0.224	41%	38%	0.464	75%	76%	0.623

eliminate COVID morbidity and examine the effect of the pandemic on other respiratory morbidity. All the data are aggregative preventing analysis based on individual factors.

5. Conclusion and implications

National data from the whole of 2020 demonstrated fewer ED visits for non-COVID respiratory causes occurring throughout the pandemic year compared to the previous year, with the sharpest decrease during the two lockdowns, especially among young children The marked

reduction in URIs suggests that improved hygiene measures, such as mask wearing and social distancing during peaks of respiratory infections could be implemented in the future to reduce morbidity in influenza, RSV and other viral outbreaks and not only during the COVID-19 era.

Improved access to community services during out-of-hours or more accessible remote communication with the paediatrician to support parents in the management of children's illnesses could be considered to reduce burden on ED in this age group. Indeed, additional services provided by HMOs during the pandemic, including telephone

and other virtual visits, may have had an impact on ED visits, with GPs and paediatricians being more available, in Israel [22] as elsewhere [23]. In this sense, the accelerated utilization of remote health created by the pandemic, if continued in the future, might reduce ED overuse in times of normalcy too. Indeed Bestsenny et al. estimated – based on US Medicare and Medicaid data – that in the future 20% of ED visits could be avoided or diverted using telemedicine and remote urgent care [24].

Changing patterns of ED use for URTI this year were probably due to a combination of both a reduced rate of viral diseases such as RSV and influenza, and also parents refraining from over exposure to the ED environment for fear of COVID-19 contamination. We can hope that this experience might prove to be an incentive in future years to reduce the use of ED services for mild URTI cases, some of which could be treated in the community.

As pandemic waves continue to come and go, and we attempt to adapt to the new normal and live with COVID, lessons can be learned from the past year. Parents should be reminded to keep home sick children to reduce the spread of respiratory and other diseases, and continued provision of virtual services may help reduce the burden on urgent care teams.

Funding

None.

CRedit authorship contribution statement

Ziona Haklai: Writing – review & editing, Formal analysis, Data curation. **Yael Applbaum:** Writing – review & editing, Formal analysis, Data curation. **Vicki Myers:** Writing – review & editing, Formal analysis, Data curation. **Mor Saban:** Writing – review & editing, Formal analysis, Data curation. **Ethel-Sherry Gordon:** Writing – review & editing, Formal analysis, Data curation. **Rachel Wilf-Miron:** Writing – review & editing, Formal analysis, Data curation. **Osnat Luxenburg:** Writing – review & editing, Formal analysis, Data curation.

Declaration of Competing Interest

None.

References

- [1] Sunagawa S, Iha Y, Kinjo T, Nakamura K, Fujita J. Disappearance of summer influenza in the Okinawa prefecture during the severe acute respiratory syndrome coronavirus 2 (SARS-CoV-2) pandemic. *Respir Investig*. 2021;59(1):149–52.
- [2] Huang QS, Wood T, Jelley L, Jennings T, Jefferies S, Daniells K, et al. Impact of the COVID-19 nonpharmaceutical interventions on influenza and other respiratory viral infections in New Zealand. *Nat Commun*. 2021 Dec;12(1):1–7.

- [3] Sullivan SG, Carlson S, Cheng AC, Chilver MBN, Dwyer DE, Irwin M, et al. Where has all the influenza gone? The impact of COVID-19 on the circulation of influenza and other respiratory viruses, Australia, March to September 2020. *Eurosurveillance*. 2020 Nov;25(47).
- [4] Olsen S. Decreased influenza activity during the COVID-19 pandemic – United States, Australia, Chile, and South Africa. *MMWR Morb Mortal Wkly Rep*. 2020;69(37):1305–9.
- [5] Fricke LM, Glöckner S, Dreier M, Lange B. Impact of non-pharmaceutical interventions targeted at COVID-19 pandemic on influenza burden – a systematic review. *J Inf Secur*. 2021;82(1):1–35.
- [6] Sekine I, Uojima H, Koyama H. Impact of non-pharmaceutical interventions for the COVID-19 pandemic on emergency department patient trends in Japan: a retrospective analysis. *Acute Med Surg*. 2020;7(1):e603.
- [7] Lucero A, Lee A, Hyun J, Lee C, Pan L. Underutilization of the emergency department during the COVID-19 pandemic. *West J Emerg Med*. 2020;21(6):15–23.
- [8] Matera L, Nenna R, Rizzo V. SARS-CoV-2 pandemic impact on pediatric emergency rooms: a multicenter study. *Int J Environ Res Public Health*. 2020;17(23):8753.
- [9] CBS. Central Bureau of Statistics. Israel Localities. <https://www.cbs.gov.il/he/publications/Pages/2019/ישיבות-בישראל.aspx>; 2020. Accessed June 24, 2020. 2019.
- [10] Silcocks P. Estimating confidence limits on a standardized mortality ratio when the expected number is not error free. *J Epidemiol Community Health*. 1994;48:313–7.
- [11] De Rosa S, Spaccarotella C, Basso C, Calabrò MP, Curcio A, Filardi PP, et al. Reduction of hospitalizations for myocardial infarction in Italy in the COVID-19 era. *Eur Heart J*. 2020;1–6.
- [12] OECD. Health at a glance 2021: Digital health. <https://www.oecd-ilibrary.org/sites/08cdda7-en/index.html?itemld=/content/component/08cdda7-en>; 2021.
- [13] Linder R. Israel after Corona - Remote Services Reaching New Audiences. 2021. <https://www.themarket.com/coronavirus/premium-1.8887367>. The Marker.
- [14] Liang M, Gao L, Cheng C, Zhou Q, Uy JP, Heiner K, et al. Efficacy of face mask in preventing respiratory virus transmission: a systematic review and meta-analysis. *Travel Med Infect Dis*. 2020;36:101751.
- [15] Satia I, Cusack R, Greene JM, O'Byrne PM, Killian KJ, Johnston N. Prevalence and contribution of respiratory viruses in the community to rates of emergency department visits and hospitalizations with respiratory tract infections, chronic obstructive pulmonary disease and asthma. *PLoS One*. 2020;15(2):e0228544.
- [16] ICDC. Monitoring respiratory viruses in Israel. Report for the Week Ending in December 19, 2020. Israel Centre for Disease Control; 2020 Available at. <https://www.gov.il/he/departments/publications/reports/corona-flu-19122020>.
- [17] Haddadin Z, Blozinski A, Fernandez K, Vittetoe K, Greeno A, Halasa N, et al. Changes in pediatric emergency department visits during the COVID-19 pandemic. *Hosp Pediatr*. 2021;11(4):e57.
- [18] Long CM, Mehrhoff C, Abdel-Latief E, Rech M, Laubham M. Factors influencing pediatric emergency department visits for low-acuity conditions. *Pediatr Emerg Care*. 2021;37(5):265–8.
- [19] Fu LS, Tsai MC. Asthma exacerbation in children: a practical review. *Pediatr Neonatol*. 2014;55(2):83–91.
- [20] Leung JM, Niikura M, Yang CWT, Sin DD. COVID-19 and COPD. *Eur Respir J*. 2020. ;56(2).
- [21] Sheehan W, Patel S, Margolis R, Kachroo N, Pillai D, Teach S. Pediatric asthma exacerbations during the COVID-19 pandemic: absence of the typical fall seasonal spike in Washington DC. *J Allergy Clin Immunol Pr*. 2021;9(5):2073.
- [22] Grossman Z, Chodick G, Reingold SM, Chapnick G, Ashkenazi S. The future of telemedicine visits after COVID-19: perceptions of primary care pediatricians. *Isr J Health Policy Res*. 2020;9:53.
- [23] Fiks AG, Jenssen BP, Ray KN. A defining moment for pediatric primary care telehealth. *JAMA Pediatr*. 2021;175(1):9–10.
- [24] Bestsenny O, Gilbert G, Harris A, Rost J. Telehealth – A Quarter Trillion Dollar Post-COVID-19 Reality. <https://www.mckinsey.com/industries/healthcare-systems-and-services/our-insights/telehealth-a-quarter-trillion-dollar-post-covid-19-reality>.