Brief Summary of the Association between Underlying Conditions and Severe COVID-19: Asthma

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Brief Summary of Findings on the Association Between Asthma and Severe COVID-19 Outcomes

Overall, 69 studies were retrieved that reported adjusted measures of effect on the association between underlying asthma and severe COVID-19 outcomes including mortality, intensive care unit (ICU) admission, intubation, ventilation, hospitalization, and readmission. All studies were rated as having a moderate to low threat to internal validity except for one study (Gottlieb 2020).

- Asthma: Data indicate underlying asthma is associated with an increase in ICU admission[1-19] (N =836,857) and hospitalization[2,5,7,8,12,14,17,20-35] (N = 861,886) among COVID-19 patients. Data suggest underlying asthma is associated with an increase in ventilation[1,7,34] (N = 5,403) and indicate it is associated with readmission[36,37] (N = 8,990). Data were inconsistent and inconclusive on the associations between underlying asthma and mortality[1-12,18,31,33-35,38-61] (N = 4,889,078) and intubation[10,12-14,16,48] (N = 223,519) among COVID-19 patients.
- Severity: Data from six studies[2,22,34,41,45,62,63] (N = 89,578) suggest severe asthma is associated with an increase in hospitalization when compared to less severe asthma. Data are inconsistent and inconclusive on the association between severity of underlying asthma and the outcomes of mortality,[2,9,34,45,63-66] ICU admission,[2,9,45] and ventilation;[34,45] however, heterogeneous measures of severity were used across studies. Several studies[2,34,39,45,63,64] report COVID-19 patients with no asthma as a comparison group and did not report data stratified by severity for asthma-specific populations.
- Treatment: Data from five studies[39,41,45,50,67] are inconclusive on the association between asthma treatment and the outcomes of mortality, ICU admission, ventilation, and hospitalization among COVID-19 patients with underlying asthma. These studies use different combinations of steroids and other asthma medications as exposure measures. Several studies[39,45,50] did not report data stratified by medication type for asthma-specific populations and instead report COVID-19 patients with no asthma as a comparison group.
- Comorbidities: Data from two studies[41,67] (N = 12,800) suggest an increased risk of mortality for COVID-19 patients with asthma and chronic heart disease when compared with COVID-19 patients with asthma alone. Data are inconsistent and inconclusive for other comorbidities including diabetes, hypertension, obesity, and chronic kidney disease. Data from one study[33] (N = 15,690) suggest there is no association between obesity and hospitalization among COVID-19 patients with asthma.
- Risk Markers: Data from eight studies[30,31,33,41,45,67-69] (N = 145,330) suggest female sex is associated with an increase in hospitalization among COVID-19 patients with underlying asthma. Data are inconclusive and inconsistent for age, race, ethnicity, and smoking status. Several studies report COVID-19 patients with no asthma as a comparison group and did not stratify severity data for asthma-specific populations.

A. Methods

The aim of this review is to identify and synthesize the best available evidence to answer the question: "what is the association between asthma and severe COVID-19?" This evidence will be used to update the Centers for Disease Control and Prevention (CDC) website on underlying conditions and enable the creation of a provider-specific website with more rigorous information.

The methods for underlying conditions and risk factors are outlined in the webpage, https://www.cdc.gov/coronavirus/2019-ncov/science/science-briefs/systematic-review-process.html. These methods were established in May 2021 and are used for conditions and risk factors where CDC conducted the review.

Below are methodologic highlights and additional methods unique to this review. For more information, please visit https://www.cdc.gov/coronavirus/2019-ncov/science/science-briefs/systematic-review-process.html.

A.1. Literature Search

A list of search terms was developed to identify the literature most relevant to the population, exposure, comparator, and outcome (PECO) question. Clinical experts and library scientists were consulted to develop a robust list of search terms. These terms were then incorporated into search strategies, and these searches were performed in OVID using the COVID-19 filter from the end of the previous literature search (December 2020). The detailed search strategies for identifying primary literature and the search results are provided in the Appendix. Subject matter experts supplemented the literature search results by recommending relevant references published before December 2020. References were included if retrieved by the chronic lung disease literature search and reported exposures and outcomes relevant to this review.

A.2. Study Selection

Titles and abstracts from references were screened by dual review (M.C., A.H., J.H., J.K.K., M.M., C.O., D.O.S., K.T.R., T.R., C.N.S., E.C.S., or M.W.).

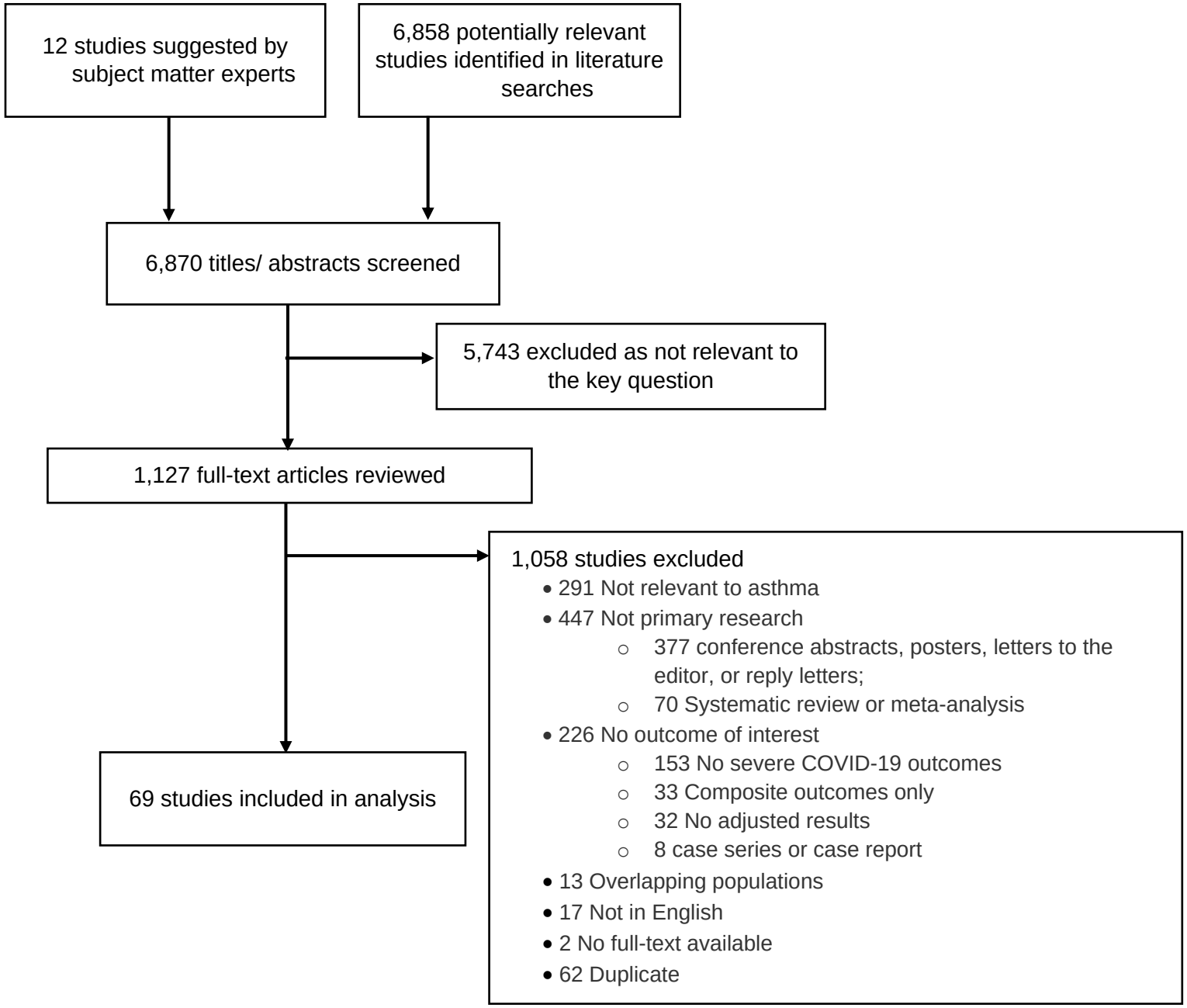
Full-text articles were retrieved if they were:

1. Relevant to the PECO question;
2. Primary research, and
3. Written in English.

Part B presents the full list of exclusion criteria. The full texts of selected articles were then screened by two independent reviewers, and disagreements were resolved by discussion (M.C., J.H., J.K.K., C.O., D.O.S., T.R., C.N.S., E.C.S., or M.W.).

After the full-text screening was complete, a bibliography of the articles selected for inclusion was vetted with subject matter experts. Additional studies suggested by the subject matter experts were screened for inclusion as described above. The results of the study selection process are depicted in Figure 1.

Figure 1. Results of the Study Selection Process



A.3. Data Extraction and Synthesis

Methodologic data and results of relevant outcomes from the studies meeting inclusion criteria were extracted into standardized evidence tables. Data and analyses were extracted as presented in the studies. For the purposes of this review:

- Confidence intervals were determined for each outcome; width of the CI was defined as "wide" if it was within the upper tertile of the range of confidence interval widths.
- Any determination of association based on measures of association was made based on the following rules of thumb:
    - Measures of association greater than 1.1 were determined as "suggestive" or "indicative" of an increase in risk, regardless of confidence interval or statistical significance.
    - Measures of association between 0.9 and 1.1 were determined to be "suggestive" or "indicative" of no difference, and confidence intervals must have crossed the null
    - Measures of association less than 0.9 were determined to be "suggestive" or "indicative" of a decrease in risk, regardless of confidence interval or statistical significance
    - If the overall direction of evidence was consistent, a Bayesian approach was taken to aggregating the evidence and determining the strength of association.
- Statistical significance was defined as $p \leq 0.05$.
- Studies with denominators smaller than 10% of the median denominator for this review (N = 7,137) were considered to have a small sample size (N < 714).

A.4. Internal Validity Assessment

The internal validity associated with each study was assessed using scales developed by the Division of Healthcare Quality Promotion and scores were recorded in the evidence tables. Part B includes the questions used to assess the quality of each study design. The strength, magnitude, precision, consistency, and applicability of results were assessed for all comparators. The overall confidence in the evidence base is reported in the aggregation tables in Part B.

A.5. Reviewing and Finalizing the Systematic Review

Draft findings, aggregation tables, and evidence tables, were presented to CDC subject matter experts for review and input. Following further revisions, the summary will be published on the CDC website.

B. Systematic Literature Review Results

B.1. Search Strategies and Results

Table 1. Chronic Lung Disease search conducted December 3, 2021

#	Search History
1	chronic lung disease
2	respiratory system disease*
3	reactive airway disease*
4	emphysema
5	chronic bronchitis
6	COPD
7	Chronic obstructive pulmonary disease
8	Asthma *
9	allergic asthma
10	irritant asthma
11	Interstitial lung disease
12	Pulmonary fibrosis
13	idiopathic pulmonary fibrosis
14	nonspecific interstitial pneumonitis
15	hypersensitivity pneumonitis
16	sarcoidosis
17	pneumoconiosis
18	asbestosis
19	coal workers pneumoconiosis
20	silicosis
21	bronchiectasis
22	cystic fibrosis
23	pulmonary vascular disease
24	pulmonary hypertension
25	bronchopulmonary dysplasia
26	bronchiolitis obliterans
27	asthma*
28	reactive airway disease*
29	CF
30	1 or 2 or 3 or 4 or 5 or 6 or 7 or 8 or 9 or 10 or 11 or 12 or 13 or 14 or 15 or 16 or 17 or 18 or 19 or 20 or 21 or 22 or 23 or 24 or 25 or 26 or 27 or 28 or 29
31	Limit 30 to covid-19
32	(202012* or 2021*).dt
33	(202012* or 2021*).dc
34	32 or 33
35	31 and 34

#	Search History
36	Deduplicate

B.2. Study Inclusion and Exclusion Criteria

Inclusion Criteria: Studies were included at the title and abstract screen if they:

- were relevant to the key question "what is the association between chronic lung disease and severe COVID-19?";
    - Studies deemed not relevant included those that reported autopsy results, and examined lung transplant, cancer, or immunocompromised populations;
- were primary research;
- were written in English (can be seen as [language] in title); and
- examined humans only.

Exclusion Criteria: Studies were excluded at full text review if they:

- did not answer the key question "what is the association between asthma and severe COVID-19?";
- were not available as full-text;
- were not available in English;
- were not primary research articles that underwent the peer-review process including
    - conference abstracts, posters, letters to the editor, or reply letters;
    - systematic reviews, narrative reviews, or meta-analyses,
- reported only composite outcome measures for "severe COVID-19";
- did not report adjusted results; and
- reported data from the same population as examined in another study (in these cases, the study with the larger study population or longer study period was maintained in the analysis).

B.3. Evidence Review: Asthma and Severe COVID-19

B.3.a. Strength & Direction of Evidence

Table 2. The Association between Asthma and Severe COVID-19 Outcomes

Outcome	Results
Mortality	Evidence is inconsistent and inconclusive on the association between underlying asthma and mortality among COVID-19 patients. • Strength of Association: Thirty-eight studies[1-12,18,31,33-35,38-43,46-50,52-61] report adjusted measures of association ranging from 0.12 (95% CI: 0.01-1.14) to 4.58 (95% CI: 2.58-8.13) . • Precision of Association: Of the 36 studies reporting confidence intervals, 15[1,3,6,7,9,18,38,39,41,47-49,52,54,56] are wide and 25[2,3,6-11,18,31,33,35,38,41-43,46,48,49,52,55-57,60,61] include the null. • Consistency of Association: Results are inconsistent.

	• Applicability of Association: Settings and populations are applicable.
	
	Forty studies[1-12,18,31,33-35,38-44,46-61] (N = 4,889,078) report data on underlying asthma and mortality among COVID-19 patients. Two studies[5,49] have a low threat to internal validity and 38[1-4,6-12,18,31,33-35,38-44,46-48,50-61] have a moderate threat to internal validity.
	• Twelve studies[1,9,38,39,41,44,47,48,51,52,54,60] (N = 2,066,387) suggest that underlying asthma is associated with an increase in mortality among COVID-19 patients. Nine cohort studies[1,9,38,39,41,47,48,54,60] (N = 97,648) report adjusted effect measures ranging from 1.14 (95% CI: 0.98-1.32) to 4.58 (95% CI: 2.58-8.14). One modeling study[52] (N = NR) reports an association between US county-level COVID-19 case fatality rates and county-level, age-adjusted mortality due to asthma among counties with high COVID-19 mortality surrounded by other counties with high COVID-19 mortalities. This study reports a protective association for counties with low COVID-19 mortality surrounded by other counties with low COVID-19 mortalities. Two ecological studies[44,51] (N = 1,968,739) suggest an association between underlying asthma and an increase in mortality. One[44] (N = NR) reports that COVID-19 fatality is positively related to asthma prevalence and the other[51] (N = 1,968,739) reports that COVID-19 lag-adjusted case fatality rates increase as asthma prevalence increases in US counties.
	  ○ Of these studies, nine[1,9,38,39,41,47,48,52,54] have wide confidence intervals and five[9,38,41,48,60] cross the null, decreasing confidence in these findings. One study[54] has a small sample size, two studies[47,48] report a low number of deaths, and three studies[9,38,47] report a low prevalence of asthma in the study population, one[39] of which compares severe asthma to no asthma.
	• Twelve studies[2,3,8,11,33,42,46,49,53,55,57,61] (N = 911,127) report no association between mortality and underlying asthma among COVID-19 patients. Eleven cohort studies[2,3,8,11,33,42,49,53,55,57,61] (N = 910,075) report adjusted effect measures ranging from 0.95 (95% CI: 0.83-1.08) to 1.1 (95% CI: 0.6-2.04) and all confidence intervals include the null. One ecological study[46] (N=1,052 counties) reports no association between the prevalence of underlying asthma and COVID-19 case fatality risk.
	  ○ Of these studies, two[3,49] have wide confidence intervals, decreasing confidence in the findings. Two studies[49,57] report a low prevalence of underlying asthma among the study population, one[49] of which defines asthma as moderate to severe asthma, and one study[53] has a small sample size.
	• Sixteen studies[4-7,10,12,18,31,34,35,40,43,50,56,58,59] (N = 1,907,498) suggest that underlying asthma is associated with a decrease in mortality among COVID-19 patients. Fourteen cohort studies[4,6,7,10,12,18,31,34,35,40,43,50,56,58] (N = 1,398,985), one case-control study[5] (N=502,656), and one cross-sectional study[59] (N = 5,857) report effect measures ranging from 0.12 (95% CI: 0.01-1.14) to 0.88 (95% CI: 0.69-1.1).
	  ○ Of these studies, three[6,7,18] have wide confidence intervals and eight confidence intervals[6,7,10,18,31,35,43,56] include the null, decreasing confidence in these findings. Four studies[6,7,54,56] have a small sample size and five[6,10,34,50,56] report a low number of deaths. Two studies[10,58] report a low prevalence of underlying asthma.

ICU admission	Evidence indicates an increase in ICU admissions among COVID-19 patients with underlying asthma. • Strength of Association: Nineteen studies[1-19] report adjusted measures of association ranging from 0.51 (95% CI: 0.41-0.64) to 2.5 (95% CI: 1.2-5.2).

- Precision of Association: Of the 18 studies reporting confidence intervals, seven[1,6,8,13,17-19] are wide and nine[2,3,6,7,9,11,13,17,18] include the null.
- Consistency of Association: Results are consistent.
- Applicability of Association: Settings and populations were applicable.

Nineteen studies[1-19] (N =836,857) report data on underlying asthma and ICU admission among COVID-19 patients. One study[5] has a low threat to internal validity and 18[1-4,6-19,45] have a moderate threat.

- Twelve studies[1,3-6,8,10,13,16-19] (N = 719,215) suggest that underlying asthma is associated with an increase in ICU admissions among COVID-19 patients. Eleven cohort studies[1,3,4,6,8,10,13,16-19] (N = 216,559) and one case-control study[5] (N = 502,656) report effect measures ranging from 1.17 (95% CI: 0.4-2.41) to 2.5 (95% CI: 1.2-5.2).
  - Of these studies, seven[1,6,8,13,17-19] have wide confidence intervals and five[3,6,13,17,18] include the null, decreasing confidence in the findings. Two studies[6,17] report a low number of ICU admissions and three[6,13,18] have small sample sizes. One study[10] reports a low prevalence of underlying asthma in the study population.
- Three cohort studies[2,11,14] (N = 160,121) report no association between ICU admission and underlying asthma among COVID-19 patients.
  - One study[2] (N = NR) reported an effect measure suggesting no association between underlying asthma and ICU admission among COVID-19 patients when adjusting for all other respiratory disease, ethnicity, socioeconomic status, region of England, BMI, smoking status, non-smoking-related illness and smoking related illness [aHR 1.08 (95% CI: 0.93-1.25), p = NR].
  - One study[11] (N = 5,104) reported an effect measure suggesting no association between underlying asthma and ICU admission among COVID-19 patients when adjusting for age, sex, education level, and a combined covariate for cardiac disease [aHR 1.07 (95% CI: 0.65-1.75), p = 0.79].
  - One study[14] (N = 155,017) reported an effect measure suggesting no association between underlying asthma and ICU admission among COVID-19 patients when adjusting for sociodemographic and clinical characteristics [aRR 0.98 (95% CI: NR), p > 0.05]. The study did not report a confidence interval and reported a low prevalence of underlying asthma in the study population, decreasing confidence in the findings.
- Four studies[7,9,12,15] (N = 18,859) report data that suggest underlying asthma is associated with a decrease in ICU admissions among COVID-19 patients and reported adjusted effect measures ranging from 0.51 (95% CI: 0.41-0.64) to 0.66 (95% CI: 0.30-1.46).
  - Of these studies, two[7,9] have confidence intervals that include the null, decreasing confidence in the findings. Two studies[7,15] have a small sample size and the other[9] reports a low prevalence of underlying asthma.

Intubation	The evidence is inconsistent and inconclusive on the association between underlying asthma and intubation among COVID-19 patients. • Strength of Association: Six studies[10,12-14,16,48] report adjusted measures of association ranging from 0.56 (95% CI: 0.17-1.86) to 1.77 (95% CI: 0.99-3.04). • Precision of Association: Two studies[12,13] report wide confidence intervals and four[10,12,13,48] include the null. • Consistency of Association: Results are inconsistent. • Applicability of Association: Settings and populations are applicable. Six studies[10,12-14,16,48] (N = 223,519) report data on underlying asthma and intubation among COVID-19 patients and all have a moderate threat to internal validity. • Three cohort studies[13,16,48] (N = 18,559) report effect measures suggesting that underlying asthma is associated with an increase in intubation among COVID-19 patients. ▪ One study[13] (N = 502) reports an effect measure suggesting underlying asthma is associated with an increase in intubation among COVID-19 patients when adjusting for age, sex, and obesity [aOR 1.77 (95% CI: 0.99-3.04), p = 0.06]. The study has a small sample size and the confidence interval is wide and includes the null, decreasing confidence in the finding. ▪ One study[48] (N = 935) reports an effect measure suggesting underlying asthma is associated with an increase in intubation among COVID-19 patients when adjusting for demographic variables and BMI [aOR 1.18 (95% CI: 0.45-1.32), p = 0.35]. The confidence interval includes the null, decreasing confidence in the finding. ▪ One study[16] (N = 17,122) report an effect measure indicating underlying asthma is associated with an increase in intubation among COVID-19 patients. The association remains when adjusting for age, sex, degree of dependency, dyslipidemia, chronic heart failure, severe chronic renal failure, cancer, COPD, respiratory rate >20, and risk category [aOR 1.24 (95% CI: 1.01-1.55), p = 0.049]. • Three cohort studies[10,12,14] (N = 204,960) report adjusted effect measures suggesting that underlying asthma is associated with a decrease in intubation among COVID-19 patients. ▪ One study[10] (N = 39,420) reports an effect measure suggesting that underlying asthma is associated with a decrease in intubation among COVID-19 patients. The association remains when adjusting for age, sex, and other systemic comorbidities [aOR 0.61 (95% CI: 0.29-1.3), p = 0.2]. The confidence interval includes the null, and the prevalence of underlying asthma in the study population is low, decreasing confidence in the finding. ▪ One study[12] (N = 10,523) reported an effect measure suggesting that underlying asthma is associated with a decrease in intubation among COVID-19 patients. The association remained when adjusting for COVID-19 disease severity, comorbidities, and concurrent therapies [aOR 0.56 (95% CI: 0.17-1.86), p = 0.35]. The confidence interval was wide and included the null, decreasing confidence in the finding. ▪ One study[14] (N = NR) reports an effect measure indicating that underlying asthma is associated with a decrease in intubation among COVID-19 patients when adjusting for sociodemographic characteristics, medical history, and the interaction of age and cardio-metabolic comorbidities [aRR 0.77 (95% CI: NR), p<0.01]. The study does not report a

	confidence interval and reports a low prevalence of underlying asthma in the study population, decreasing confidence in the finding.
Ventilation	The evidence suggests an increase in ventilation among COVID-19 patients with underlying asthma. • Strength of Association: Three studies[1,7,34] report adjusted measures of association ranging from 0.69 (95% CI: 0.36-1.29) to 2.1 (95% CI: 1.3-3.5). • Precision of Association: Two studies[1,7] report wide confidence intervals and two[7,34] include the null. • Consistency of Association: Results are inconsistent. • Applicability of Association: Settings and populations are applicable. Three studies[1,7,34] (N = 5,403) report data on underlying asthma and ventilation among COVID-19 patients and all have a moderate threat to internal validity. • Two cohort studies[1,7] (N = 2,155) report adjusted effect measures suggesting that underlying asthma is associated with an increase in ventilation among COVID-19 patients. ▪ One study[1] (N = 1,812) reports an effect measure indicating underlying asthma is associated with an increase in ventilation among COVID-19 patients when adjusting for age, sex, and the number and type of comorbidities except for anemia [aOR 2.1 (95% CI: 1.3-3.5), p = 0.003]. The study has a wide confidence interval, decreasing confidence in the results. ▪ One study[7] (N = 343) reports an effect measure suggesting underlying asthma is associated with an increase in mechanical ventilation among COVID-19 patients when adjusting for age, sex, race, COPD and obesity [aOR 1.10 (95% CI: 0.56-2.12), p = 0.77]. The study has a small sample size and a wide confidence interval that includs the null, decreasing confidence in the finding. • One cohort study[34] (N = 3,248) suggests that underlying asthma is associated with a decrease in ventilation among COVID-19 patients. ▪ One study[34] (N = 3,248) reports an effect measure suggesting underlying asthma is associated with a decrease in mechanical ventilation when adjusting for age, sex, race, ethnicity, payor, smoking status, BMI, and Charlson comorbidity index [aHR 0.69 (95% CI: 0.36-1.29), p = NR]. The confidence interval includes the null and the study reports a low number of ventilations, decreasing confidence in the results.
Hospitalization	Evidence indicates an increase in hospitalization among COVID-19 patients with underlying asthma. • Strength of Association: Twenty-three studies[2,5,7,8,12,14,17,20-35] report adjusted measures of association ranging from 0.28 (95% CI: 0.14-0.55) to 4.53 (95% CI: 1.39-14.79).

	• Precision of Association: Nine studies[7,17,20,24,27,28,31,32,35] report wide confidence intervals and eight[7,17,22,25,26,31,34,35] include the null. • Consistency of Association: Results are consistent. • Applicability of Association: Settings and populations are applicable. Twenty-three studies[2,5,7,8,12,14,17,20-35] (N = 861,886) report data on underlying asthma and hospitalization among COVID-19 patients. One study[5] has a low threat to internal validity, 21[2,7,8,12,14,17,20-25,27-35] a moderate threat, and one[26] a high threat to internal validity • Sixteen studies[2,5,8,17,20-22,24,27-33,35] (N = 682,894) suggest that underlying asthma is associated with an increase in hospitalization among COVID-19 patients. Thirteen cohort studies[2,8,17,20-22,27-29,31-33,35] (N = 135,521) and two case-controls[5,24] (N = 503,908), and one cross-sectional[30] (N = 43,465) report effect measures ranging from 1.11 (95% CI: 1.02-1.2) to 4.53 (95% CI: 1.39-14.79). One cohort study[45] reported an increase in hospitalization among COVID-19 patients with active asthma, however there was no association for COVID-19 patients with inactive asthma. ○ Of these studies, eight[17,20,24,27,28,31,32,35] have wide confidence intervals and four[17,22,31,35] include the null, decreasing confidence in the findings. Two studies[20,27] have small sample sizes and both report a low number of hospitalizations. One study[28] reports a low prevalence of underlying asthma and one[21] does not report the prevalence. • Three cohort studies[7,25,34] (N = 3,800) report no association between hospitalization and underlying asthma among COVID-19 patients. ▪ One study[7] (N = 343) reports an effect measure suggesting no association between underlying asthma and hospitalization when adjusting for age, sex, race, COPD, and obesity (aOR 1.0 (95% CI: 0.34-3.28), p > 0.99). The study has a small sample size and reports a wide confidence interval, decreasing confidence in the finding. ▪ One study[25] (N = 209) reports an adjusted effect measure suggesting no association between underlying asthma and hospitalization [aOR 1 (95% CI: 0.9-1.05), p = 0.9]. The study has a small sample size and does not report which variables are included in the model, decreasing confidence in the finding. ▪ One study[34] (N = 3,248) reports an effect measure suggesting no association between underlying asthma and hospitalization when adjusting for age, sex, race, ethnicity, payor, smoking status, BMI, and Charles Comorbidity Index [aHR 0.99 (95% CI: 0.8-1.22), p = NR]. • Four studies[12,14,23,26] (N = 175,192) suggest that underlying asthma is associated with a decrease in hospitalization among COVID-19 patients. Three cohort studies[12,14,23] (N = 166,519) and one case-control study[26] (N = 8,673) report effect measures ranging from 0.28 (95% CI: 0.14-0.55) to 0.87 (95% CI: NR). ○ One study[26] has a high threat to internal validity and reports a confidence interval that includes the null and one study[23] reports a low number of hospitalizations, decreasing confidence in the findings.
Readmission	The evidence indicates an increase in readmission among COVID-19 patients with underlying asthma. • Strength of Association: Two studies[36,37] report adjusted measures of association of 1.52 (95% CI: 1.04-2.22) and 1.7 (95% CI: 1.1-2.7).

	• Precision of Association: Both[36,37] confidence intervals are wide. • Consistency of Association: Results are consistent. • Applicability of Association: Settings and populations were applicable. Two studies[36,37] (N = 8,990) report data on underlying asthma and readmission among COVID-19 patients and both have a moderate threat to internal validity. • Two cohort studies[36,37] (N = 8,990) report adjusted effect measures indicating underlying asthma is associated with an increase in readmission among COVID-19 patients. ▪ One study[36] (N = 7,137) reports an effect measure indicating an increase in non-elective readmissions to the hospital during the first 30 days after being discharged when adjusting for age, Charlson Comorbidity Index score, diabetes, COPD, solid neoplasia, hypertension, dementia, duration of symptoms before admission, hemoglobin level and platelets count at admission, ground-glass infiltrate at admission, acute cardiac injury, acute kidney failure, and glucocorticoid treatment [aOR 1.52 (95% CI: 1.04-2.22), p = 0.031]. ▪ One study[37] (N = 1,853) reports an effect measure indicating an increase in subsequent hospital encounters within 30 days of initial discharge when adjusting for age at encounter, sex, race/ethnicity, parent hospital, month of diagnostic encounter, social vulnerability index, financial class, BMI, obesity class, medical history, surgical history, exposure history, symptoms screening, admission category, and therapy administered at initial encounter [aOR 1.7 (95%CI: 1.1-2.7), p = 0.03].

Table 3. Severity of underlying asthma examined for association with severe COVID-19 outcomes

Outcome	Results
Mortality	Evidence is inconsistent and inconclusive on the association between asthma severity and mortality among COVID-19 patients with underlying asthma. Definitions used for asthma severity were heterogeneous across studies, limiting the conclusions that can be drawn from these results. • Strength of Association: Eight studies[2,9,34,45,63-66] report adjusted measures of association ranging from 0.06 (95% CI: 0.001-2.06) to 3.62 (95% CI: 0.89-14.68). • Precision of Association: Confidence intervals are wide in five studies[9,34,64-66] and all eight report confidence intervals that include the null. • Consistency of Association: Results are inconsistent. • Applicability of Association: Settings and populations were applicable. Eight studies[2,9,34,45,63-66] (N = 91,104) report mortality data that is stratified by asthma severity or examined in a subgroup analysis among COVID-19 patients with underlying asthma, and all have a moderate threat to internal validity. • Three cohort studies[63,65,66] (N = 14,862) suggest an increase in asthma severity is associated with an increase in mortality among COVID-19 patients with underlying asthma.

	▪ One study[65] (N = 7,590) reports an effect measure suggesting an increase in mortality among COVID-19 patients with uncontrolled asthma when compared to those with controlled asthma [aOR 3.62 (95% CI: 0.89-14.68), p = 0.072]. Uncontrolled asthma is defined as an asthma exacerbation requiring an emergency room visit in the past year. The study reports a wide confidence interval that includes the null, decreasing confidence in the results. ▪ One study[66] (N = 7,272) reports an effect measure suggesting an increase in mortality among COVID-19 patients with moderate to severe asthma compared to those with mild asthma [aOR 1.33 (95% CI: 0.54-3.30, p = 0.526]. Moderate to severe asthma is determined by prescribed medication. This study reports a wide confidence interval that includes the null, decreasing confidence in the results. ▪ One study[63] (N = NR) reports an increase in mortality for COVID-19 patients with recent oral corticosteroid (OCS) use, however there is no difference for those with no recent OCS use (recent OCS use: aHR 1.13 (95% CI: 1.01-1.26), p = NR; no recent OCS use: aHR 0.99 (0.93-1.05), p = NR]. This study uses COVID-19 patients without asthma as a comparison group. • Two cohort studies[2,45] (N = 61,338) suggest no association between mortality and asthma severity among COVID-19 patients with underlying asthma. ▪ One cohort study[2] (N = NR) reports effect measures suggesting no association between mortality and severe asthma or active asthma among COVID-19 patients when compared to patients without asthma [severe: aHR 1.08 (95% CI: 0.98-1.19), p = NR; active: aHR 1.05 (95% CI: 0.96-1.15), p = NR]. Severe asthma includes patients who were prescribed at least three different classes of medication for asthma in the previous year. Active asthma includes patients who had at least one prescription for asthma medication. This study uses COVID-19 patients without asthma as a comparison group. ▪ One cohort study[45] (N = 61,388) reports effect measures suggesting no association between mortality and asthma among COVID-19 patients regardless of whether asthma is classified as active or inactive [active: aOR 0.98 (95% CI: 0.76-1.27), p = NR; inactive: aOR 0.83 (95% CI: 0.58-1.19), p = NR]. Active asthma is defined as any scheduled or unscheduled clinical visit with an asthma diagnosis code in the 12 months prior to a COVID-19 diagnosis. This study uses COVID-19 patients without asthma as the comparison group. • Three cohort studies[9,34,64] (N = 14,904) suggest asthma severity is associated with a decrease in mortality among COVID-19 patients with underlying asthma. ▪ One study[9] (N = 7,590) reports effect measures suggesting a decrease in mortality among COVID-19 patients with more severe asthma. Patients are classified based on asthma medications used for the past year. The first step includes SABA; the second includes ICS, LTRA or xanthine; the third includes ICS/LABA alone, ICS with LTRA or ICS with xanthine; the fourth includes ICS/LABA with LAMA, ICS/LABA with LTRA, or ICS/LABA with xanthine; and the most severe category includes oral corticosteroid with a duration longer than 90 days. The odds of mortality decreases for patients categorized in steps 2 through 5 when compared to those in step 1 using SABA, however the confidence intervals are wide and include the null, decreasing confidence in the results.

	▪ One study[64] (N= 4,066) reports adjusted effect measures suggesting a decrease in mortality among COVID-19 patients with asthma compared to those without asthma, however the decrease is greater among those with severe asthma defined as patients using ICS/LABA with LAMA, ICS/LABA with LTRA, ICS/LABA with xanthine, or corticosteroids for over 90 days within previous two years [mild: aOR 0.85 (95% CI: 0.45-1.6), p = 0.605; severe: aOR 0.7 (95% CI: 0.13-3.68), p = 0.672]. ▪ One study[34] (N = 3,248) reports an adjusted effect measure suggesting a decrease in mortality among COVID-19 patients with allergic asthma compared to those with non-allergic asthma [aHR 0.82 (95% CI: 0.24-2.75)]. Allergic asthma includes those with a history of allergic rhinitis in the past year or those on therapy with oral antihistamine, leukotriene modifier, intranasal corticosteroid spray, or intranasal antihistamine in the past year. This study has a low number of deaths and a wide confidence interval that includes the null, decreasing confidence in the finding.
ICU admission	The evidence is inconclusive on the association between asthma severity and ICU admission among COVID-19 patients with underlying asthma. Definitions used for asthma severity were heterogeneous across studies, limiting the conclusions that can be drawn from these results. • Strength of Association: Three studies[2,9,45] report adjusted measures of association ranging from 0.06 (95% CI: 0.002-1.85) to 1.47 (95% CI: 1.14-1.89). • Precision of Association: One study[9] has wide confidence intervals and two[9,45] include the null. • Consistency of Association: Results are inconsistent. • Applicability of Association: Settings and populations were applicable. Three studies[2,9,45] (N = 68,928) report ICU admission data that is stratified by asthma severity or examined in a subgroup analysis among COVID-19 patients with underlying asthma and all have a moderate threat to internal validity. • Two cohort studies[2,45] (N = 61,338) suggest that asthma severity is associated with an increase in ICU admission among COVID-19 patients with asthma. Each study defines asthma severity differently, decreasing confidence in the results. ▪ One study[2] (N = NR) reports effect measures indicating severe asthma and active asthma are associated with an increase in ICU admission when compared to those without asthma [severe: aHR 1.30 (95% CI: 1.08-1.58), p = NR; active: aHR 1.34 (95% CI: 1.14-1.58), p = NR]. Severe asthma includes patients who were prescribed at least three different classes of medication for asthma in the previous year, while active asthma includes patients who had at least one prescription for asthma medication. This study uses COVID-19 patients without asthma as the comparison group. ▪ One study[45] (N = 61,388) reports an effect measure indicating active asthma is associated with an increase in ICU admission among COVID-19 patients while there was no association for those with inactive asthma [active: aOR 1.47 (95% CI: 1.14-1.89), p = NR; inactive: aOR 0.81 (95% CI: 0.56-1.2), p = NR]. Active asthma is defined as any scheduled or unscheduled clinical visit with an asthma diagnosis code in the 12 months prior to a COVID-19 diagnosis. This study used COVID-19 patients without asthma as the comparison group.

	• One cohort study[9] (N = 7,590) suggests an increase in asthma severity is associated with a decrease in ICU admission among COVID-19 patients with underlying asthma. ▪ One study[9] (N = 7,590) reports effect measures suggesting a decrease in ICU admission among COVID-19 patients with more severe asthma. Patients are classified based on asthma medications used for the past year. The first step includes SABA; the second includes ICS, LTRA or xanthine; the third includes ICS/LABA alone, ICS with LTRA or ICS with xanthine; the fourth includes ICS/LABA with LAMA, ICS/LABA with LTRA, or ICS/LABA with xanthine; and the most severe category includes oral corticosteroid with a duration longer than 90 days. The odds of ICU admission decreases for patients categorized in steps 2-5 when compared to those in step 1 using SABA, however the confidence intervals are wide and include the null, decreasing confidence in the results.
Ventilation	The evidence is inconclusive on the association between asthma severity and ventilation among COVID-19 patients with underlying asthma. Definitions used for asthma severity were heterogeneous across studies, limiting the conclusions that can be drawn from these results. • Strength of Association: Two studies[34,45] report adjusted measures of association ranging from 0.47 (95% CI: 0.22-1.01) to 85.2 (95% CI: 5.55-1310). • Precision of Association: One study[34] reports a wide confidence interval and both report confidence intervals that include the null. • Consistency of Association: Results are inconsistent. • Applicability of Association: Settings and populations were applicable. Two studies[34,45] (N = 64,586) report ventilation data by that is stratified by asthma severity or examined in a subgroup analysis among COVID-19 patients with underlying asthma and both have a moderate threat to internal validity. • Two cohort studies[34,45] suggests that asthma severity is associated with an increase in ventilation among COVID-19 patients with underlying asthma. ▪ One study[45] (N = 61,338) reports an effect measure indicates active asthma is associated with an increase in ventilation among COVID-19 patients while there was no association for those with inactive asthma [active: aOR 1.49 (95% CI: 1.21-1.83), p = NR; inactive: aOR 0.83 (95% CI: 0.61-1.12), p = NR]. Active asthma is defined as any scheduled or unscheduled clinical visit with an asthma diagnosis code in the 12 months prior to a COVID-19 diagnosis. This study uses COVID-19 patients without asthma as the comparison group. ▪ One study[34] (N=3,248) reports an effect measure suggesting severe asthma is associated with an increase in mechanical ventilation when compared to patients with non-severe asthma (aHR 85.2 (95% CI: 5.55-1310)). Severe asthma includes patients who used asthma biologics in past year, received oral corticosteroids three or more times in past year, or received theophylline in the past year. However, the study reports a decrease in mechanical ventilation among COVID-19 patients with allergic asthma compared to those with non-allergic asthma [aHR 0.65 (95% CI: 0.28-1.51)]. Allergic asthma includes those with a history of allergic rhinitis in the past year or those on therapy with oral antihistamine, leukotriene

	modifier, intranasal corticosteroid spray, or intranasal antihistamine in the past year. This study has a wide confidence interval that includes the null and reports a low number of ventilations, decreasing confidence in the findings.
Hospitalization	The evidence suggests asthma severity is associated with an increase in hospitalization among COVID-19 patients with underlying asthma, while allergic asthma is associated with a decrease in hospitalization. However, definitions used for asthma severity are heterogeneous across studies, limiting the conclusions that can be drawn from these results. • Strength of Association: Six studies[2,22,34,41,45,62] report adjusted measures of association ranging from 0.52 (95% CI: 0.28-0.91) to 1.99 (95% CI: 0.82-4.79). • Precision of Association: Two studies[34,41] report wide confidence intervals and three[34,41,45] report confidence intervals that include the null. • Consistency of Association: Results are inconsistent. • Applicability of Association: Settings and populations were applicable. Six cohort studies[2,22,34,41,45,62] (N = 89,578) report hospitalization data that is stratified by asthma severity or examined in a subgroup analysis among COVID-19 patients with underlying asthma among COVID-19 patients with underlying asthma and all six have a moderate threat to internal validity. • Four studies[2,34,45,62] (N = 79,424) indicate that asthma severity is associated with an increase in hospitalization among COVID-19 patients with underlying asthma. Four studies report adjusted effect measures ranging from 1.26 (95% CI: 1.2-1.33) to 1.99 (95% CI: 0.82-4.79). In one study,[2] severe asthma includes patients who were prescribed at least three different classes of medication for asthma in the previous year while active asthma includes patients who had at least one prescription for asthma medication. Another study[62] determines severity by the number of general practitioner-managed asthma exacerbations in the past five years, which are defined as a prescription for a short course of oral corticosteroids. One study[45] defines active asthma as any scheduled or unscheduled clinical visit with an asthma diagnosis code in the 12 months prior to a COVID-19 diagnosis. In another,[34] severe asthma includes patients who used asthma biologics in the past year, received oral corticosteroids three or more times in the past year, or received theophylline in the past year. ○ One study[34] reports a wide confidence interval that includes the null, decreasing confidence in the finding. Three studies[2,34,45] use COVID-19 patients without asthma as comparison groups. • Three studies[22,34,41] (N = 13,482) suggest that severe and allergic asthma is associated with a decrease in hospitalization among COVID-19 patients with underlying asthma. ▪ One study[22] (N = 5,596) reports an adjusted effect measure suggesting a decrease in hospitalization among COVID-19 patients with allergic asthma compared to those with non-allergic asthma [aOR 0.52 (95% CI: 0.28-0.91), p = 0.026]. Allergic asthma includes allergic rhinitis or atopic dermatitis. ▪ One study[41] (N = 4,558) reports effect measures suggesting hospitalization is lowest among patients with severe asthma as categorized by ICD-9 and ICD-10 codes [aOR 0.58 (95% CI: 0.13-2.59)]. There is a decrease in hospitalization among patients with mild persistent asthma [(aOR 0.77 (95% CI: 0.28-2.13)], however there is no difference for patients with mild intermittent or moderate persistent asthma [mild intermittent: aOR 0.92 (95% CI: 0.55-1.53); moderate persistent:

	aOR 1.0 (95% CI: 0.42-2.37)]. The study has wide confidence intervals that include the null and reports a low number of hospitalizations among patients with mild persistent asthma, moderate persistent asthma, and severe asthma, decreasing confidence in the findings. ▪ One study[34] (N = 3,328) reports an adjusted effect measure suggesting a decrease in hospitalization among COVID-19 patients with allergic asthma compared to those with non-allergic asthma [aHR 0.86 (95% CI: 0.64-1.16)]. Allergic asthma includes those with a history of allergic rhinitis in the past year or those on therapy with oral antihistamine, leukotriene modifier, intranasal corticosteroid spray, or intranasal antihistamine in the past year. This study has a wide confidence interval that includes the null, decreasing confidence in the findings.

Table 4. Treatment for underlying asthma examined for association with severe COVID-19 outcomes

Outcome	Results
Mortality	The evidence is inconclusive on the association between asthma treatment and mortality among COVID-19 patients with underlying asthma. Definitions used for asthma treatment are heterogeneous across studies, limiting the conclusions that can be drawn from these results. • Strength of Association: Four studies[39,45,50,67] report adjusted effect measures ranging from 0.23 (95% CI: 0.05-1.1) to 2 (95% CI: 1.18-3.4). • Precision of Association: Two studies[50,67] report wide confidence intervals and all four report confidence intervals that include the null. • Consistency of Association: Results are inconsistent. • Applicability of Association: Settings and populations were applicable. Four studies[39,45,50,67] (N = 146,088) report mortality data that is stratified by asthma treatment or examined in a subgroup analysis among COVID-19 patients with underlying asthma and all four have a moderate threat to internal validity. • Two cohort studies[50,67] (N = 9,287) suggest steroid use is associated with an increase in mortality among COVID-19 patients with underlying asthma. ▪ One study[67] (N = 8,242) reports adjusted effect measures suggesting steroid use is associated with an increase in mortality among COVID-19 patients with underlying asthma [aHR 1.16 (95% CI: 0.81-1.64), p = 0.418]. When stratifying on recency, data suggests an increase in risk for those with recent steroid use in the previous 120 days, however there is no association for asthmatics with former steroid use in the previous 120 to 365 days [recent use: aHR 1.4 (95% CI: 0.92-2.15), p = 0.12; former use: aHR 0.93 (95% CI: 0.57-1.51), p = 0.769]. When stratified by the number of steroid prescriptions, data indicates an increase in mortality among those with three or more steroid prescriptions but not for those with one or two prescriptions [one: aHR 0.91 (95% CI: 0.53-1.56, p = 0.733; two: aHR 0.86 (95% CI: 0.42-1.78), p = 0.694; three or more: aHR 1.64 (95% CI: 1.05-2.59), p = 0.032]. There is no association between the use of biologics and

	mortality among asthmatics with COVID-19. This study reports wide confidence intervals that include the null, decreasing confidence in the findings. ▪ One cohort study[50] (N = 1,045) report adjusted effect measures suggesting a smaller decrease in mortality among COVID-19 patients with underlying asthma on ICS than those not on ICS when compared to patients without asthma. While data suggests a decrease in mortality among COVID-19 patients with underlying asthma regardless of documented use of ICS in the previous seven days, the decrease appears greater among those not on ICS (ICS: aOR 0.46 (95% CI: 0.18-2.2), p = NR; no ICS: aOR 0.23 (95% CI: 0.05-1.1), p = 0.051). This study reports a low number of deaths and wide confidence intervals that include the null, decreasing confidence in the findings. • Two cohort studies[39,45] (N = 136,801) suggest asthma medication is associated with a decrease in mortality among COVID-19 patients with underlying asthma. ▪ One study[39] (N=75,463) reports effect measures suggesting asthma therapies are associated with a decrease in mortality when adjusting for severity on admission, age, and comorbidities. While there is no difference in mortality for COVID-19 patients aged 16 to 49 who are on SABA, ICS, or ICS with LABA treatments when compared to those without asthma, there is an increase for those with underlying asthma who were not on any asthma therapy [SABA: aHR 1.01 (95% CL 0.62-1.65), p = 0.964; ICS: aHR 0.99 (95% CI: 0.65-1.49), p = 0.956; ICS with LABA: aHR 1.03 (95% CI: 0.68-1.55), p = 0.898; no therapy: aHR 1.21 (95% CI: 0.75-1.95), p = 0.435]. For patients aged 50 and older, there is a decrease in mortality among COVID-19 patients with underlying asthma on ICS treatment when compared to those with no respiratory disease, while there is no difference in mortality for those with asthma not on ICS treatment [ICS: aHR 0.88 (95% CI: 0.82-0.94), p < 0.001; no ICS: aHR 0.97 (95% CI: 0.9-1.05), p =0.455]. ▪ One study[45] (N = 61,338) reports adjusted effect measures suggesting there is a decrease in mortality among COVID-19 patients with either active asthma or inactive asthma when patients are on medication including bronchodilators, leukotriene receptor antagonists, or corticosteroids [active asthma: aHR 0.86 (95% CI: 0.63-1.18), p = NR; inactive asthma: aHR 0.77 (95% CI: 0.47-1.27), p = NR]. There is an increase in mortality for COVID-19 patients with active asthma without medication and no association for patients with inactive asthma without medication [active asthma: aHR 1.33 (95% CI: 0.87-2.05), p = NR; inactive asthma: aHR 0.91 (95% CI: 0.54-1.51), p = NR]. This study reports confidence intervals that include the null, decreasing confidence in the findings.
ICU admission	The evidence is inconclusive on the association between asthma treatment and ICU admission among COVID-19 patients with underlying asthma. Aggregation indices cannot be measured with only one study which was found to have a moderate threat to internal validity. • One cohort study[45] (N = 61,338) suggests asthma treatment is associated with a decrease in ICU admission among COVID-19 patients with active asthma. ▪ One study[45] (N = 61,338) reports adjusted measures of effect suggesting medications including bronchodilators, leukotriene receptor antagonists, or corticosteroids are associated with a decrease in ICU admission for COVID-19 patients with active asthma. When compared to those without asthma, the odds of ICU admission is greater among

	COVID-19 patients with active asthma not on medication in the past 12 months than for those on medication [medication: aOR 1.2 (95% CI: 0.89-1.62), p = NR; no medication: aOR 2.75 (95% CI: 1.77-4.27), p = NR]. However, for inactive asthma the data suggest no association between medication and ICU admission [medication: aOR 0.88 (95% CI: 0.53-1.45), p = NR; no medication: aOR 0.74 (95% CI: 0.41-1.32), p = NR].
Ventilation	The evidence is inconclusive on the association between asthma treatment and ventilation among COVID-19 patients with underlying asthma. Aggregation indices cannot be measured with only one study which was found to have a moderate threat to internal validity. • One cohort study[45] (N = 61,338) suggests asthma treatment is associated with a decrease in ventilation among COVID-19 patients with underlying active asthma. ▪ The study[45] (N = 61,338) reports adjusted measures of effect suggesting medications including bronchodilators, leukotriene receptor antagonists, or corticosteroids are associated with a decrease in ventilation for COVID-19 patients with active asthma. When compared to those without asthma, the odds of ventilation is greater among COVID-19 patients with active asthma not on medication in the past 12 months than for those on medication [medication: aOR 1.36 (95% CI: 1.08-1.72), p = NR; no medication: aOR 2.06 (95% CI: 1.37-3.1), p = NR]. However, for inactive asthma the data suggested no association between medication use and ventilation [medication: aOR 0.93 (95% CI: 0.63-1.14), p = NR; no medication: aOR 0.71 (95% CI: 0.45-1.14), p = NR].
Hospitalization	The evidence is inconclusive on the association between asthma treatment and hospitalization among COVID-19 patients with underlying asthma. Definitions used for asthma treatment were heterogeneous across studies, limiting the conclusions that can be drawn from these results. • Strength of Association: Three studies[41,45,62] report adjusted measures of association ranging from 0.59 (95% CI: 0.21-1.69) to 2.36 (95% CI: 0.273-20.4). • Precision of Association: Two studies[41,62] report wide confidence intervals and all three studies report confidence intervals that include the null. • Consistency of Association: Results are inconsistent. • Applicability of Association: Settings and populations were applicable. Three cohort studies[41,45,62] (N = 80,734) reported hospitalization data that are stratified by asthma treatment or examined in a subgroup analysis among COVID-19 patients with underlying asthma and three have a moderate threat to internal validity. • Two studies study[41,62] (N = 19,396) suggest inhaled corticosteroids, montelukast, and biologics are associated with an increase in hospitalization among COVID-19 patients with underlying asthma. ▪ One study[62] (N = 14,838) reports adjusted measures of effect indicating regular inhaled corticosteroids (ICS) is associated with an increase in hospitalization [regular ICS: aHR 1.27 (95% CI: 1.10-1.61), p <0.05; regular ICS with add-on: aHR 1.63 (95% CI: 1.37-1.94), p <0.001]. There is no association for SABA treatment or intermittent ICS [SABA only: aHR 0.94 (95%

	CI: 0.75-1.17), p = 0.56; intermittent ICS: aHR 0.9 (95% CI: 0.67-1.21), p = 0.49], however there is an increase for intermittent ICS with an additional asthma maintenance medication [aHR 2.0 (95% CI: 1.43-2.79), p<0.001]. ▪ One study[41] (N = 4,558) reports adjusted measures of effect suggesting inhaled corticosteroids (ICS), montelukast, and biologics are associated with an increase in hospitalization among COVID-19 patients with underlying asthma [ICS: aOR 1.51 (95% CI: 0.9-2.56), p = NR; montelukast: aOR 1.36 (95% CI: 0.72-2.54), p = NR; biologics: aOR 2.36 (95% CI: 0.27-20.4), p = NR]. Both antihistamines and SCIT are associated with a decrease in hospitalization, while there was no association for oral corticosteroids [antihistamines: aOR 0.88 (95% CI: 0.54-1.43), p = NR; SCIT: aOR 0.8 (95% CI: 0.2-3.22), p = NR; oral corticosteroids: aOR 1.04 (95% CI: 0.68-1.6), p = NR]. When stratifying inhaled corticosteroids by dose, data suggest no association with hospitalization regardless of dose among COVID-19 patients with underlying asthma [low: aOR 1.64 (95% CI: 0.17-15.06), p = NR; medium: aOR 1.53 (95% CI: 0.51-4.53), p = NR; high: aOR 0.59 (95% CI: 0.21-1.69), p = NR]. This study reports wide confidence intervals that include the null, decreasing confidence in the findings. • One cohort study[45] (N = 61,338) suggests asthma treatment is associated with a decrease in hospitalization among COVID-19 patients with underlying active asthma. ▪ One study[45] (N = 61,338) reports adjusted measures of effect indicating medications including bronchodilators, leukotriene receptor antagonists, or corticosteroids are associated with a decrease in hospitalization for COVID-19 patients with active asthma. When compared to those without asthma, the odds of hospitalization are greater among COVID-19 patients with active asthma not on medication in the past 12 months than for those on medication [medication: aOR 1.56 (95% CI: 1.35-1.81), p = NR; no medication: aOR 2.14 (95% CI: 1.62-2.82), p = NR]. However, for inactive asthma the measures of association suggest no difference in the adjusted odds of hospitalization for COVID-19 patients with or without medication [medication: aOR 1.02 (95% CI: 0.8-1.28), p = NR; no medication: aOR 0.89 (95% CI: 0.68-1.15), p = NR].

Table 5. The association between asthma and other comorbidities and severe COVID-19 outcomes

Outcome	Results
Mortality	The evidence suggests comorbidities are associated with an increase in mortality among COVID-19 patients with underlying asthma. • Strength of Association: Two studies[41,67] report adjusted measures of association ranging from 1.12 (95% CI: 0.79-1.59) to 3.2 (95% CI: 1.32-7.79). • Precision of Association: One study[41] report wide confidence intervals and one[67] reports confidence intervals that includes the null. • Consistency of Association: Results are consistent. • Applicability of Association: Settings and populations were applicable.

	Two studies[41,67] (N = 12,800) report data on comorbidities and mortality among COVID-19 patients with underlying asthma and both have a moderate threat to internal validity. • Two cohort studies[41,67] (N = 12,800) suggest that comorbidities are associated with an increase in mortality among COVID-19 patients with underlying asthma. ▪ One study[67] (N = 8,242) reports adjusted effect measures indicating that diabetes and ischemic heart disease are associated with an increase in mortality, and suggestive that hypertension and obesity are associated with an increase in mortality among COVID-19 patients with underlying asthma [diabetes: aHR 1.73 (95% CI: 1.22-2.47), p = 0.002; ischemic heart disease: aHR 1.85 (95% CI: 1.31-2.6), p < 0.001; hypertension: aHR 1.44 (95% CI: 0.87-2.37), p = 0.154; obesity: aHR 1.12 (95% CI: 0.79-1.59), p = 0.514]. ▪ One study[41] (N=4,558) reports adjusted effect measures suggesting that congestive heart failure (CHF) and COPD are associated with an increase in mortality among COVID-19 patients with underlying asthma [CHF: aOR 2.29 (95% CI: 1.009-5.22), p = 0.2; COPD: aOR 3.2 (95% CI: 1.32-7.79), p = 0.06]. Hypertension, diabetes, and chronic kidney disease are not found to affect mortality among admitted COVID-19 patients with underlying asthma. The study has wide confidence intervals, decreasing confidence in the findings.
Hospitalization	The evidence is inconclusive on the association between comorbidities and hospitalization among COVID-19 patients with underlying asthma. Aggregation indices cannot be measured with only one study which was found to have a moderate threat to internal validity. • One cohort study[33] (N = 15,690) suggests there is no association between BMI score and hospitalization among COVID-19 patients with underlying asthma. ▪ One study[33] (N = 15,690) reports adjusted effect measures suggesting no difference in the association between hospitalization and underlying asthma across BMI score [BMI <30: aRR 1.09 (95% CI: 0.97-1.22), p = 0.13; BMI ≥30: aRR 1.11 (95% CI: 0.98-1.25), p = 0.111].

Table 6. The association between asthma and risk markers and severe COVID-19 outcomes

Outcome	Results
Mortality	The evidence is inconclusive on the association between risk markers and mortality among COVID-19 patients with underlying asthma. • Strength of Association: Five studies[30,31,45,67,69] report adjusted measures of association ranging from 0.73 (95% CI: 0.52-1.02) to 1.88 (95% CI: 1.43-2.48). • Precision of Association: Three studies[31,45,67] report wide confidence intervals and all five report confidence intervals that included the null. • Consistency of Association: Results are consistent.

	• Applicability of Association: Settings and populations were applicable. Five studies[30,31,45,67,69] reported mortality data that is stratified by risk marker or examined in a subgroup analysis among COVID-19 patients with underlying asthma, and were found to have a moderate threat to internal validity. • Three studies[30,45,67] (N = 113,045) report data on age, mortality, and underlying asthma among COVID-19 patients. Two studies[30,45] report adjusted effect measures suggesting younger age is associated with an increase in mortality among COVID-19 patients with active asthma[45] and pediatric COVID-19 patients with underlying asthma.[30] However, there was no difference in the odds of mortality across age groups among COVID-19 patients with inactive asthma,[45] and one study[67] reports that mortality increases with each year increase in age. o One study[45] reports wide confidence intervals and two[30,45] report confidence intervals that include the null, decreasing confidence in the results. • Two studies[67,69] (N = 8,242) report data on sex, mortality, and underlying asthma among COVID-19 patients. One study[67] reports an adjusted effect measure suggesting male sex is associated with an increase in mortality among COVID-19 patients with underlying asthma, however another study[69]reports adjusted effect measures suggesting female sex is associated with an increase. o One study[67] reports a wide confidence interval and one[69] reports a confidence interval that includes the null, decreasing confidence in the results. • Two studies[31,67] (N = 20,172) report data on race or ethnicity, mortality, and underlying asthma among COVID-19 patients. One study[31] reports adjusted effect measures suggesting an increase in mortality for non-Hispanic Asians with underlying asthma, but not for non-Hispanic White, non-Hispanic Black, or Hispanic patients with underlying asthma when compared to patients without underlying asthma. Another study[67] reports no difference among patients with underlying asthma when comparing Arab ethnicity to Jewish ethnicity. One study[67] reports a decrease in mortality for patients who reported having ever smoked when compared to those who had never smoked. o One study[31] reports wide confidence intervals and both[31,67] report confidence intervals that include the null, decreasing confidence in the results.
ICU admission	The evidence is inconclusive on the association between risk markers and ICU admission among COVID-19 patients with underlying asthma. Aggregation indices cannot be measured with only one study which was found to have a moderate threat to internal validity. • One cohort study[45] (N = 61,338) suggests younger age is associated with an increase in ICU admission among COVID-19 patients with underlying asthma. ▪ One study[45] reports adjusted effect measures suggesting that while active asthma is associated with an increase in ICU admission regardless of age, the association decreases with age [age 18-34: aOR 1.86 (95% CI: 0.76-4.55), p = NR; age 35-64: aOR 1.52 (95% CI: 1.07-2.15), p = NR; age ≥65: 1.29 (95% CI: 0.86-1.94), p = NR]. Similarly, there is no association

	between inactive asthma and ICU admission among COVID-19 patients aged 18 to 34, however data suggest there could be a decrease in ICU admission for those aged 35 and older [age 18-34: aOR 0.99 (95% CI: 0.23-4.17), p = NR; age 35-64: aOR 0.78 (95% CI: 0.46-1.33), p = NR; age ≥65: aOR 0.87 (95% CI: 0.47-1.59), p = NR].
Ventilation	The evidence is inconclusive on the association between risk markers and ventilation among COVID-19 patients with underlying asthma. Aggregation indices cannot be measured with only one study which was found to have a moderate threat to internal validity. • One cohort study[45] (N = 61,338) suggests younger age is associated with an increase in ventilation among COVID-19 patients with underlying asthma. ▪ One study[45] reported adjusts effect measures suggesting that while active asthma is associated with an increase in ventilation regardless of age, the measure of association decreases with age [age 18-34: aOR 1.74 (95% CI: 0.8-3.77), p = NR; age 35-64: aOR 1.6 (95% CI: 1.21-2.13), p = NR; age ≥65: 1.27 (95% CI: 0.91-1.76), p = NR]. Similarly, there is no association between inactive asthma and ICU admission among COVID-19 patients aged 18 to 64, however the data suggest a decrease in ICU admission for those aged 65 and older [age 18-34: aOR 0.92 (95% CI: 0.28-3.01), p = NR; age 35-64: aOR 0.97 (95% CI: 0.66-1.43), p = NR; age ≥65: aOR 0.66 (95% CI: 0.39-1.11), p = NR].
Hospitalization	The evidence suggests female sex is associated with an increase in hospitalization among COVID-19 patients with underlying asthma. Evidence is inconclusive on the association between other risk markers and hospitalization. • Strength of Association: Six studies[31,33,41,45,68,69] report measures of association ranging from 0.2 (95% CI: 0.12-0.34) to 2.21 (95% CI: 1.53-3.2). • Precision of Association: Four studies[31,41,45,68] have wide confidence intervals and five[31,33,41,45,68] report confidence intervals that include null. • Consistency of Association: Results are inconsistent. • Applicability of Association: Settings and populations were applicable. Six studies[31,33,41,45,68,69] (N = 93,623) report stratified hospitalization data by risk markers or subgroup analyses among COVID-19 patients with underlying asthma and have a moderate threat to internal validity. • Three studies[33,41,45] (N = 81,586) report data on age, hospitalization, and underlying asthma among COVID-19 patients. One study[45] reports adjusted effect measures suggesting younger age is associated with an increased odds of hospitalization among COVID-19 patients with underlying asthma. However, another study[41] reports adjusted effect measures indicating that older age is associated with an increase in hospitalization and one[33] reports no association between age and hospitalization among COVID-19 patients with underlying asthma. ○ One study[45] reports wide confidence intervals and two[33,45] report confidence intervals that include the null, decreasing confidence in the findings.

	• Three studies[33,41,69] (N = 20,248) report adjusted effect measures indicating female sex is associated with an increase in hospitalization among COVID-19 patients with underlying asthma.
	  ○ One study[33] reports a confidence interval that includes the null, decreasing confidence in the finding.
	• Three studies[31,33,41] (N = 32,178) reports on race or ethnicity, hospitalization, and underlying asthma among COVID-19 patients. All three report adjusted effect measures suggesting non-Hispanic White ethnicity is associated with an increase in hospitalization when either compared with other racial or ethnic groups[41] or when stratified by race or ethnicity.[31,33] One study[31] also reports an increase among non-Hispanic Asian patients with underlying asthma when compared to patients without underlying asthma.
	  ○ Two studies[31,41] report wide confidence intervals and all three report confidence intervals that include the null, decreasing confidence in the findings.
	• Three studies[33,41,68] (N = 20,355) report on smoking status, hospitalization, and underlying asthma among COVID-19 patients. One study[41] reports an adjusted effect measure suggesting current smokers have lower odds of hospitalization than COVID-19 patients with underlying asthma who reported never smoking. However, another study (Beken 2021) reports an increase in the odds of hospitalization for those with passive tobacco exposure and one[33] reports no difference across smoking status.
	  ○ Two studies[41,68] report wide confidence intervals and all three report confidence intervals that include the null, decreasing confidence in the findings. One study[68] has a small sample size.

B.3.b. Extracted Evidence

Table 7. Extracted Studies Reporting the Association between Asthma and Severe COVID-19 Outcomes

Study	Population and Setting	Intervention	Definitions	Outcomes
Author: Aabakke[20] **Year:** 2021 **Data Extractor:** MW **Reviewer:** DOS **Study Design:** Cohort **Study Objective:** To identify risk factors for SARS-CoV-2 infection in pregnancy in a universally tested population and risk factors for severe	**Population:** N=418 **Setting:** Community setting **Location:** Denmark **Study dates:** March 1, 2020 – February 8, 2021 **Inclusion criteria:** All women registered with a pregnancy or birth-related ICD-10 diagnosis or procedure between March 1 and	**Medical Condition, n/N (%):** Pre-existing asthma: 21/418 (5.0%) **Control/Comparison group, n/N (%):** No pre-existing asthma: 397/418 (95.0%)	**Medical Condition(s):** *Pre-existing asthma:* Asthma requiring steroid inhalation as registered in the Danish Shared Medication Record **Severity Measure(s):** NR **Clinical marker:** NR **Treatment/ Associated Therapy:** NR **Outcome Definitions:** *Mortality:* NR *ICU admission:* NR *Intubation:* NR *Ventilation:* NR	**Severe COVID-19:** *aOR: Multivariable Logistic Regression; model included age, BMI, parity, and smoking* *Hospitalization, n/N (%):* Asthma: • aOR: 4.53 (95% CI: 1.39-14.79), p=NR • Hospitalized: 4/23 (17.4%) • Not hospitalized: 17/395 (4.3%) **Severity of Condition:** NR **Duration of Condition:** NR **Treatment/ Associated Therapy:** NR

Study	Population and Setting	Intervention	Definitions	Outcomes
infection requiring hospital admission, and to investigate the consequences of infection and severe infection on pregnancy, delivery, and neonatal outcomes when comparing with all non-infected pregnancies during the same time period. **IVA Score:** 24 (Moderate)	October 31, 2020, SARS-CoV-2-positive cases within the study population were identified by linkage to Danish Microbiology Database, Eligible SARS-CoV-2 tests included PCR tests (of pharyngeal swab or tracheal secretion), antigen tests (of nasal swab), or detection of antibodies (IgG or total antibodies in serum) combined with a history of COVID-19 symptoms during pregnancy. **Exclusion criteria:** Duplicate data, no registered department, and not pregnant at time of COVID-19 test		*Hospitalization:* admission to hospital due to COVID-19 symptoms *Non-elective readmissions*: NR **Comments:** None	**Comorbid Conditions:** NR **Risk Markers:** NR **Long-term Sequelae:** NR
Author: Abayomi[38] **Year:** 2021 **Data Extractor:** DOS **Reviewer:** CNS **Study Design:** Cohort **Study Objective:** To assess the hypothesis that hypertension worsens the morbidity and mortality outcomes of confirmed COVID-19 patients. **IVA Score:** 23 (moderate)	**Population:** N=2075 **Setting:** 10 designated isolation and treatment centers and hospitals dedicated solely to the treatment of COVID-19 **Location:** Nigeria **Study dates:** February 27 - July 6, 2020 **Inclusion criteria:** Adult COVID-19 patients ≥18 years of age who were consecutively admitted with RT-PCR results confirming COVID-19. **Exclusion criteria:** NR	**Medical Condition, n/N (%):** Asthma: 42/2075 (2.0%) **Control/Comparison group, n/N (%):** No asthma: 2033/2075 (98.0%)	**Medical Condition(s):** *Asthma:* ND **Severity Measure(s):** NR **Clinical marker:** NR **Treatment/ Associated Therapy:** NR **Outcome Definitions:** *Mortality:* death during study period *ICU admission:* NR *Intubation:* NR *Ventilation:* NR *Hospitalization:* NR *Non-elective readmissions*: NR **Comments:** None	**Severe COVID-19:** *aHR: Adjusted Hazard Ratio; model included age, sex, hypertension, diabetes mellitus, renal disease, HIV/HBV co-infection, asthma, other cardiovascular diseases, and cancer* *HR: Hazard Ratio* *Mortality:* • aHR: 1.75 (95% CI: 0.5-5.7); p=0.354 • HR: 2.06 (95% CI: 0.6-6.5); p=0.218 **Severity of Condition:** NR **Duration of Condition:** NR **Treatment/ Associated Therapy:** NR **Comorbid Conditions:** NR **Risk Markers:** NR **Long-term Sequelae:** NR

Study	Population and Setting	Intervention	Definitions	Outcomes
Author: Adir[67] **Year:** 2021 **Data Extractor:** JKK **Reviewer:** JH **Study Design:** Cohort **Study Objective:** To evaluate the association between biologics or systemic corticosteroid (SCS) use and PCR positivity for SARS-CoV-2 and COVID-19 severity and mortality among asthmatic patients. **IVA Score:** 24 (Moderate)	**Population:** N=80,602; COVID+ n=8,242 **Setting:** Database including data from primary care, community specialty clinics, hospitalizations, laboratories, and pharmacies **Location:** Israel **Study dates:** March 1 – December 7, 2020 **Inclusion criteria:** All adult (≥18 years) asthmatic patients who underwent PCR testing for SARS-CoV-2 obtained from nasopharyngeal swabs during the study dates; patients with a positive PCR test result constituted a case. **Exclusion criteria:** NR	**Medical Condition, n/N (%):** Asthma: 8,242/8,242 (100%) **Control/Comparison group, n/N (%):** No asthma: 0/8,242 (0%)	**Medical Condition(s):** *Asthma*: ICD-9 code 493.xx **Severity Measure(s):** NR **Clinical marker:** NR **Treatment/ Associated Therapy:** *Steroid Use*: in the previous year according to Anatomical Therapeutic Chemical classification codes in pharmacy records *Chronic Steroid Treatment*: ≥6 prescriptions in the previous year according to Anatomical Therapeutic Chemical classification codes in pharmacy records *Biologics Use*: at least 1 prescription filled in the 120 days before PCR test according to Anatomical Therapeutic Chemical classification codes in pharmacy records; biologics included benralizumab, dupilumab, mepolizumab, omalizumab, and reslizumab **Outcome Definitions:** *Mortality:* all-cause mortality during 90-days following PCR test date *ICU admission:* NR *Intubation:* NR *Ventilation:* NR *Hospitalization:* NR *Non-elective readmissions*: NR **Comments:** None	**Severe COVID-19:** *aHR: Adjusted Hazard Ratio including age, sex, ethnicity, diabetes, hypertension, ischemic heart disease, obesity, smoking, and steroids and biologics use* **Severity of Condition:** NR **Duration of Condition:** NR **Treatment/ Associated Therapy:** *Mortality among asthmatics:* Steroids Use (compared to none): • aHR: 1.16 (95% CI: 0.81-1.64), p=0.418 Recent steroids Use ≤120 days (compared to none): • aHR: 1.40 (95% CI: 0.92-2.15), p=0.120 Former steroids Use 120-365 days (compared to none): • aHR: 0.93 (95% CI: 0.57-1.51), p=0.769 Steroids Use 1 Prescription (compared to none): • aHR: 0.91 (95% CI: 0.53-1.56), p=0.733 Steroids Use 2 Prescriptions (compared to none): • aHR: 0.86 (95% CI: 0.42-1.78), p=0.694 Steroids Use ≥3 Prescriptions (compared to none): • aHR: 1.64 (95% CI: 1.05-2.59), p=0.032 Chronic Steroid Treatment (compared to none): • aHR: 2.00 (95% CI: 1.18-3.40), p=0.010 Biologics Use (compared to none): • aHR: 1.04 (95% CI: 0.14-7.59), p=0.969 **Comorbid Conditions:** *Mortality among asthmatics:* Diabetes: • aHR: 1.73 (95% CI: 1.22-2.47), p=0.002 Hypertension: • aHR: 1.44 (95% CI: 0.87-2.37), p=0.154 Obesity: • aHR: 1.12 (95% CI: 0.79-1.59), p=0.514 Ischemic Heart Disease: • aHR: 1.85 (95% CI: 1.31-2.60), p<0.001 **Risk Markers:** *Mortality among asthmatics:* Asthma Age (for each year increase): • aHR: 1.11 (95% CI: 1.09-1.12), p<0.001 Male sex: • aHR: 1.63 (95% CI: 1.14-2.33), p=0.008 Arab ethnicity (compared to Jewish ethnicity):

Study	Population and Setting	Intervention	Definitions	Outcomes
				• aHR: 1.07 (95% CI: 0.71-1.63), p=0.723 Smoking (ever compared to never): • aHR: 0.74 (95% CI: 0.50-1.09), p=0.124 **Long-term Sequelae:** NR
Author: Akhtar[1] **Year:** 2021 **Data Extractor:** MC **Reviewer:** JH/MW **Study Design:** Cohort **Study Objective**: To identify the clinical outcomes and determine the impact of various factors, such as age, sex, and number and types of underlying comorbidities in patients with COVID-19, that can resultantly contribute to adverse clinical outcomes, including COVID-19 severity, requirement of ICU admission, ventilator aid, and mortality. **IVA Score:** 24 (Moderate)	**Population:** N= 1,812 **Setting:** Four major tertiary care hospitals **Location:** Pakistan **Study dates:** February - August 2020 **Inclusion criteria:** Patients admitted to one of four major hospitals in the Rawalpindi-Islamabad region of Pakistan between the study dates with confirmed COVID-19 diagnosis by real-time reverse transcription–polymerase chain reaction (RT-PCR). **Exclusion criteria:** Patients with COVID-19 who had immunological diseases or missing data.	**Medical Condition, n/N (%):** Asthma: 93/1,812 (5.1%) **Control/Comparison group, n/N (%):** No asthma: 1,719/1,812 (94.9%)	**Medical Condition(s):** *Asthma*: ND **Severity Measure(s):** NR **Clinical marker:** NR **Treatment/ Associated Therapy:** NR **Outcome Definitions:** *Mortality:* ND *ICU admission:* ND *Intubation:* NR *Ventilation:* ND *Hospitalization:* NR *Non-elective readmissions*: NR **Comments:** None	**Severe COVID-19:** *aOR: Multivariable Logistic Regression; model included age, sex, number and types of comorbidities except for anemia* *Mortality, n/N (%):* Asthma: • aOR: 2.4 (95% CI: 1.5-4.0), p < 0.001 • Died: 53/469 (11.3%) • Survived: 40/1,343 (3.0%) *ICU Admission, n/N (%):* Asthma: • aOR: 2.4 (95% CI: 1.5-4.0), p < 0.001 • ICU Admission: 51/443 (11.5%) • No ICU Admission: 42/1,369 (3.0%) *Ventilation, n/N (%):* Asthma: • aOR: 2.1 (95% CI: 1.3-3.5), p = 0.003 • Ventilation: 45/390 (11.5%) • No ventilation: 48/1,422 (3.4%) **Severity of Condition:** NR **Duration of Condition:** NR **Treatment/ Associated Therapy:** NR **Comorbid Conditions:** NR **Risk Markers:** NR **Long-term Sequelae:** NR
Author: Antoon[21] **Year:** 2021 **Data Extractor:** DOS **Reviewer:** MW **Study Design:** Cohort	**Population:** N=19,976 **Setting:** 45 tertiary care hospitals affiliated with the Children's Hospital Association **Location:** US	**Medical Condition, n/N (%):** Asthma: n/N = NR **Control/Comparison group, n/N (%):** No asthma: n/N = NR	**Medical Condition(s):** *Asthma:* ICD-10 codes J4521, J4522, J4531, J4532, J4541, J4542, J4551, J4552, J45901, J45902; exclude patients <2 years of age **Severity Measure(s):** NR **Clinical marker:** NR	**Severe COVID-19:** *aOR: Multivariable Logistic Regression; model included race and ethnicity, age, sex, payor, cardiovascular complex chronic conditions, neurologic/neuromuscular complex chronic conditions, obesity/type 2 diabetes mellitus, pulmonary complex chronic conditions, asthma, and immunocompromised complex chronic conditions* *Hospitalization:*

Study	Population and Setting	Intervention	Definitions	Outcomes
Study Objective: To determine the clinical factors associated with severe COVID-19 among children and adolescents in the United States. **IVA Score:** 23 (moderate)	**Study dates:** April 1 - September 30, 2020 **Inclusion criteria:** Patients 30 days to 18 years of age discharged from emergency department or inpatient setting with a primary diagnosis of COVID-19 (ICD-10 codes U.071 and U.072) during study dates. **Exclusion criteria:** Patients with secondary diagnoses of COVID-19, pediatric patients with surgical diagnoses, and neonates who never left the hospital.		**Treatment/ Associated Therapy:** NR **Outcome Definitions:** *Mortality:* NR *ICU admission:* NR *Intubation:* NR *Ventilation:* NR *Hospitalization:* inpatient admission to hospital floor or ICU *Non-elective readmissions*: NR **Comments:** None	Asthma: • aOR: 1.41 (95% CI: 1.26-1.59); p=NR **Severity of Condition:** NR **Duration of Condition:** NR **Treatment/ Associated Therapy:** NR **Comorbid Conditions:** NR **Risk Markers:** NR **Long-term Sequelae:** NR
Author: Aveyard[2] **Year:** 2021 **Data Extractor:** TR **Reviewer:** DOS **Study design:** Retrospective cohort study **Study Objective:** To assess whether chronic lung disease or use of inhaled corticosteroids (ICS) affects the risk of contracting severe COVID-19.	**Population:** N= 8,256,161 **Setting:** 1,205 general practices **Location:** England, UK **Study dates:** January 24, 2020-April 30, 2020 **Inclusion criteria:** All patients aged 20 years and older registered with one of the 1,205 general practices in England contributing to the QResearch database (version 44, uploaded March 23,	**Medical Condition, n/N (%):** Asthma: 1,090,028/8,256,161 (13.2%) **Control/Comparison group, n/N (%):** No Asthma: 7,166,133/8,256,161 (86.8%)	**Medical Condition(s):** *Asthma:* ND **Severity Measure(s):** *Active asthma:* having at least one prescription for asthma medication *Severe asthma:* being prescribed at least three different classes of medication for asthma in the year before cohort entry **Clinical marker:** NR **Treatment/ Associated Therapy:** NR Inhaled corticosteroids (ICS): commonly used treatments for airways disease **Outcome Definitions:** *Mortality:* confirmed or suspected COVID-19 (ICD-10 codes U07.1 and	**Severe COVID-19:** *aHR: Adjusted Hazard Ratio for all other respiratory diseases, ethnicity, socioeconomic status, region of England, body-mass index, smoking status, non-smoking-related illness (hypertension, type 1 diabetes, chronic liver disease, chronic neurological disease) and smoking-related illness (coronary heart disease, stroke, atrial fibrillation, type 2 diabetes, chronic kidney disease)* *HR: Hazard Ratio* *Mortality, n/N (%):* Asthma: • aHR: 0.99 (95% CI: 0.91-1.07) • HR: 0.96 (95% CI: 0.89-1.04) • Asthma: 762/1,090,028 (0.1%) *ICU admission, n/N (%):* Asthma: • aHR: 1.08 (95% CI: 0.93-1.25) • HR: 1.05 (95% CI: 0.91-1.22) • 213/1,090,028 (<0.1%)

Study	Population and Setting	Intervention	Definitions	Outcomes
IVA Score: 24 (moderate)	2020) were included in this population cohort study. Data were linked to Public Health England's database of SARS-CoV-2 testing and English hospital admissions, ICU admissions, and deaths for COVID-19. **Exclusion criteria:** NR		U07.2) on the death certificate, including deaths in and out of hospital *ICU admission: a*dmission to an ICU with severe COVID-19 (ICD-10 code U07.1 or U07.2) in Intensive Care National Audit and Research Centre (ICNARC) records *Intubation:* NR *Ventilation:* NR *Hospitalization:* positive test for SARS-CoV-2 and appearing in the Hospital Episode Statistics dataset as an in-patient within 30 days of that test or having an International Classification of Diseases (ICD)-10 code U07.1 for confirmed COVID-19 or U07.2 for suspected COVID-19 *Non-elective readmissions*: NR **Comments:** None	*Hospitalization, n/N (%):* Asthma: • aHR: 1.18 (95% CI: 1.13-1.24) • HR: 1.22 (95% CI: 1.17-1.28) • Asthma: 2,266/1,090,028 (0.2%) **Severity of Condition:** *Mortality, n/N (%):* Active asthma: • aHR: 1.05 (95% CI: 0.96-1.15) • HR: 1.62 (95% CI: 1.49-1.77) • Active asthma: 602/535,126 (0.1%) Severe asthma: • aHR: 1.08 (95% CI: 0.98-1.19) • HR: 1.78 (95% CI: 1.62-1.95) • Severe asthma: 476/385,702 (0.1%) *ICU admission, n/N (%):* Active asthma: • aHR: 1.34 (95% CI: 1.14-1.58) • HR: 1.73 (95% CI: 1.47-2.03) • Active asthma: 165/535,126 (<0.1%) Severe asthma: • aHR: 1.30 (95% CI: 1.08-1.58) • HR: 1.79 (95% CI: 1.49-2.15) • Severe asthma: 124/385,702 (<0.1%) *Hospitalization, n/N (%):* Active asthma: • aHR: 1.26 (95% CI: 1.20-1.33) • HR: 1.95 (95% CI: 1.85-2.05) • Active asthma: 1,720/535,126 (0.3%) Severe asthma: • aHR: 1.29 (95% CI: 1.22-1.37) • HR: 2.14 (95% CI: 2.02-2.26) • Severe asthma: 1,369/385,702 (0.4%) **Duration of Condition:** NR **Treatment/ Associated Therapy:** *Mortality:* ICS: • aHR: 1.15 (95% CI: 1.01-1.31)

Study	Population and Setting	Intervention	Definitions	Outcomes
				• HR: 2.63 (95% CI: 2.44-2.84) *ICU admission:* ICS: • aHR: 1.63 (95% CI: 1.18-2.24) • HR: 2.10 (95% CI: 1.78-2.46) *Hospitalization:* ICS: • aHR: 1.13 (95% CI: 1.03-1.23) • HR: 2.72 (95% CI: 2.60-2.85) **Comorbid Conditions:** NR **Risk Markers:** *Mortality among asthma patients, n/N (%):* Age: p=0.001 20-39: • HR: 2.11 (95% CI: 1.00-4.42) • Died: 9/459,751 (<0.01%) 40-59: • HR: 1.27 (95% CI: 0.95-1.69) • Died: 54/352,853 (0.02%) 60-79: • HR: 1.09 (95% CI: 0.96-1.24) • Died: 275/218,881 (0.13%) ≥ 80: • HR: 0.85 (95% CI: 0.77-0.95) • Died: 424/58,543 (0.72%) Sex: p=0.628 Women: • HR: 0.97 (95% CI: 0.86-1.08) • Died: 362/571,497 (0.06%) Men: • HR: 1.01 (95% CI: 0.90-1.12) • Died: 400/518,531 (0.08%) Ethnic group: p=0.448 White: • HR: 0.96 (95% CI: 0.87-1.05) • Died: 514/84,083 (0.61%) Asian: • HR: 1.00 (95% CI: 0.78-1.27) • Died: 80/68,014 (0.12%) Black:

Study	Population and Setting	Intervention	Definitions	Outcomes
				• HR: 0.97 (95% CI: 0.72-1.32) • Died: 48/2,835 (1.69%) Chinese: • HR: 0.95 (95% CI: 0.22-4.03) • Died: <5/3,503 (0.14%) Other or not recorded: • HR: 1.14 (95% CI: 0.94-1.38) • Died: 118/206,076 (0.06%) Smoking status: p=0.396 Non-smoker: • HR: 0.99 (95% CI: 0.89-1.10) • Died: 374/624,797 (0.06%) Ex-smoker: • HR: 0.99 (95% CI: 0.88-1.11) • Died: 341/257,566 (0.13%) Current smoker: • HR: 0.91 (95% CI: 0.65-1.26) • Died: 40/193,373 (0.02%) *ICU admission among asthma patients, n/N (%):* Age: p=0.015 20-39: • HR: 2.16 (95% CI: 1.40-3.33) • ICU admission: 28/459,751 (0.01%) 40-59: • HR: 1.03 (95% CI: 0.81-1.30) • ICU admission: 78/352,853 (0.02%) 60-79: • HR: 1.03 (95% CI: 0.83-1.27) • ICU admission: 103/218,881 (0.05%) ≥ 80: • HR: 0.61 (95% CI: 0.22-1.69) • ICU admission: <5/58,543 (0.01%) Sex: p=0.021 Women: • HR: 1.36 (95% CI: 1.07-1.74) • ICU admission: 84/571,497 (0.01%) Men: • HR: 0.95 (95% CI: 0.79-1.15) • ICU admission: 129/518,531 (0.02%) Ethnic group: p=0.230 White: • HR: 1.18 (95% CI: 0.97-1.43)

Study	Population and Setting	Intervention	Definitions	Outcomes
				• ICU admission: 124/784,083 (0.02%) Asian: • HR: 0.94 (95% CI: 0.65-1.34) • ICU admission: 34/68,014 (0.05%) Black: • HR: 1.33 (95% CI: 0.88-2.02) • ICU admission: 26/28,352 (0.09%) Chinese: • HR: 0.99 (95% CI: 0.13-7.56) • ICU admission: <5/3,503 (0.14%) Other or not recorded: • HR: 0.77 (95% CI: 0.52-1.13) • ICU admission: 28/206,076 (0.01%) Smoking status: p=0.725 Non-smoker: • HR: 1.06 (95% CI: 0.88-1.28) • ICU admission: 124/624,797 (0.02%) Ex-smoker: • HR: 1.14 (95% CI: 0.90-1.45) • ICU admission: 81/257,566 (0.03%) Current smoker: • HR: 0.79 (95% CI: 0.36-1.73) • ICU admission: 7/193,373 (<0.01%) *Hospitalization among asthma patients, n/N (%):* Age: p<0.0001 20-39: • HR: 1.59 (95% CI: 1.37-1.86) • Hospitalized: 206/459,751 (0.04%) 40-59: • HR: 1.43 (95% CI: 1.29-1.57) • Hospitalized: 507/352,853 (0.14%) 60-79: • HR: 1.19 (95% CI: 1.10-1.28) • Hospitalized: 847/218,881 (0.39%) ≥ 80: • HR: 0.93 (95% CI: 0.86-1.00) • Hospitalized: 706/58,543 (1.21%) Sex: p=0.0001 Women: • HR: 1.29 (95% CI: 1.21-1.37) • Hospitalized: 1,238/571,497 (0.22%) Men:

Study	Population and Setting	Intervention	Definitions	Outcomes
				• HR: 1.08 (95% CI: 1.01-1.15) • Hospitalized: 1,028/518,531 (0.20%) Ethnic group: p=0.868 White: • HR: 1.20 (95% CI: 1.14-1.27) • Hospitalized: 1,539/784,083 (0.20%) Asian: • HR: 1.16 (95% CI: 1.01-1.33) • Hospitalized: 252/68,014 (0.37%) Black: • HR: 1.10 (95% CI: 0.93-1.31) • Hospitalized: 149/28,352 (0.53%) Chinese: • HR: 1.07 (95% CI: 0.43-2.67) • Hospitalized: 5/3,503 (0.14%) Other or not recorded: • HR: 1.15 (95% CI: 1.02-1.29) • Hospitalized: 321/206,076 (0.16%) Smoking status: p=0.286 Non-smoker: • HR: 1.18 (95% CI: 1.11-1.25) • Hospitalized: 1,205/624,797 (0.19%) Ex-smoker: • HR: 1.16 (95% CI: 1.07-1.25) • Hospitalized: 868/257,566 (0.34%) Current smoker: • HR: 1.32 (95% CI: 1.12-1.55) • Hospitalized: 182/193,373 (0.09%) **Long-term Sequelae:** NR
Author: Beatty[3] **Year:** 2021 **Data Extractor:** JKK **Reviewer:** CNS **Study Design:** Cohort **Study Objective:** To characterize the epidemiology of COVID-19 hospitalized patients in wave 1 of the COVID-19 pandemic in Ireland	**Population:** N=4,086 **Setting:** All public acute hospitals **Location:** Ireland **Study dates:** February 29 – July 31, 2020 **Inclusion criteria:** Hospital Inpatient Enquiry (HIPE) record national dataset, including COVID-19	**Medical Condition, n/N (%):** Asthma: 132/4,086 (3.2%) **Control/Comparison group, n/N (%):** No Asthma: 3,954/4,086 (96.8%)	**Medical Condition(s):** Asthma: ICD-10 codes J44 and J45 **Severity Measure(s):** NR **Clinical marker:** NR **Treatment/ Associated Therapy:** NR **Outcome Definitions:** *Mortality:* in hospital mortality *ICU admission:* ND *Intubation:* NR *Ventilation:* NR *Hospitalization:* NR	**Severe COVID-19:** *aOR: Multivariable Logistic Regression; adjusted for age group, sex, and comorbidities* *Mortality, n/N (%):* Asthma • aOR: 1.0 (95% CI: 0.48-2.14), p=not significant *ICU Admission, n/N (%):* Asthma • aOR: 1.3 (95% CI: 0.79-2.11), p=not significant **Severity of Condition:** NR **Duration of Condition:** NR

Study	Population and Setting	Intervention	Definitions	Outcomes
and identify factors independently associated with adverse outcomes, specifically long length of stay, ICU admission and in hospital mortality. **IVA Score:** Asthma: 24 (moderate) COPD: 23 (moderate)	discharge episodes admitted during the study dates; COVID-19-related discharge were defined by the presence of ICD-10-AM codes U07.1, B34.2, or B97.2. **Exclusion criteria:** Records with admission dates prior to the date of Ireland's first confirmed case of COVID-19 (February 29, 2020) and records with an admission date between July 31 and August 10, 2020.		*Non-elective readmissions:* NR **Comments:** None	**Treatment/ Associated Therapy:** NR **Comorbid Conditions:** NR **Risk Markers:** NR **Long-term Sequelae:** NR
Author: Beken[68] **Year:** 2021 **Data Extractor:** DOS **Reviewer:** MW **Study design:** Case-control **Study Objective:** To investigate the frequency of allergic diseases in pediatric patients with COVID-19 on the basis of clinical and laboratory evaluation and evaluated whether allergic diseases are a risk factor for hospitalization. **IVA Score:** 20 (moderate)	**Population:** N=107 **Setting:** Tertiary reference hospital with COVID-19 outpatient clinic in emergency department where all suspected cases are evaluated **Location:** Turkey **Study dates:** March 15 - May 31, 2020 **Inclusion criteria:** Children aged 0-18 years old admitted to the COVID-19 clinic with a positive PCR test for SARS-CoV-2 or hospitalized for COVID-19 with a positive PCR test for	**Medical Condition, n/N (%):** Asthma: 7/107 (6.5%) **Control/Comparison group, n/N (%):** No asthma: 100/107 (93.5%)	**Medical Condition(s):** *Asthma:* physician-diagnosis based on respiratory symptoms typical of asthma plus documentation of variable airflow limitation by pulmonary function tests (PFTs) (FEV<80%), FEV1FVC<80%, and >12% reversibility of FEV1) for children older than 5 years and based on the modified asthma predictive index for children 5 years old and younger; patients were evaluated in pediatric allergy immunology and pediatric pulmonology departments 1 to 4 months after discharge or having a negative PCR test for SARS-CoV-2 **Severity Measure(s):** NR **Clinical marker:** NR **Treatment/ Associated Therapy:** NR **Outcome Definitions:** *Mortality:* NR *ICU admission:* NR	**Severe COVID-19:** **Odds ratio [OR] (95% CI) calculated by ERT; n/N (%)* *Hospitalization, n/N (%):* Asthma: • *OR: 0.54 (95% CI: 0.12-2.56) • Hospitalized: 3/61 (4.9%) • Not hospitalized: 4/46 (8.7%) • p=0.46 **Severity of Condition:** NR **Duration of Condition:** NR **Treatment/ Associated Therapy:** NR **Comorbid Conditions:** NR **Risk Markers:** *aOR: Adjusted odds ratio; multivariable logistic regression model; model included asthma with or without allergic rhinitis, atopic dermatitis, pet at home, and passive tobacco exposure* Age, median months (IQR): • Hospitalized: 102 (26.5-190)

Study	Population and Setting	Intervention	Definitions	Outcomes
	SARS-CoV-2, or those hospitalized for COVID-19 with a negative PCR test for SARS-CoV-2, a chest CT scan compatible with COVID-19 (i.e., bilateral distribution of ground-glass opacities with or without consolidation in posterior and peripheral lungs; multifocal, patchy, or segmental consolidation distributed in subpleural areas or along with bronchovascular bundles; and a reticular pattern with interlobular septal thickening, crazy paving pattern, and air bronchogram), and direct contact with people with SARS-CoV-2 confirmed by PCR testing. **Exclusion criteria:** NR		*Intubation:* NR *Ventilation:* NR *Hospitalization:* determined according to the American Academy of Pediatrics as follows: 1) hypoxemia (peripheral capillary oxygen saturation of <92%), 2) infant less than 3 to 6 months of age; 3) tachypnea; 4) respiratory distress; 5) signs of dehydration or reduced oral intake; 6) capillary refill of more than 2 seconds; 7) toxic appearance; 8) underlying comorbidities; 9) complications; 10) failure of outpatient therapy *Non-elective readmissions*: NR **Comments:** None	• Not hospitalized: 103.5 (39.8-170.3) • p=0.84 Sex, male, n/N (%): • Hospitalized: 35/61 (57.4%) • Not hospitalized: 23/46 (50%) • p=0.45 Passive tobacco exposure, n/N (%): • aOR: 1.596 (95% CI: 0.654-3.892), p=0.30 • Hospitalized: 22/61 (36.1%) • Not hospitalized: 12/46 (26.1%) • p=0.27 **Long-term Sequelae:** NR
Author: Beltramo[4] **Year:** 2021 **Data Extractor:** MC **Reviewer:** DOS	**Population:** N= 89,530 COVID-19 patients **Setting:** Public and private hospitals **Location:** France	**Medical Condition, n/N (%):** Asthma: 3,273/89,530 (3.66%) **Control/Comparison group, n/N (%):** No CRD: 75,179/89,530 (84.0%)	**Medical Condition(s):** *Asthma*: ICD-10 J45, J46 **Severity Measure(s):** NR **Clinical marker:** NR	**Severe COVID-19:** *aOR: Adjusted odds ratio; adjusted for obesity, diabetes, hypertension, heart failure, atherosclerotic heart disease, sex, and age as a continuous variable* *OR: Odds ratio* *Mortality, n/N (%):* Asthma:

Study	Population and Setting	Intervention	Definitions	Outcomes
Study design: Retrospective cohort **Study Objective:** To describe and compare chronic respiratory diseases (CRD) in hospitalized patients suffering from COVID-19 or influenza (2018-2019 season), and to describe and compare respiratory complications for COVID-19 patients with CRD to COVID-19 patients without CRD and to influenza patients. **IVA Score:** 24 (moderate)	**Study dates:** COVID-19 cohort: March 1 - April 30, 2020 **Inclusion criteria:** For the COVID-19 cohort, all patients hospitalized for COVID-19 during the study dates were included and identified by the primary, related or associated diagnoses by the ICD-10 codes U0710, U0711, U0712, U0714 or U0715, regardless of their age. Data obtained from the national Programme de Medicalisation des Systemes d'Information (PMSI) database. **Exclusion criteria:** NR		**Treatment/ Associated Therapy, n/N (%):** NR **Outcome Definitions:** *Mortality:* in-hospital mortality during hospitalization *ICU admission:* ND *Intubation:* NR *Ventilation:* NR *Hospitalization:* NR *Non-elective readmissions*: NR **Comments:** none	• aOR: 0.82 (95% CI: 0.71-0.94) • OR: 0.51 (95% CI: 0.45-0.58) • Asthma: 266/2973 (9.0%) • No CRD: 11222/75179 (14.93%) • p<0.05 *ICU admission, n/N (%):* Asthma: • aOR: 1.23 (95% CI: 1.12-1.36) • OR: 1.35 (95% CI: 1.23-1.48) • Asthma: 570/2973 (19.2%) • No CRD: 12119/75179 (16.12%) • p<0.05 **Severity of Condition:** NR **Duration of Condition:** NR **Treatment/ Associated Therapy:** NR **Comorbid Conditions:** NR **Risk Markers:** NR **Long-term Sequelae:** NR
Author: Bergman[5] **Year:** 2021 **Data Extractor:** DOS **Reviewer**: CS **Study design:** Case-control **Study Objective:** To investigate the	**Population:** N=502,656 **Setting:** Nationwide registries **Location:** Sweden **Study dates:** Up to mid-September 2020	**Medical Condition, n/N (%):** Asthma: 4,493/68,575 (6.6%) **Control/Comparison group, n/N (%):** Asthma: 27,746/434,081 (6.4%)	**Medical Condition(s):** *Asthma:* ICD9/10 J45, J46, 493 **Severity Measure(s):** NR **Clinical marker:** NR **Treatment/ Associated Therapy:** *Corticosteroids, systemic:* ND *Immunosuppressants:* ND **Outcome Definitions:**	**Severe COVID-19:** *aHR: Adjusted hazard ratio; cox regression; model included demographic variables, comorbidities, and prescription medications: Adjusted hazard ratio; cox regression; model included demographic variables, comorbidities, and prescription medications* *HR: Unadjusted hazard ratio* *aOR: Adjusted odds ratio; multinomial logistic regression; model included demographic variables, comorbidities, and prescription medications: Adjusted odds ratio; multinomial logistic regression; model included demographic variables, comorbidities, and prescription medications*

Study	Population and Setting	Intervention	Definitions	Outcomes
importance of potential medical and demographic risk factors for COVID-19 diagnosis, hospitalization (with or without ICU admission), and subsequent all-cause mortality during the first wave of COVID-19. **IVA Score:** 26 (low)	**Inclusion criteria:** All cases of COVID-19 confirmed in Sweden until mid-September 2020. Reporting confirmed cases is required by law. Control population comprised of random sample of 5 non-diagnosed individuals for each COVID-19 case. Each control was residing in Sweden on January 1, 2020 and was alive on January 31, 2020. **Exclusion criteria:** Persons were excluded from models if they had missing data on at least one of the included variables.		*Mortality:* All-cause mortality until October 1, 2020 *ICU admission:* ICU hospitalization for confirmed COVID-19 (ICD-10 U071) *Intubation:* NR *Ventilation:* NR *Hospitalization:* non-ICU hospitalization with confirmed COVID-19 (ICD-10 U071) *Non-elective readmissions*: NR **Comments:** None	*OR: Unadjusted odds ratio; univariable logistic regression* *Mortality:* Asthma: • aHR: 0.85 (95% CI: 0.78-0.93) • HR: 1.22 (95% CI: 1.12-1.33) *ICU admission, n/N (%):* Asthma: • aOR: 1.53 (95% CI: 1.30-1.79) • OR: 1.35 (95% CI: 1.17-1.56) • ICU admission: 211/2494 (8.5%) *Hospitalization, n/N (%):* Asthma: • aOR: 1.22 (95% CI: 1.13-1.31) • OR: 1.43 (95% CI: 1.35-1.52) • Hospitalized: 1,419/16,083 (8.8%) **Severity of Condition:** NR **Duration of Condition:** NR **Treatment/ Associated Therapy:** NR **Comorbid Conditions:** NR **Risk Markers:** NR **Long-term Sequelae:** NR
Author: Bloom[39] **Year:** 2021 **Data Extractor:** JKK **Reviewer:** DOS **Study design:** Prospective cohort study	**Population:** N=75,463 patients **Setting:** 258 health-care facilities **Location:** England, Scotland, and Wales **Study dates:** January 17-August 3, 2020	**Medical Condition, n/N (%):** Asthma: 7,859/75,463 (10.4%) Asthma and COPD: 2,701/75,463 (3.6%) **Control/Comparison group, n/N (%):** No Respiratory Condition: 55,267/75,463 (73.2%)	**Medical Condition(s):** *Asthma*: "asthma" indicated on case report form or (for patients age <50 years) patients without COPD who were taking inhaled asthma medication within 2 weeks of admission *COPD*: "chronic pulmonary disease (no asthma)" entered on case report form **Severity Measure(s):** NR	**Severe COVID-19:** *aHR: Adjusted Hazard Ratio (95% CI)* **Severity of Condition:** NR **Duration of Condition:** NR **Treatment/ Associated Therapy:** *Mortality among rt-PCR confirmed COVID-19+ patients:* Asthma, 16-49 years: • No asthma: Ref

Study	Population and Setting	Intervention	Definitions	Outcomes
Study Objective: To characterize people with COVID-19 admitted to hospital with underlying respiratory disease, assess the level of care received, measure in-hospital mortality, and examine the effect of inhaled corticosteroid use. **IVA Score:** 24 (moderate)	**Inclusion criteria:** All patients admitted to hospital between January 17 – August 3, 2020 that were either COVID-19 positive or highly suspected but unproven cases of COVID-19 were eligible. SARS-CoV-2 was confirmed via RT-PCR. **Exclusion criteria:** Patients without data available on comorbidities or admitted to hospital after August 3, 2020.		*Severe Asthma*: prescribed an inhaled corticosteroid plus LABA plus another maintenance asthma medication **Clinical marker:** NR **Treatment/ Associated Therapy:** *ICS*: inhaled corticosteroid *LABA*: long-acting beta-agonists *SABA*: short-acting beta-agonists **Outcome Definitions:** *Mortality*: ND *ICU admission:* NR *Intubation:* NR *Ventilation:* NR *Hospitalization:* NR *Non-elective readmissions*: NR **Comments:** Patient follow-up ended on August 17, 2020. Data were presented for COVID-19 positive via signs and symptoms and lab-confirmed but only data on lab-confirmed patients was extracted.	• No asthma therapy, aHR: 1.21 (95% CI: 0.75−1.95), p=0.435 • SABA, aHR: 1.01 (95% CI: 0.62−1.65), p=0.964 • ICS, aHR: 0.99 (95% CI: 0.65−1.49), p=0.956 • ICS+LABA, aHR: 1.03 (95% CI: 0.68−1.55), p=0.898 • Severe asthma: aHR: 2.08 (95% CI: 1.32−3.26), p=0.002 Asthma, ≥50 years: • No respiratory disease, no inhaled steroids: Ref • No inhaled steroids, aHR: 0.97 (95% CI: 0.90−1.05), p=0.455 • ICS, aHR: 0.88 (95% CI: 0.82−0.94), p<0.001 **Comorbid Conditions:** NR **Risk Markers:** *Mortality among rt-PCR confirmed COVID-19+ patients:* Age, 16-25 years: ref • 25-40 years, aHR: 1.95 (95% CI: 1.14−3.34), p=0.014 • 40-50 years, aHR: 3.67 (95% CI: 2.18−6.17), p<0.001 Age, 50-70 years: ref • 70-80 years, aHR: 1.93 (95% CI: 1.85−2.01), p<0.001 • ≥80 years, aHR: 2.63 (95% CI: 2.53−2.74), p<0.001 Sex, male: ref Sex, female: • 16-49 years, aHR: 0.69 (95% CI: 0.58−0.83), p<0.001 • ≥50 years, aHR: 0.78 (95% CI: 0.76−0.80), p<0.001 Race, White: ref Race, Asian: • 16-49 years, aHR: 0.88 (95% CI: 0.66−1.17), p=0.366 • ≥50 years, aHR: 1.28 (95% CI: 1.19−1.37), p<0.001 Race, Black: • 16-49 years, aHR: 0.76 (95% CI: 0.51−1.13), p=0.166 • ≥50 years, aHR: 1.14 (95% CI: 1.05−1.24), p=0.003 Race, Other: • 16-49 years, aHR: 0.94 (95% CI: 0.73−1.21), p=0.616 • ≥50 years, aHR: 1.08 (95% CI: 1.01−1.15), p=0.018 Smoking status, current: ref Smoking status, never: • 16-49 years, aHR: 1.03 (95% CI: 0.78−1.35), p=0.825 • ≥50 years, aHR: 0.98 (95% CI: 0.92−1.06), p=0.662

Study	Population and Setting	Intervention	Definitions	Outcomes
				Smoking status, former: • 16-49 years, aHR: 0.83 (95% CI: 0.57−1.20), p=0.321 • ≥50 years, aHR: 1.03 (95% CI: 0.96−1.10), p=0.453 IMD Quintile, 1: ref IMD Quintile, 2: • 16-49 years, aHR: 1.34 (95% CI: 0.94−1.91), p=0.109 • ≥50 years, aHR: 1.04 (95% CI: 1.00−1.09), p=0.053 IMD Quintile, 3: • 16-49 years, aHR: 1.34 (95% CI: 0.94−1.90), p=0.106 • ≥50 years, aHR: 1.03 (95% CI: 0.98−1.07), p=0.208 IMD Quintile, 4: • 16-49 years, aHR: 1.58 (95% CI: 1.14−2.19), p=0.007 • ≥50 years, aHR: 1.03 (95% CI: 0.99−1.08), p=0.164 IMD Quintile, 5: • 16-49 years, aHR: 1.66 (95% CI: 1.22−2.28), p=0.002 • ≥50 years, aHR: 1.05 (95% CI: 1.01−1.10), p=0.012 **Long-term Sequelae:** NR
Author: Bloom[62] **Year:** 2022 **Data Extractor:** MC **Reviewer:** DOS/MW **Study Design:** Cohort **Study Objective**: To determine the effect of asthma phenotype on three levels of COVID-19 outcomes, and to compare hospitalization rates to influenza and pneumonia. **IVA Score:** 24 (Moderate)	**Population:** N=1,182,675 COVID-19+, N= 14,838 **Setting:** Primary care and hospitals **Location**: England, UK **Study dates:** February 1 - June 26, 2020 **Inclusion criteria:** Adults ≥18 years old in Clinical Practice Research Datalink dataset that were alive on February 1, 2020, with at least 1 year of baseline data, and Hospital Episode Statistics data- Public Health England databases- Office of National Statistics linked data. Asthma cohort included patients with asthma	**Medical Condition, n/N (%):** Asthma: 8,056/14,838 (54.3%) **Control/Comparison group, n/N (%):** General population: 6,782/14,838 (45.7%)	**Medical Condition(s):** *Asthma*: at least one prescription for a relevant medication (inhaler or oral asthma medication) in the year before the start of the study **Severity Measure(s):** *1 GP exacerbation:* 1 GP-managed exacerbation for asthma in past 5 years defined as a prescription of a short course of oral corticosteroids *>1 GP or hospital exacerbation:* >1 GP-managed or ≥1 hospital admission for asthma in the past 5 years **Clinical marker:** NR **Treatment/ Associated Therapy:** *SABA only*: short-acting beta agonist (SABA) use alone during baseline year *Intermittent inhaled corticosteroid (ICS):* 1-3 prescriptions during baseline year *Regular ICS*: ≥4 prescriptions during baseline year *Intermittent ICS + add-on*: Intermittent ICS plus an additional asthma maintenance medication such as inhaled long-acting β-agonist, oral leukotriene receptor antagonist, or oral theophylline	**Severe COVID-19:** *aHR: Multivariable Cox's proportional hazard models, stratified by matched set (matched on age, sex, and GP practice); models adjusted for ethnicity, socioeconomic status, obesity, cardiac disease, diabetes, cerebrovascular accident, dementia, cancer, chronic renal failure, atopy, respiratory disease severity, and asthma exacerbation history* *HR: Hazard ratio* *Hospitalization, rate per 100,000 [n/N (%)]:* • Asthma: 19.33 [990/8,056 (12.3%)] • No asthma: 11.08 [979/6,782 (14.4%)] • p=NR **Severity of Condition:** NR *Hospitalization, n/N (%):* 1 GP exacerbation vs. 0 GP exacerbations: • aHR: 1.43 (95% CI: 1.29-1.58), p<0.001 • HR: 2.65 (95% CI: 2.42-2.89), p<0.001 >1 GP or hospital exacerbation vs. 0 GP exacerbations: • aHR: 1.76 (95% CI: 1.57-1.97), p<0.001 • HR: 3.51 (95% CI 1.57-1.97), p<0.001 **Duration of Condition:** NR **Treatment/ Associated Therapy:** *Hospitalization, n/N (%):* SABA only:

Study	Population and Setting	Intervention	Definitions	Outcomes
	code within 3 years and ≥1 asthma medication in baseline year and no COPD. Each asthma patient was matched to at least one (maximum three) unexposed patient from general population on year of birth, sex, and general practice (GP), and no COPD. COVID-19 was determined by GP diagnosis and included suspected or confirmed COVID-19. **Exclusion criteria:** Patients under the age of 18 years, no data linkage, <1-year baseline data, or if they did not meet any cohort criteria. Patients in asthma matched cohort with COPD co-diagnosis.		*Regular ICS + add-on*: Regular ICS plus an additional asthma maintenance medication such as inhaled long-acting β-agonist, oral leukotriene receptor antagonist, or oral theophylline **Outcome Definitions:** *Mortality:* NR *ICU admission:* NR *Intubation:* NR *Ventilation:* NR *Hospitalization:* hospitalization for COVID-19 ICD-10: U07.1 or U07.2, HES and CHESS *Non-elective readmissions*: NR **Comments:** None	• aHR: 0.94 (95% CI: 0.75-1.17), p=0.56 • HR: 1.15 (95% CI: 0.94-1.42), p=0.18 Intermittent ICS: • aHR: 0.90 (95% CI: 0.67-1.21), p=0.49 • HR: 1.06 (95% CI: 0.81-1.40), p=0.67 Regular ICS: • aHR: 1.27 (95% CI: 1.01-1.61), p<0.05 • HR: 1.52 (95% CI: 1.23-1.89), p<0.001 Intermittent ICS + add-on: • aHR: 2.00 (95% CI: 1.43-2.79), p<0.001 • HR: 2.47 (95% CI: 1.82-3.35), p<0.001 Regular ICS + add-on: • aHR: 1.63 (95% CI: 1.37-1.94), p<0.001 • HR: 2.17 (95% CI: 1.89-2.50), p<0.001 **Comorbid Conditions:** NR **Risk Markers:** NR **Long-term Sequelae:** NR
Author: Calmes[6] **Year:** 2021 **Data Extractor:** MW **Reviewer:** JH/CNS **Study Design:** Cohort **Study Objective:** To determine if patients with asthma or chronic obstructive pulmonary disease (COPD) are at risk of experiencing an ICU admission and death as compared with nonobstructive patients. **IVA Score:** COPD: 24 (Moderate)	**Population:** N=596 **Setting:** University hospital **Location:** Belgium **Study dates:** March 18 – April 17, 2020 **Inclusion criteria:** Adult patients who were hospitalized between the study dates for COVID-19 which was confirmed by nasopharyngeal swab RT-PCR test, who had asthma, COPD, or no obstruction present before COVID-19 diagnosis.	**Medical Condition, n/N (%):** Asthma: 57/596 (9.6%) **Control/Comparison group, n/N (%):** No history of obstructive pulmonary disease: 493/596 (82.7%)	**Medical Condition(s):** *Asthma:* Diagnosis was done by a pulmonologist according to lung function tests, bronchodilation test, and methacholine concentration provoking a 20% fall in FEV1 if necessary **Severity Measure(s):** NR **Clinical marker:** NR **Treatment/ Associated Therapy:** NR **Outcome Definitions:** *Mortality:* amongst hospitalized patients *ICU admission:* amongst hospitalized patients *Intubation:* NR *Ventilation:* NR *Hospitalization:* NR *Non-elective readmissions*: NR	**Severe COVID-19:** *aOR1: Multivariable Logistic Regression (model included: age, sex, asthma, COPD, cardiopathy, and immunosuppressive disease)* *aOR2: Multivariable Logistic Regression (model included: age, sex, asthma, COPD, obesity)* *aOR3: Multivariable Logistic Regression (model included: age and sex)* *OR: Univariable (Univariate) Logistic Regression* *Mortality, n/N (%):* Asthma: • aOR1: 0.74 (95% CI: 0.24-2.3), p=0.59 • aOR3: 0.59 (95% CI: 0.20-1.8), p=0.35 • OR: 0.41 (95% CI: 0.15-1.2), p=0.098 • Asthma: 4/57 (7.0%) • No obstruction: 67/493 (13.6%) *ICU admission, n/N (%)* Asthma: • aOR2: 1.4 (95% CI: 0.64-3.2), p=0.39 • aOR3: 1.4 (95% CI: 0.69-3.0), p=0.33 • OR: 1.3 (95% CI: 0.61-2.6), p=0.53

Study	Population and Setting	Intervention	Definitions	Outcomes
Asthma: 24 (Moderate)	**Exclusion criteria:** NR		**Comments:** None	• Asthma: 10/57 (17.5%) • No obstruction: 69/493 (14.0%) **Severity of Condition:** NR **Duration of Condition:** NR **Treatment/ Associated Therapy:** NR **Comorbid Conditions:** NR **Risk Markers:** NR **Long-term Sequelae:** NR
Author: Cao[7] **Year:** 2021 **Data Extractor:** CS **Reviewer:** MW **Study design:** Cohort study **Study Objective:** To perform a study to assess the impact of asthma on COVID-19 diagnosis, presenting symptoms, disease severity, and cytokine profiles. **IVA Score:** 23 (moderate)	**Population:** N=435 COVID-19 positive: n=343 COVID-19 negative: n=92 **Setting:** 2 tertiary medical centers within a healthcare system **Location:** Missouri, USA **Study dates:** March-September 2020 **Inclusion criteria:** Adult patients ≥18 years old who presented with symptoms consistent with COVID-19 at 2 medical centers for whom a health care provider requested SARS-CoV-2 testing were included. **Exclusion criteria:** NR	**Medical Condition, n/N (%):** Asthma & COVID-19 +: 72/343 (21.0%) **Control/Comparison group, n/N (%):** No asthma & COVID-19 +: 271/343 (79.0%)	**Medical Condition(s):** *Asthma:* patients were defined as having a preexisting diagnosis of asthma if their health records contained an International Classification of Diseases, Tenth Revision code beginning with J45; Symptoms were self-reported through participant interviews and additional medical data were retrieved from medical records **Severity Measure(s):** NR **Clinical marker:** NR **Treatment/ Associated Therapy:** NR **Outcome Definitions:** *Mortality:* due to COVID-19 or in-hospital mortality *ICU admission:* ND *Intubation:* NR *Ventilation:* mechanical *Hospitalization:* ND *Non-elective readmissions*: NR **Comments:** None	**Severe COVID-19:** *aOR: Multivariable Logistic Regression adjusting for age, sex, race (Black, not Black), COPD, and obesity: Multivariable Logistic Regression adjusting for age, sex, race (Black, not Black), COPD, and obesity* *Mortality due to COVID-19:* • aOR: 0.73 (95% CI: 0.30-1.64), p=0.46 *In-hospital mortality:* • aOR: 0.72 (95% CI: 0.31-1.57), p=0.42 *ICU admission:* • aOR: 0.59 (95% CI: 0.31-1.08), p=0.01 *Mechanical ventilation:* • aOR: 1.10 (95% CI: 0.56-2.12), p=0.77: *Hospitalization:* • aOR: 1 (95% CI: 0.34-3.28), p>0.99: **Severity of Condition:** NR **Duration of Condition:** NR **Treatment/ Associated Therapy:** NR **Comorbid Conditions:** NR **Risk Markers:** NR **Long-term Sequelae:** NR

Study	Population and Setting	Intervention	Definitions	Outcomes
Author: Castilla[8] **Year:** 2021 **Data Extractor:** MW **Reviewer:** DOS **Study Design:** Cohort **Study Objective:** To evaluate sociodemographic characteristics, chronic conditions and health-related variables as independent risk factors for confirmed infection, hospitalization, intensive care unit admission, and death from SARS-CoV-2 in the second epidemic surge. **IVA Score:** COPD: 23 (Moderate) Asthma: 24 (Moderate)	**Population:** N = 643,757 COVID-19+ = 35,387 **Setting:** Community **Location:** Spain **Study dates:** July – December 2020 **Inclusion criteria:** People covered by the Navarre Health Service at least from July 2019, as well as children born in Navarre after this date. Confirmed COVID-19 cases were defined as patients who tested positive for SARS-CoV-2 by real-time RT-PCR or antigen test in a respiratory tract sample. **Exclusion criteria:** People who had been confirmed for SARS-CoV-2 infection before July 2020, not covered by the health service, and were residing in the region <12 months.	**Medical Condition, n/N (%):** Asthma: 2,330/35,387 (6.6%) **Control/Comparison group, n/N (%):** No Asthma: 33,057/35,387 (93.4%)	**Medical Condition(s):** *Asthma:* ND **Severity Measure(s):** NR **Clinical marker:** NR **Treatment/ Associated Therapy:** NR **Outcome Definitions:** *Mortality:* Deaths from SARS-CoV-2 infection during follow-up period of 30 days after infection diagnosis *ICU admission:* ND *Intubation:* NR *Ventilation:* NR *Hospitalization:* Hospitalizations from SARS-CoV-2 infection during follow-up period of 30 days after diagnosis *Non-elective readmissions*: NR **Comments:** None	**Severe COVID-19:** *aRR1: Fully adjusted Relative Risk (model included sex, age, nursing home resident, healthcare worker, place of birth, place of residence, income level, smoking status, hospitalization in prior year, and comorbid conditions)* *aRR2: Relative Risk adjusted for age and sex* *Mortality, n/N (%):* *Asthma:* • aRR1: 1.03 (95%CI: 0.70–1.51); p=0.886 • aRR2: 1.05 (95%CI: 0.72–1.54); p=0.796 • Asthma: 28/2330 (1.2%) • No asthma: 438/33,057 (1.3%) *ICU admission, n/N (%):* *Asthma:* • aRR1: 1.84 (95%CI: 1.19–2.83); p=0.006 • aRR2: 1.94 (95%CI: 1.26–2.99); p=0.003 • Asthma: 23/2330 (0.99%) • No asthma: 223/33,057 (0.67%) *Hospitalization, n/N (%):* *Asthma:* • aRR1: 1.27 (95%CI: 1.07–1.50); p=0.006 • aRR2: 1.29 (95%CI: 1.09–1.53); p=0.003 • Asthma: 147/2330 (6.3%) • No asthma: 1,933/33,057 (5.8%) **Severity of Condition:** NR **Duration of Condition:** NR **Treatment/ Associated Therapy:** NR **Comorbid Conditions:** NR **Risk Markers:** NR **Long-term Sequelae:** NR
Author: Choi[9] **Year:** 2021 **Data Extractor:** MC **Reviewer:** JH	**Population:** N= 7,590 **Setting:** Hospitals **Location**: Korea **Study dates:** January 17 - August 3, 2020	**Medical Condition, n/N (%):** Asthma: 218/7,590 (2.9%) **Control/Comparison group, n/N (%):** No asthma: 7,372/7,590 (96.5%)	**Medical Condition(s):** *Asthma:* Patients who met the following criteria: ICD-10 code J45 and J46 as primary diagnosis or first sub-diagnosis and prescription of asthma medications on at least two occasions during outpatient visits or prescription of asthma medication following an outpatient visit at least once	**Severe COVID-19:** *aOR: Multivariate Logistic Regression (adjusted for age, sex, and underlying conditions)* *OR: Univariate Logistic Regression* *Mortality, n/N (%):* Asthma: • aOR: 1.317 (95% CI: 0.708-2.451), p=0.385

Study	Population and Setting	Intervention	Definitions	Outcomes
Study Design: Cohort **Study Objective**: To evaluate the effects of asthma and asthma medication use on the prognosis of COVID-19 using the national medical claims data for Korean patients. **IVA Score:** 24 (Moderate)	**Inclusion criteria:** Patients with confirmed positive COVID-19 by RNA-PCR with diagnostic code for asthma (J45 and J46) as primary diagnosis or first sub-diagnosis, and a prescription for asthma medications from January 2019 to December 2019: a) ≥2 occasions as outpatient visits for asthma or b) ≥1 occasion as outpatient visits for asthma and admission with treatment using systemic corticosteroids for asthma exacerbation. **Exclusion criteria:** NR		and admission with treatment using systemic corticosteroids during the assessment period **Severity Measure(s):** All asthmatic patients were classified based on the asthma medications used for the past year as follows: *Step 1 (reference)*: SABA or short-acting muscarinic antagonist *Step 2*: ICS, LTRA or xanthine *Step 3*: ICS/LABA alone, ICS+LTRA or ICS+xanthine *Step 4*: ICS/LABA+LAMA, ICS/LABA+LTRA or ICS/LABA+xanthine *Step 5*: oral corticosteroid with a duration >90days following some modifications of the GINA treatment guidelines and a previous study **Clinical marker:** NR **Treatment/ Associated Therapy:** *ICS alone*: inhaled corticosteroid alone *ICS-LABA*: inhaled corticosteroid – long-acting β_2-agonist *Inhaled LABA*: inhaled long-acting β_2-agonist *Oral LABA*: oral long-acting β_2-agonist *Patch LABA*: patch long-acting β_2-agonist *LTRA*: leukotriene receptor antagonist *Inhaled SABA*: inhaled short-acting acting β_2-agonist *Oral SABA*: oral short-acting acting β_2-agonist *Xanthine* *Inhaled LAMA*: inhaled long-acting muscarinic antagonist **Outcome Definitions:** *Mortality:* Death *ICU admission:* ND *Intubation:* NR *Ventilation:* NR *Hospitalization:* NR *Non-elective readmissions*: NR **Comments:** None	• OR: 2.885 (95% CI: 1.726-4.822), p < 0.001 • Asthma: 17/218 (7.8%) • No asthma: 210/7,372 (2.8%) • p < 0.001 *ICU Admission, n/N (%):* Asthma: • aOR: 0.656 (95% CI: 0.295-1.460) p=0.302 • OR: 1.143 (95% CI: 0.531-2.457), p =0.733 • Asthma: 7/218 (3.2%) • No asthma: 208/7,372 (2.8%) • p = 0.733 **Severity of Condition:** *Mortality, n/N (%):* Step 2: • aOR: 0.068 (95% CI: 0.005-1.002), p=0.050 • OR: 0.428 (95% CI: 0.079-2.323), p=0.325 Step 3: • aOR: 0.055 (95% CI: 0.001-2.059), p=0.117 • OR: 0.400 (95% CI: 0.044-3.627), p=0.415 Step 4: • aOR: 0.409 (95% CI: 0.042-3.955), p=0.440 • OR: 0.974 (95% CI: 0.308-3.078), p=0.964 Step 5: • aOR: 0.000 (95% CI: 0.000-999.999), p=0.978 • OR: 0.000 (95% CI: 0.000-999.999), p=0.987 *ICU admission, n/N (%):* Step 2: • aOR: 0.061 (95% CI: 0.002-1.847), p=0.108 • OR: 0.364 (95% CI: 0.036-3.626), p=0.389 Step 3: • aOR: 0.000 (95% CI: 0.000-999.999), p=0.945 • OR: 0.000 (95% CI: 0.000-999.999), p=0.967 Step 4: • aOR: 0.081 (95% CI: 0.004-1.581), p=0.097 • OR: 0.527 (95% CI: 0.103-2.714), p=0.444 Step 5: • aOR: 0.000 (95% CI: 0.000-999.999), p=0.976 • OR: 0.000 (95% CI: 0.000-999.999), p=0.987 **Duration of Condition:** NR **Treatment/ Associated Therapy:** *Mortality, n/N (%):* ICS alone, past year: • aOR: 11.741 (95% CI: 0.765-180.151), p=0.077 • OR: 1.685 (95% CI: 0.612-4.637), p=0.313

Study	Population and Setting	Intervention	Definitions	Outcomes
				ICS alone, past 2 months: • aOR: 17.810 (95% CI: 0.944-336.092), p=0.055 • OR: 2.059 (95% CI: 0.745-5.691), p=0.164 ICS-LABA, past year: • aOR: 1.444 (95% CI: 0.130-16.103), p=0.765 • OR: 1.462 (95% CI: 0.541-3.951), p=0.454 ICS-LABA, past 2 months: • aOR: 3.493 (95% CI: 0.242-50.396), p=0.358 • OR:1.663 (95% CI: 0.615-4.502), p=0.316 Oral LABA, past year: • aOR:0.890 (95% CI: 0.113-7.023), p=0.912 • OR: 0.747 (95% CI: 0.253-2.204), p=0.597 Oral LABA, past 2 months: • aOR: 0.685 (95% CI: 0.085-5.508), p=0.722 • OR: 0.872 (95% CI: 0.295-2.578), p=0.804 Patch LABA, past year: • aOR:0.139 (95% CI: 0.003-6.226), p=0.309 • OR:0.252 (95% CI: 0.032-1.954), p=0.187 Patch LABA, past 2 months: • aOR:1.358 (95% CI: 0.016-112.584), p=0.892 • OR:0.296 (95% CI: 0.038-2.309), p=0.246 LTRA, past year: • aOR: 1.203 (95% CI: 0.070-20.631), p=0.899 • OR: 1.194 (95% CI: 0.373-3.821), p=0.765 LTRA, past 2 months: • aOR:1.795 (95% CI: 0.086-37.650), p=0.707 • OR: 1.699 (95% CI: 0.534-5.408), p=0.370 Inhaled SABA, past year: • aOR:1.925 (95% CI: 0.172-21.588), p=0.595 • OR: 2.505 (95% CI: 0.941-6.862), p=0.074 Inhaled SABA, past 2 months: • aOR: 1.273 (95% CI: 0.112-14.420), p=0.846 • OR: 2.989 (95% CI: 1.089-8.208), p=0.034 Oral SABA, past year: • aOR: 1.836 (95% CI: 0.154-21.926), p=0.631 • OR: 1.382 (95% CI: 0.372-5.125), p=0.629 Oral SABA, past 2 months: • aOR: 1.626 (95% CI: 0.113-23.347), p=0.721 • OR: 1.509 (95% CI: 0.405-5.621), p=0.540 Xanthine, past year: • aOR: 0.464 (95% CI: 0.072-2.997), p=0.420 • OR: 1.114 (95% CI: 0.413-3.003), p=0.831 Xanthine, past 2 months: • aOR: 0.753 (95% CI: 0.121-4.690), p=0.761 • OR: 1.360 (95% CI: 0.504-3.667), p=0.544 Inhaled LAMA, past year: • aOR: 0.515 (95% CI: 0.051-5.193), p=0.574 • OR: 5.225 (95% CI: 1.737-15.716), p=0.003 Inhaled LAMA, past 2 months:

Study	Population and Setting	Intervention	Definitions	Outcomes
				• aOR: 0.371 (95% CI: 0.038-3.643), p=0.395 • OR: 5.225 (95% CI: 1.737-15.716), p=0.003 *ICU admission, n/N (%):* ICS alone, past year: • aOR: 3.802 (95% CI: 0.137–105.589), p=0.431 • OR: 0.919 (95% CI: 0.174–4.861), p=0.921 ICS alone, past 2 months: • aOR: 2.387 (95% CI: 0.070–81.543), p=0.629 • OR: 1.107 (95% CI: 0.209–5.870), p=0.905 ICS-LABA, past year: • aOR: 0.384 (95% CI: 0.029-5.036), p=0.466 • OR: 0.629 (95% CI: 0.119-3.320), p=0.585 ICS-LABA, past 2 months: • aOR: 0.503 (95% CI: 0.046-5.451), p=0.572 • OR: 0.711 (95% CI: 0.135-3.751), p=0.687 Oral LABA, past year: • aOR:0.373 (95% CI: 0.021-6.561), p=0.500 • OR: 0.725 (95% CI: 0.137-3.830), p=0.705 Oral LABA, past 2 months: • aOR: 0.254 (95% CI: 0.010-6.487), p=0.407 • OR: 0.841 (95% CI: 0.159-4.446), p=0.839 Patch LABA, past year: • aOR: 0.061 (95% CI: 0.000-50.882), p=0.416 • OR: 0.713 (95% CI: 0.084-6.085), p=0.757 Patch LABA, past 2 months: • aOR: 0.521 (95% CI: 0.000-388.916), p=0.847 • OR: 0.838 (95% CI: 0.098-7.180), p=0.872 LTRA, past year: • aOR: 1.588 (95% CI: 0.088-28.582), p=0.754 • OR: 0.903 (95% CI: 0.170-4.789), p=0.905 LTRA, past 2 months: • aOR: 8.106 (95% CI: 0.309-212.62), p=0.209 • OR: 1.268 (95% CI: 0.240-6.697), p=0.780 Inhaled SABA, past year: • aOR: 2.385 (95% CI: 0.098-58.120), p=0.594 • OR: 0.642 (95% CI: 0.122-3.387), p=0.602 Inhaled SABA, past 2 months: • aOR: 3.253 (95% CI: 0.083-126.978), p=0.528 • OR: 0.756 (95% CI: 0.143-3.994), p=0.742 Oral SABA, past year: • aOR: 4.484 (95% CI: 0.317-63.484), p=0.267 • OR: 5.112 (95% CI: 1.085-24.096), p=0.039 Oral SABA, past 2 months: • aOR: 12.987 (95% CI: 0.472-357.078), p=0.129 • OR: 5.581 (95% CI: 1.180-26.402), p=0.030 Xanthine, past year: • aOR: 0.319 (95% CI: 0.019-5.444), p=0.430 • OR: 1.321 (95% CI: 0.289-6.045), p=0.720

Study	Population and Setting	Intervention	Definitions	Outcomes
				Xanthine, past 2 months: • aOR: 0.564 (95% CI: 0.028-11.527), p=0.710 • OR: 1.597 (95% CI: 0.349-7.312), p=0.546 Inhaled LAMA, past year: • aOR: 0.000 (95% CI: 0.000-999.999), p=0.904 • OR: 0.000 (95% CI: 0.000-999.999), p=0.968 Inhaled LAMA, past 2 months: • aOR: 0.000 (95% CI: 0.000-999.999), p=0.917 • OR: 0.000 (95% CI: 0.000-999.999), p=0.968 **Comorbid Conditions:** NR **Risk Markers:** NR **Long-term Sequelae:** NR
Author: Eggert[22] **Year:** 2021 **Data Extractor:** DOS **Reviewer:** MC **Study Design:** Cohort **Study Objective:** To evaluate all patients who tested positive for SARS-CoV-2 to determine the impact of asthma and asthma phenotypes on disease severity and outcomes in COVID-19 patients. **IVA Score:** 24 (moderate)	**Population:** N=5,596 **Setting:** Academic healthcare system that includes a tertiary and quaternary hospital, children's hospital, and affiliated clinics and acute care facilities **Location:** California, US **Study dates:** March 1 - September 30, 2020 **Inclusion criteria:** Patients who underwent FDA emergency use authorized SARS-CoV-2 nucleic acid amplification tests from either nasal, nasopharyngeal swab, or bronchoalveolar lavage and tested positive during study period. **Exclusion criteria:** Patients younger than 28 days old and those without additional encounters or ICD10 codes within EHR	**Medical Condition, n/N (%):** Asthma: 598/5,596 (10.7%) **Control/Comparison group, n/N (%):** No asthma: 4,998/5,596 (89.3%)	**Medical Condition(s):** *Asthma:* ICD-10 codes J45 or J46 **Severity Measure(s):** *Allergic asthma:* ICD-10 codes for allergic rhinitis (J30.1-4) or atopic dermatitis (L20) *GINA classification:* asthma severity categorized according to the five steps in GINA 2020 guidelines **Clinical marker:** NR **Treatment/ Associated Therapy:** NR **Outcome Definitions:** *Mortality:* NR *ICU admission:* NR *Intubation:* NR *Ventilation:* NR *Hospitalization:* hospitalized within 14 days of a positive test for SARS-CoV-2 *Non-elective readmissions*: NR **Comments:** None	**Severe COVID-19:** *aOR1: Multivariable Logistic Regression; model included age, sex, ethnicity, diabetes, obesity, coronary heart disease, hypertension* *aOR2: Multivariable Logistic Regression; model included age, sex, and ethnicity* *OR: Univariable Logistic Regression* *Hospitalization, n/N (%):* Asthma: • aOR1: 1.12 (95% CI: 0.86-1.45); p=0.40 • aOR2: 1.55 (95% CI: 1.21-1.97); p<0.001 • OR: 1.53 (95% CI: 1.2-1.93); p<0.001 • Asthma: 100/598 (16.7%) • No asthma: 505/4998 (10.1%) **Severity of Condition:** *Hospitalization, n/N (%):* Allergic asthma: • aOR1: 0.52 (95% CI: 0.28-0.91); p=0.026 • aOR2: 0.54 (95% CI: 0.3-0.93); p=0.031 • OR: 0.55 (95% CI: 0.31-0.92); p=0.029 • Allergic asthma: 19/167 (11.4%) • Non-allergic asthma: 81/431 (18.8%) *Hospitalization, %:* GINA classification: • GINA class 3-5: 19.4% • GINA class 1-2: 14.6% • p=0.22 **Duration of Condition:** NR **Treatment/ Associated Therapy:** NR

Study	Population and Setting	Intervention	Definitions	Outcomes
	besides their SARS-CoV-2 diagnostic test.			**Comorbid Conditions:** *Hospitalization, n/N (%):* COPD among those hospitalized: • Asthma: 14/100 (14.0%) • No asthma: 24/505 (4.8%) • p=0.008 Cancer among those hospitalized: • Asthma: 23/100 (23.0%) • No asthma: 73/505 (14.5%) • p=0.082 Cerebrovascular disease among those hospitalized: • Asthma: 13/100 (13.0%) • No asthma: 61/505 (12.1%) • p=0.93 Chronic renal disease among those hospitalized: • Asthma: 29/100 (29.0%) • No asthma: 90/505 (17.8%) • p=0.042 Coronary heart disease among those hospitalized: • Asthma: 28/100 (28.0%) • No asthma: 114/505 (22.6%) • p=0.38 Diabetes among those hospitalized: • Asthma: 38/100 (38.0%) • No asthma: 178/505 (35.2%) • p=0.73 Other endocrine system disease among those hospitalized: • Asthma: 15/100 (15.0%) • No asthma: 40/505 (7.9%) • p=0.079 Hypertension among those hospitalized: • Asthma: 58/100 (58.0%) • No asthma: 238/505 (47.1%) • p=0.094 Immunodeficiency among those hospitalized: • Asthma: 9/100 (9.0%) • No asthma: 33/505 (6.5%) • p=0.59 Liver disease among those hospitalized:

Study	Population and Setting	Intervention	Definitions	Outcomes
				• Asthma: 22/100 (22.0%) • No asthma: 83/505 (16.4%) • p=0.32 Obesity among those hospitalized: • Asthma: 42/100 (42.0%) • No asthma: 131/505 (25.9%) • p=0.008 Obesity among those with asthma: • Morbidly obese (BMI≥40): 13/67 (19.4%) • Severely obese (BMI 35-39.9): 12/54 (22.2%) • Obese (BMI 30-34.9): 14/102 (13.7%) • Overweight (BMI 25-29.9): 32/158 (20.3%) • Healthy weight (BMI 18.5-24.9): 15/117 (12.8%) • p=NR Other chronic lung disease among those hospitalized: • Asthma: 20/100 (20.0%) • No asthma: 38/505 (7.5%) • p=0.003 **Risk Markers:** *Hospitalization, n/N (%):* Age among those with asthma: • 0-14 years: 7/78 (9.0%) • 15-49 years: 38/300 (12.7%) • 50-64 years: 21/122 (17.2%) • ≥65 years: 34/98 (34.7%) • p=NR Sex among those with asthma: • Female: 58/354 (16.4%) • Male: 42/244 (17.2%) • p=NR Race and ethnicity among those with asthma: • Asian: 9/44 (20.5%) • Hispanic/Latino: 49/254 (19.3%) • Non-Hispanic Black: 3/40 (7.5%) • Non-Hispanic White: 25/163 (15.4%) • Other: 14/59 (31.1%) • p=NR Smoking history among those with asthma: • Current smoker: 3/22 (13.6%) • Former smoker: 20/82 (24.4%) • Never smoker: 64/365 (17.5%) • Passive smoke exposure: 1/3 (66.7%)

Study	Population and Setting	Intervention	Definitions	Outcomes
				• p=NR **Long-term Sequelae:** NR
Author: Experton[40] **Year:** 2021 **Data Extractor:** JKK **Reviewer:** MW **Study Design:** Cohort **Study Objective:** To develop a model to predict COVID-19 hospitalization and death for Medicare beneficiaries using de-identified Medicare claims to optimize COVID-19 vaccine allocation in the higher-risk Medicare population. **IVA Score:** Asthma: 24 (moderate) COPD: 23 (moderate)	**Population:** N=1,030,893 **Setting:** NR **Location:** US **Study dates:** October 1, 2019 – November 22, 2020 **Inclusion criteria:** Medicare fee-for-service (FFS) beneficiaries who since January 1, 2020 either had a COVID-19 test or a COVID-19 diagnosis (identified by ICD-10 code U071 after April 1st), or for any medical reason were hospitalized or had an emergency department, urgent care, or telehealth visit. **Exclusion criteria:** NR	**Medical Condition, n/N (%):** Asthma: 141,319/1,030,893 (13.7%) **Control/Comparison group, n/N (%):** No Asthma: 889,574/1,030,893 (86.3%)	**Medical Condition(s):** *Asthma*: CMS code ASTHMA_EVER **Severity Measure(s):** NR **Clinical marker:** NR **Treatment/ Associated Therapy:** NR **Outcome Definitions:** *Mortality:* cases who died of SARS-CoV-2 infection during COVID-19 hospitalization or within 60 days of COVID-19 diagnosis *ICU admission:* NR *Intubation:* NR *Ventilation:* NR *Hospitalization:* requiring inpatient admission for management of COVID-19 *Non-elective readmissions*: NR **Comments:** None	**Severe COVID-19:** *aOR1: Multivariable Logistic Regression including ESRD, North American native, age, prior hospitalization, race, sex, comorbidities, income, housing, dual Medicare-Medicaid, treatment, and drug use; excluded history of colorectal and endometrial cancer, acute MI between July and December 2019, ischemic heart disease, hypertension, residence in zip codes in top quartile of crowded/multiunit housing, and prescriptions for opioid drugs* *aOR2: Multivariable Logistic Regression including ESRD, North American native, age, prior hospitalization, race, sex, comorbidities, income, housing, dual Medicare-Medicaid, treatment, and drug use; excluded history of breast cancer in second half of 2019, prescriptions for immunosuppressive and corticosteroid drugs overlapping COVID-19 diagnosis date, hypertension, and pneumococcal vaccinations* *Mortality, n/N (%):* Asthma • aOR1: 0.87 (95% CI: 0.85-0.90), p=NR *Hospitalization, n/N (%):* Asthma • aOR2: 0.94 (95% CI: 0.92-0.96), p=NR **Severity of Condition:** NR **Duration of Condition:** NR **Treatment/ Associated Therapy:** NR **Comorbid Conditions:** NR **Risk Markers:** NR **Long-term Sequelae:** NR
Author: Ferastraoaru[41] **Year:** 2021 **Data Extractor:** DOS **Reviewer**: CS **Study design:**	**Population:** N=4,558 N=2,496 admitted patients **Setting:** Academic tertiary care hospital **Location:** NY, US	**Medical Condition, n/N (%):** Asthma: 951/4,558 (20.9%) **Control/Comparison group, n/N (%):** No asthma: 3,607/4,558 (79.1%)	**Medical Condition(s):** *Asthma:* ICD9/10 493.00, 493.90, 493.92, J45.20, J45.21, J45.22, J45.30, J45.31, J45.40, J45.41, J45.42, J45.50, J45.51, J45.901, J45.909 **Severity Measure(s):** *Mild intermittent asthma:* ICD9/10 J45.20, J45.21, J45.22 *Mild persistent asthma:* J45.30, J45.31	**Severe COVID-19:** *aOR: Adjusted odds ratio; multivariable logistic regression* adjusting for age, race, sex, and smoking status *Numerators calculated by ERT using percentages reported in Figure 1 *Mortality, n/N (%):* Asthma (no comorbidities):

Study	Population and Setting	Intervention	Definitions	Outcomes
Retrospective cohort **Study Objective:** To analyze the relationship between asthma and COVID-19 by identifying the factors predisposing to inpatient admission in our asthmatic population, and by comparing the mortality risk among admitted patients with only asthma and those with other coexistent chronic conditions, which have been shown to be unique risk factors for severe complications of COVID-19. **IVA Score:** 24 (moderate)	**Study dates:** March 14 - April 27, 2020 **Inclusion criteria:** All adult patients (≥18 years old) who tested positive for SARS-CoV-2 infection by PCR at study institution during study dates were identified by a software application that stores EHR data. All patients who presented to the emergency department for COVID-19 symptoms and who had also been seen at least once in the study healthcare system within previous 10 years were included in analysis. **Exclusion criteria**: NR		*Moderate persistent asthma:* ICD9/10 J45.40, J45.41, J45.42 *Severe asthma:* ICD9/10 J45.50, J45.51 *Strength of inhaled corticosteroids (ICS):* strength of daily dose inhaler based on last prescription found in chart within last year before COVID-19 infection; categorized as low, medium, or high dose **Clinical Marker:** *Prior eosinophilia:* patients with mean AEC ≥150 cells/µL *Increasing eosinophilia:* admitted patients with eosinopenia in whom AEC increased to a peak ≥150 cells/µL **Treatment/ Associated Therapy:** *ICS:* asthma patients with prescription for ICS within the year prior *Oral corticosteroids*: asthma patients with prescription for oral corticosteroids within the year prior *Montelukast:* asthma patients with prescription for montelukast within the year prior *Antihistamines:* asthma patients with prescription for antihistamines within the year prior *Subcutaneous immunotherapy (SCIT):* asthma patients with prescription for SCIT within the prior 3 years *Biologics:* asthma patients with prescription for biologics within the prior 3 years **Outcome Definitions:** *Mortality:* mortality risk in admitted patients *ICU admission:* NR *Intubation:* NR *Ventilation:* NR	• aOR: 1.41 (95% CI: 0.28-7.12), p=0.6 • Asthma alone: 66/358 (18.4%) • No comorbidities: 10/74 (13.5%) COPD vs. Asthma: • aOR: 0.87 (95% CI: 1.15-3.04), p=0.06 • COPD, no asthma: n=NR/N=NR (48.3%) • Asthma alone: 66/358 (18.4%) • p=0.01 *Hospitalization, n*/N (%):* Asthma: • Admitted: 749/951 (78.8%) • Not admitted: 202/951 (21.2%) **Severity of Condition:** *Hospitalization among all asthmatics, n*/N (%):* Mild intermittent asthma: • aOR: 0.92 (95% CI: 0.55-1.53): 0.92 (95% CI: 0.55-1.53) • Admitted: 75/581 (12.9%) • Not admitted: 28/156 (17.9%) • p=0.76 Mild persistent asthma: • aOR: 0.77 (95% CI: 0.28-2.13) • Admitted: 15/581 (2.6%) • Not admitted: 6/156 (3.8%) • p=0.62 Moderate persistent asthma: • aOR: 1.0 (95% CI: 0.42-2.37) • Admitted: 25/581 (4.3%) • Not admitted: 8/156 (5.1%) • p=0.99 Severe asthma: • aOR: 0.58 (95% CI: 0.13-2.59) • Admitted: 5/581 (0.9%) • Not admitted: 3/156 (1.9%) • p=0.48 Low dose of ICS: • aOR: 1.64 (95% CI: 0.17-15.06) • Admitted: 8/N=NR (7%) • Not admitted: 1/N=NR (4.8%) • p=0.66 Medium dose of ICS:

Study	Population and Setting	Intervention	Definitions	Outcomes
			Hospitalization: admission from the emergency department *Non-elective readmissions*: NR **Comments:** None	• aOR: 1.53 (95% CI: 0.51-4.53) • Admitted: 43/N=NR (37.7%) • Not admitted: 6/N=NR (28.6%) • p=0.44 High dose of ICS: • aOR: 0.59 (95% CI: 0.21-1.69): 0.59 (95% CI: 0.21-1.69) • Admitted: 63/N=NR (55.3%) • Not admitted: 14/N=NR (66.7%) • p=0.33 **Clinical Marker:** *Mortality among admitted asthmatics, n*/N (%):* Increasing eosinophilia: • aOR: 0.006 (95% CI: 0.0001-0.64): 0.006 (95% CI: 0.0001-0.64) • AEC ≥150 cells/µL: n=NR/104 (9.6%) • AEC <150 cells/µL: n=NR/213 (25.8%) • p=0.03 *Hospitalization among all asthmatics, n*/N (%):* Prior eosinophilia: • aOR: 0.46 (95% CI: 0.21-0.98): 0.46 (95% CI: 0.21-0.98) • Admitted: 303/581 (52.1%) • Not admitted: 91/156 (58.1%) • p=0.04 **Duration of Condition:** NR **Treatment/ Associated Therapy:** *Hospitalization among all asthmatics, n*/N (%):* ICS: • aOR: 1.51 (95% CI: 0.9-2.56): 1.51 (95% CI: 0.9-2.56) • Admitted: 114/581 (19.6%) • Not admitted: 21/156 (13.5%) • p=0.11 Oral corticosteroids: • aOR: 1.04 (95% CI: 0.68-1.6): 1.04 (95% CI: 0.68-1.6) • Admitted: 139/581 (23.9%) • Not admitted: 38/156 (24.4%) • p=0.84 Montelukast:

Study	Population and Setting	Intervention	Definitions	Outcomes
				• aOR: 1.36 (95% CI: 0.72-2.54): 1.36 (95% CI: 0.72-2.54) • Admitted: 66/581 (11.4%) • Not admitted: 14/156 (9%) • p=0.33 Antihistamines: • aOR: 0.88 (95% CI: 0.54-1.43): 0.88 (95% CI: 0.54-1.43) • Admitted: 85/581 (14.7%) • Not admitted: 29/156 (18.7) • p=0.61 SCIT: • aOR: 0.8 (95% CI: 0.2-3.22): 0.8 (95% CI: 0.2-3.22) • Admitted: 8/581 (1.4%) • Not admitted: 3/156 (1.9%) • p=0.75 Biologics: • aOR: 2.36 (95% CI: 0.273-20.4): 2.36 (95% CI: 0.273-20.4) • Admitted: 6/581 (1%) • Not admitted: 1/156 (0.6%) • p=0.43 **Comorbid Conditions:** *Mortality, n/N (%):* Asthma & CHF: • aOR: 2.29 (95% CI: 1.009-5.22), p=0.2: 2.29 (95% CI: 1.009-5.22), p=0.2 • Asthma & CHF: n=NR/N=NR (41.1%) • Asthma, no CHF: n=NR/N=NR (20.7%) • p=0.04 Asthma & COPD: • aOR: 3.2 (95% CI: 1.32-7.79), p=0.06: 3.2 (95% CI: 1.32-7.79), p=0.06 • Asthma & COPD: n=NR/N=NR (41%) • Asthma, no COPD: n=NR/N=NR (24.2%) • p=0.01 Hypertension, diabetes, and CKD were not found to affect mortality in admitted patients with asthma. *Hospitalization among all asthmatics, n*/N (%):* Asthma & CHF:

Study	Population and Setting	Intervention	Definitions	Outcomes
				• aOR: 1.61 (95% CI: 1.01-2.56): 1.61 (95% CI: 1.01-2.56) • Admitted: 214/581 (36.8%) • Not admitted: 31/156 (19.9%) • p=0.04 Asthma & hypertension: • aOR: 1.13 (95% CI: 0.72-1.76): 1.13 (95% CI: 0.72-1.76) • Admitted: 460/581 (79.2%) • Not admitted: 102/156 (65.4%) • p=0.59 Asthma & diabetes: • aOR: 1.0 (95% CI: 0.68-1.46): 1.0 (95% CI: 0.68-1.46) • Admitted: 328/581 (56.5%) • Not admitted: 76/156 (48.7%) • p=0.9 Asthma & CKD: • aOR: 1.61 (95% CI: 1.04-2.51): 1.61 (95% CI: 1.04-2.51) • Admitted: 253/581 (43.5%) • Not admitted: 38/156 (24.4%) • p=0.03 Asthma & obesity (BMI≥30): • aOR: 1.19 (95% CI: 0.8-1.75): 1.19 (95% CI: 0.8-1.75) • Admitted: 307/581 (52.8%) • Not admitted: 90/156 (57.5%) • p=0.37 Asthma & metabolic syndrome (BMI≥30 & hypertension & diabetes): • aOR: 1.04 (95% CI: 0.68-1.57): 1.04 (95% CI: 0.68-1.57) • Admitted: 161/581 (27.7%) • Not admitted: 41/156 (26.3%) • p=0.84 Asthma & COPD: • aOR: 2.06 (95% CI: 1.14-3.74): 2.06 (95% CI: 1.14-3.74) • Admitted: 139/581 (23.9%) • Not admitted: 16/156 (10.3%) • p=0.017 **Risk Markers:** *Hospitalization among all asthmatics, n*/N (%):*

Study	Population and Setting	Intervention	Definitions	Outcomes
				Age 18-45: • aOR: 0.2 (95% CI: 0.12-0.34): 0.2 (95% CI: 0.12-0.34) • Admitted: 57/581 (9.8%) • Not admitted: 41/156 (26.3%) • p<0.001 Age 46-64: • aOR: 0.5 (95% CI: 0.33-0.75): 0.5 (95% CI: 0.33-0.75) • Admitted: 214/581 (36.8%) • Not admitted: 67/156 (42.9%) • p=0.001 Age >65: ref • Admitted: 310/581 (53.4%) • Not admitted: 48/156 (30.9%) Male: • aOR: 0.58 (95% CI: 0.38-0.88): 0.58 (95% CI: 0.38-0.88) • Admitted: 206/581 (35.5%) • Not admitted: 40/156 (25.6%) • p=0.01 Race, White: ref • Admitted: 40/581 (6.9%) • Not admitted: 7/156 (4.5%) Race, Black: • aOR: 0.8 (95% CI: 0.33-1.93): 0.8 (95% CI: 0.33-1.93) • Admitted: 218/581 (37.5%) • Not admitted: 59/156 (37.8%) • p=0.62 Race, Hispanic: • aOR: 0.78 (95% CI: 0.32-1.88): 0.78 (95% CI: 0.32-1.88) • Admitted: 240/581 (41.3%) • Not admitted: 69/156 (44.2%) • p=0.58 Race, Asian: • aOR: 0.62 (95% CI: 0.15-2.43): 0.62 (95% CI: 0.15-2.43) • Admitted: 14/581 (2.4%) • Not admitted: 5/156 (3.2%) • p=0.49 Race, other/unknown: • aOR: 1.01 (95% CI: 0.35-2.84): 1.01 (95% CI: 0.35-2.84) • Admitted: 69/581 (11.9%)

Study	Population and Setting	Intervention	Definitions	Outcomes
				• Not admitted: 16/156 (10.3%) • p=0.98 Smoking status, current smoker: • aOR: 0.82 (95% CI: 0.42-1.58): 0.82 (95% CI: 0.42-1.58) • Admitted: 46/581 (7.9%) • Not admitted: 15/156 (9.6%) • p=0.56 Smoking status, former smoker: • aOR: 1.07 (95% CI: 0.66-1.75): 1.07 (95% CI: 0.66-1.75) • Admitted: 145/581 (25%) • Not admitted: 31/156 (20%) • p=0.77 Smoking status, never smoker: ref • Admitted: 265/581 (45.6%) • Not admitted: 77/156 (49.4%) **Long-term Sequelae:** NR
Author: Floyd[23] **Year:** 2021 **Data Extractor:** TR **Reviewer:** DOS **Study design:** Retrospective cohort **Study Objective:** To determine the association between current asthma and hospitalization in a large pediatric cohort of patients with PCR-confirmed COVID-19. **IVA Score:** 25 (moderate)	**Population:** N= 979 **Setting:** Pediatric health system **Location:** Pennsylvania, USA **Study dates:** March 17, 2020, to August 26, 2020 **Inclusion criteria:** All patients aged ≤21 years with a positive PCR test for SARSCoV-2 at any study hospital setting (drive-through testing, outpatient, emergency department [ED], or inpatient) during study period.	**Medical Condition, n/N (%):** Asthma: 205/979 (21%) **Control/Comparison group, n/N (%):** No asthma: 774/979 (79%)	**Medical Condition(s):** *Asthma:* diagnosed using existing EHR asthma registry definition, which required that they met either of the following criteria at the time of testing: (1) encounter diagnosis for asthma (International Classification of Disease, 10th Revision, code J45) within the past 1 year or an active problem list diagnosis for asthma and a prescription for an asthma-specific medication in the last year; or (2) an active persistent asthma diagnosis on the problem list **Severity Measure(s):** NR **Clinical marker:** NR **Treatment/ Associated Therapy:** *SABA:* short-acting β-agonist *ICS:* inhaled corticosteroids *LABA:* long-acting β-agonist	**Severe COVID-19:** *aOR: Multivariable Logistic Regression* *Hospitalization, n/N (%)* • aOR: 0.28 (95% CI: 0.14-0.55), p<.001 • Hospitalized: 11/121 (9%) • Not hospitalized: 194/856 (23%) **Severity of Condition:** NR **Duration of Condition:** NR **Treatment/ Associated Therapy:** *Hospitalization, n/N (%):* SABA only: • Hospitalized: 2/11 (18%) • Not hospitalized: 115/194 (59%) ICS or LM: • Hospitalized: 6/11 (55%) • Not hospitalized: 52/194 (59%) ICS/LABA or ICS + LM: • Hospitalized: 3/11 (27%) • Not hospitalized: 25/194 (13%) Biologic: • Hospitalized: 0/11 (0%)

Study	Population and Setting	Intervention	Definitions	Outcomes
	Exclusion criteria: NR		*LM:* leukotriene modifier *Systemic corticosteroid:* ND **Outcome Definitions:** *Mortality:* NR *ICU admission:* NR *Intubation:* NR *Ventilation:* NR *Hospitalization:* any hospitalization within 14mdays of a first positive PCR for SARS-CoV-2 *Non-elective readmissions*: NR **Comments:** Non-hospitalized patients with 1 complex chronic condition were misreported in Table 1 as 746, however this number should be 146	• Not hospitalized: 2/194 (1%) Systemic corticosteroid: • Hospitalized: 7/11 (64%) • Not hospitalized: 58/194 (30%) **Comorbid Conditions:** NR **Risk Markers:** NR **Long-term Sequelae:** NR
Author: Gaietto[24] **Year:** 2021 **Data Extractor:** MW **Reviewer:** JH/CNS **Study Design:** Case-control **Study Objective:** To examine the association between asthma and COVID-19 in children using nested case-control analyses. **IVA Score:** 24 (Moderate)	**Population:** N=1,392; COVID-19+, N: 1,252 **Setting:** Pediatric referral center and associated primary care network **Location:** Pennsylvania, US **Study dates:** March 11 – December 21, 2020 **Inclusion criteria:** All children with pre-existing asthma who presented with a positive SARS-CoV-2 RT-PCR or if they met criteria for the multisystem inflammatory syndrome in children (MIS-C) between March and December 2020. As disease controls, children without pre-existing	**Medical Condition, n/N (%):** Asthma: 142/1,252 (11.3%) **Control/Comparison group, n/N (%):** No asthma: 1,110/1,252 (88.7%)	**Medical Condition(s):** *Asthma:* ND **Severity Measure(s):** NR **Clinical marker:** NR **Treatment/ Associated Therapy:** NR **Outcome Definitions:** *Mortality:* NR *ICU admission:* Among hospitalized patients *Intubation:* Invasive Ventilation *Ventilation:* High flow nasal cannula or non-invasive positive airway pressure including CPAP or BiPAP *Hospitalization:* ND *Non-elective readmissions*: NR **Comments:** None	**Severe COVID-19:** *aOR1: adjusted odds ratio (model included: age, sex, race, recent travel, known exposure, zip code's median household income, BMI percentile, the time interval (days) between symptom onset and presentation, and non-asthma related symptoms of fever, fatigue, and vomiting)* *aOR2: adjusted odds ratio (model included: age, sex, race, recent travel, known exposure, zip code's median household income, BMI percentile, and the time interval (days) between symptom onset and presentation)* *aOR3: adjusted odds ratio (model included: age, sex, race, recent travel, and known exposure)* *ICU admission, n/N (%):* Asthma: • Asthma: 1/7 (14.3%) • No asthma: 8/19 (42.1%) *Intubation, n/N (%):* Asthma: • Asthma: 0/142 (0%) • No asthma: 1/1,110 (0.09%) *Ventilation, n/N (%):* Asthma: • Asthma: 1/142 (0.70%) • No asthma: 2/1,110 (0.18%) *Hospitalization, n/N (%):*

Study	Population and Setting	Intervention	Definitions	Outcomes
	conditions who presented with COVID-19 during the same period were selected, as well as non-overlapping children with asthma recruited to the study's Asthma Registry during the same period the year prior to the pandemic who did not have COVID-19. **Exclusion criteria:** NR			Asthma: • aOR1: 3.33 (95% CI: 1.19-9.33), p<0.05 • aOR2: 4.87 (95% CI: 1.44-16.43), p<0.01 • aOR3: 3.95 (95% CI: 1.43-10.9), p<0.01 • Asthma: 7/142 (4.9%) • No asthma: 19/1,110 (1.7%) • p=0.01 **Severity of Condition:** NR **Duration of Condition:** NR **Treatment/ Associated Therapy:** NR **Comorbid Conditions:** NR **Risk Markers:** NR **Long-term Sequelae:** NR
Author: Garcia-Posada[25] **Year:** 2021 **Data Extractor:** MW **Reviewer:** CNS **Study Design:** Cohort **Study Objective:** To describe the characteristics and clinical management of a group of hospitalized patients with SARS-CoV-2 infection in a private clinic in Colombia. **IVA Score:** COPD: 23 (Moderate) Asthma: 23 (Moderate)	**Population:** N=209 **Setting:** Private third-level clinic **Location:** Colombia **Study dates:** May – August 2020 **Inclusion criteria:** Patients had to be admitted to the hospital ward and meet the criteria for COVID-19 disease classified as moderate, severe, or critical. The moderate disease was one with clinical or radiological evidence of pneumonia with clinical of pneumonia (fever, cough, dyspnea, tachypnea) without signs of severe pneumonia, with SpO2 ≥ 90% in room air. Severe disease was one that demonstrated clinical evidence of	**Medical Condition, n/N (%):** Asthma: 8/209 (3.8%) **Control/Comparison group, n/N (%):** No asthma: 201/209 (96.2%)	**Medical Condition(s):** *Asthma:* ND **Severity Measure(s):** NR **Clinical marker:** NR **Treatment/ Associated Therapy:** NR **Outcome Definitions:** *Mortality:* ND *ICU admission:* NR *Intubation:* NR *Ventilation:* NR *Hospitalization:* ND *Non-elective readmissions*: NR **Comments:** None	**Severe COVID-19:** *aOR: Multivariable Logistic Regression; models adjusted for NR* *Mortality, n/N (%)* Asthma: • Deceased: 5/107 (4.7%) • Alive: 3/102 (2.9%) • p=0.165 *Hospitalization:* Asthma: • aOR: 1 (95% CI: 0.9−1.05), p=0.9 **Severity of Condition:** NR **Duration of Condition:** NR **Treatment/ Associated Therapy:** NR **Comorbid Conditions:** NR **Risk Markers:** NR **Long-term Sequelae:** NR

Study	Population and Setting	Intervention	Definitions	Outcomes
	pneumonia, plus one of the following findings: respiratory rate >30 breaths/min; severe shortness of breath; o SpO2 < 90% in ambient air. The critical disease was considered if it met acute respiratory distress syndrome (ARDS) criteria, sepsis, or septic shock. **Exclusion criteria:** Patients' clinical history with the loss of clinical and demographic information more significant than 10%. Patients with a mild diagnosis of Covid-19 disease. Symptomatic patients based on the COVID-19 case definition criteria without evidence of viral pneumonia or hypoxia. Patients admitted to hospital for the treatment of diseases other than Covid-19.			
Author: Ge[42] **Year:** 2021 **Data Extractor:** DOS **Reviewer:** JH **Study Design:** Cohort **Study Objective:** To examine the associations of comorbidities with mortality and disease severity in individuals	**Population:** N=167,500 **Setting:** Public health insurance network **Location:** Canada **Study dates:** January 15 - December 31, 2020 **Inclusion criteria:** Individuals diagnosed with COVID-19 based on SARS-CoV-2 PCR test reported through	**Medical Condition, n/N (%):** Asthma: 26,814/167,500 (16.0%) **Control/Comparison group, n/N (%):** No asthma: 140,686/167,500 (84.0%)	**Medical Condition(s):** *Asthma:* ND *COPD:* ND **Severity Measure(s):** NR **Clinical marker:** NR **Treatment/ Associated Therapy:** NR **Outcome Definitions:** *Mortality:* deceased within 30 days after first positive COVID-19 test *ICU admission:* NR *Intubation:* NR *Ventilation:* NR	**Severe COVID-19:** *aHR: Adjusted Hazard Ratio; model included age, sex, income quantile, rural and long-term care resident* *Mortality, n/N (%):* Asthma: • aHR: 0.96 (95% CI: 0.89-1.04); p=0.37 • Asthma: 829/26,814 (3.1%) • No asthma: 3,918 /140,686 (2.8%) • p=0.006 **Severity of Condition:** NR **Duration of Condition:** NR **Treatment/ Associated Therapy:** NR

Study	Population and Setting	Intervention	Definitions	Outcomes
with COVID-19 diagnosed in 2020. **IVA Score:** Asthma: 25 (moderate) COPD: 24 (moderate)	the Ontario Laboratories Information System during the study period. **Exclusion criteria:** Individuals not eligible for the Ontario Health Insurance Plan and those who were not residents of Ontario at the beginning of the study period.		*Hospitalization:* NR *Non-elective readmissions*: NR **Comments:** None	**Comorbid Conditions:** NR **Risk Markers:** NR **Long-term Sequelae:** NR
Author: Girardin[43] **Year:** 2021 **Data Extractor:** CS **Reviewer:** MW **Study design:** Cohort study **Study Objective:** To assess the relative contribution of common upper and lower airway pulmonary diseases (COPD, asthma, and sleep apnea) in assessing likelihood of COVID-19 -related mortality independent of other medical conditions, health risks, and sociodemographic factors. **IVA Score:** 25 (moderate)	**Population:** N=4,210 **Setting:** Quaternary academic health network **Location:** NY, US **Study dates:** March 2-May 24, 2020 **Inclusion criteria:** Patients with a prior visit and presenting to the emergency department with COVID-19 complaints or as clinically indicated, who tested positive for COVID-19, and had age, sex, race, and ethnicity reported were included in the study. Only patients who had been discharged alive or dead were included.	**Medical Condition, n/N (%):** Asthma: 493/4,210 (11.7%) **Control/Comparison group, n/N (%):** No asthma: 3,717/4,210 (88.3%)	**Medical Condition(s):** *Asthma:* ND; data retrieved from EHRs **Severity Measure(s):** NR **Clinical marker:** NR **Treatment/ Associated Therapy:** NR **Outcome Definitions:** *Mortality:* ND *ICU admission:* NR *Intubation:* NR *Ventilation:* NR *Hospitalization:* NR *Non-elective readmissions*: NR **Comments:** None	**Severe COVID-19:** *aHR: Adjusted Hazard Ratio: Adjusted Hazard Ratio Mortality, n/N (%), or Median (IQR):* Asthma • aHR: 0.83 (95% CI: 0.67-1.04), p=0.10 • Asthma: 97/493 (19.7%) • No asthma: 862/3717 (23.2%) • p=0.091 **Severity of Condition:** NR **Duration of Condition:** NR **Treatment/ Associated Therapy:** NR **Comorbid Conditions:** NR **Risk Markers:** NR **Long-term Sequelae:** NR

Study	Population and Setting	Intervention	Definitions	Outcomes
	Exclusion criteria: Hospitalized patients with unknown state (alive or dead) information were excluded.			
Author: Gottlieb[26] **Year:** 2020 **Data Extractor:** CO **Reviewer:** ES/DOS **Study design:** Retrospective Cohort study **Study Objective:** to present clinical and demographic features of patients with laboratory-confirmed COVID-19 as of June 21, 2020; secondary outcome was to identify risk factors associated with hospitalization and critical illness **IVA Score:** 17 (high)	**Population:** N=8,673 patients **Setting:** One university hospital **Location:** Chicago, IL, USA **Study dates:** March 4, 2020-June 21, 2020 **Inclusion criteria:** all patients presenting to university hospital with COVID-19 **Exclusion criteria:** patients who were transferred from other inpatient hospitals	**Medical Condition:** Asthma: 736/8,673 (8.5%) **Control/Comparison group:** No Asthma: 7,937/8,673 (91.5%)	**Medical Condition(s):** Asthma: ND; extracted from electronic health records **Severity Measure(s):** NR **Clinical marker:** NR **Treatment/ Associated Therapy:** ND **Outcome Definitions:** COVID-19: Lab confirmed using molecular amplification assay and nasopharyngeal, midturbinate, or nasal swab samples. Inpatient hospitalization: any patient requiring admission to the hospital. For patients with more than one hospitalization (n=376), only the most recent hospitalization was utilized Critical illness (ICU Admission): a patient requiring ICU admission	**Severe COVID-19, n/N (%):** *aOR: Multivariable logistic regression odds ratio* *OR: Odds ratio [OR] 95% CI calculated by ERT* Hospitalization, n/N (%): 1,483/8,673 (17.1%) Asthma: aOR: 0.82 (0.65 –1.04) OR: 1.79 (1.50-2.13) • Hospitalized: 190/1,483 (12.8%) • No hospitalization: 546/7,190 (7.6%) **Severity of Condition:** NR **Duration of Condition:** NR **Treatment/ Associated Therapy:** NR **Comorbid Conditions:** NR **Risk Markers:** NR **Long-term Sequelae:** NR
Author: Graff[27] **Year:** 2021 **Data Extractor:** CS **Reviewer:** MW	**Population:** N=454 **Setting:** Children's hospital; pediatric referral center in a 7-state region	**Medical Condition, n/N (%):** Asthma: 53/435 (12.2%) **Control/Comparison group, n/N (%):** No asthma: 382/435 (87.8%)	**Medical Condition(s):** *Asthma:* ND **Severity Measure(s):** NR **Clinical marker:** NR	**Severe COVID-19:** *aOR: Multivariable Logistic Regression: Multivariable Logistic Regression* *OR: Univariable Logistic Regression* *ICU admission, n/N (%):* Asthma: • OR: 2 (95% CI: 0.5-8.2), p=0.31

Study	Population and Setting	Intervention	Definitions	Outcomes
Study design: Retrospective cohort study **Study Objective:** To evaluate the epidemiology and risk factors for severe disease among children with SARS-CoV-2 infection. **IVA Score:** 24 (moderate)	**Location:** Colorado, US **Study dates:** March 15-July 8, 2020 **Inclusion criteria:** Every pediatric patient <21 years of age with SARS-CoV-2, confirmed by molecular testing of nasopharyngeal swabs, nasopharyngeal washes/aspirates, tracheal aspirate, and bronchoalveolar lavage specimens using RT-PCR. Patients ≥21 years were included only if they were followed by the hospital for a chronic medical condition. **Exclusion criteria:** Patients tested outside Colorado, parents/caregivers of pediatric patients, pregnant women, and healthcare workers.		**Treatment/ Associated Therapy:** NR **Outcome Definitions:** *Mortality:* NR *ICU admission:* if patient either (1) were admitted to the pediatric ICU for symptomatic COVID-19 or (2) were admitted to the neonatal ICU for symptomatic COVID-19 and required a higher level of respiratory support than low-flow nasal cannula *Intubation:* NR *Ventilation:* NR *Hospitalization:* among symptomatic patients *Non-elective readmissions*: ND **Comments:** None	• ICU: 4/11 (36%) • No ICU: 12/55 (22%) *Hospitalization, n/N (%):* Asthma: • aOR: 2.17 (95% CI: 1.1-4.5), p=0.04 • OR: 2.87 (95% CI: 1.5-5.5), p=0.0017 • Hospitalized: 16/66 (24%) • Not hospitalized: 37/369 (10%) **Severity of Condition:** NR **Duration of Condition:** NR **Treatment/ Associated Therapy:** NR **Comorbid Conditions:** NR *ICU admission:* Number of comorbidities • OR: 1.19 (95% CI: 0.9-1.6), p=0.21 *Hospitalization, n/N (%):* Any comorbidities: • OR: 2.73 (95% CI: 1.6-4.7), p=0.0033 • Hospitalized: 23/66 (35%) • Not hospitalized: 219/369 (59%) **Risk Markers:** NR **Long-term Sequelae:** Non-elective readmissions: 5 patients required re-admission, 1 of whom was readmitted twice
Author: Guan[10] **Year:** 2021 **Data Extractor:** DOS	**Population:** N=39,420	**Medical Condition, n/N (%):** Asthma: 244/39,420 (0.6%) **Control/Comparison group, n/N (%):**	**Medical Condition(s):** *Asthma:* physician diagnosis at hospital admission or discharge from hospital was extracted with computer software based on ICD-10 codes from	**Severe COVID-19:** *aOR: Adjusted odds ratio; multivariable logistic regression adjusting for age, sex, and other systemic comorbidities* *OR: Odds ratio; univariable logistic regression*

Study	Population and Setting	Intervention	Definitions	Outcomes
Reviewer: MW **Study design:** Retrospective cohort **Study Objective:** To explore the association between chronic respiratory diseases (CRD) and the clinical outcomes of COVID-19. **IVA Score:** 24 (moderate)	**Setting:** National COVID-19 reporting system **Location:** China **Study dates:** December 2019 - May 6, 2020 **Inclusion criteria:** All hospitalized patients had to have a diagnosis of laboratory-confirmed COVID-19. All patients had established CRD before admission. Data derived from platform of in-patient EMR authorized by National Health Commission. Since the initial outbreak, submission of EMR from individual hospitals designated for admitting patients with COVID-19 was requested by the National health Commission. **Exclusion criteria:** Patients without any information on comorbidities, clinical outcomes, age or sex data, discharge	No asthma: 39,176/39,420 (99.4%)	EMR; all diagnoses made based on either past history documents in clinical charts or the clinical manifestations consisted with global guidelines (Global initiatives for Asthma) **Severity Measure(s):** NR **Clinical marker:** NR **Treatment/ Associated Therapy:** NR **Outcome Definitions:** *Mortality:* death within 30 days after hospitalization *ICU admission:* admission to the intensive care unit *Intubation:* NR *Ventilation:* noninvasive ventilation, invasive mechanical ventilation, ECMO *Hospitalization:* NR *Non-elective readmissions*: NR **Comments:** None	*Mortality, n/N (%):* Asthma: • aOR: 0.84 (95% CI: 0.48-1.48), p=0.544 • OR: 1.11 (95% CI: 0.65-1.91) • Asthma: 14/244 (5.7%) • No asthma: 2039/39176 (5.2%) *ICU admission, n/N (%):* Asthma: • aOR: 1.89 (95% CI: 1.34-2.66), p<0.001 • OR: 2.07 (95% CI: 1.48-2.90) • Asthma: 41/244 (16.8%) • No asthma: 5507/39176 (8.9%) *Invasive ventilation, n/N (%):* Asthma: • aOR: 0.61 (95% CI: 0.29-1.3), p=0.200 • OR: 0.74 (95% CI: 0.35-1.57) • Asthma: 7/244 (2.9%) • No asthma: 1506/39176 (3.8%) **Severity of Condition**: NR **Duration of Condition**: NR **Treatment/ Associated Therapy**: NR **Comorbid Conditions**: *Mortality, n/N (%):* COPD & asthma: • aOR: 1.06 (95% CI: 0.34-3.34), p=0.918 • OR: 3.47 (95% CI: 1.19-10.12) • COPD & asthma: 4/25 (16.0%) • No COPD & asthma: 2049/39395 (5.2%) Asthma & bronchiectasis: • aOR: 0.94 (95% CI: 0.11-7.75), p=0.95 • OR: 1.82 (95% CI: 0.23-14.22) • COPD & asthma: 1/11 (9.1%) • No COPD & asthma: 2052/39409 (5.2%) *ICU admission, n/N (%):*

Study	Population and Setting	Intervention	Definitions	Outcomes
	records, or admission date.			COPD & asthma: • aOR: 0.94 (95% CI: 0.28-3.16), p=0.921 • OR: 1.39 (95% CI: 0.42-4.65) • COPD & asthma: 3/25 (12.0%) • No COPD & asthma: 3516/39395 (8.9%) Asthma & bronchiectasis: • aOR: 0.81 (95% CI: 0.1-6.36), p=0.839 • OR: 1.02 (95% CI: 0.13-7.97) • COPD & asthma: 1/11 (9.1%) • No COPD & asthma: 3518/39409 (8.9%) *Invasive ventilation, n/N (%):* COPD & asthma: • aOR: 0.47 (95% CI: 0.06-3.52)), p=0.462 • OR: 1.04 (95% CI: 0.14-7.69) • COPD & asthma: 1/25 (4.0%) • No COPD & asthma: 1512/39395 (3.8%) Asthma & bronchiectasis: • aOR: 0 (95% CI: 0-0), p=0.946 • OR: 0 (95% CI: 0-0) • COPD & asthma: 0/11 (0%) • No COPD & asthma: 1513/39409 (3.8%) **Risk Markers**: NR **Long-term Sequelae:** NR
Author: Gude-Sampedro[28] **Year:** 2020 **Data Extractor:** CO **Reviewer:** ECS/MW/DOS **Study design:** Retrospective cohort **Study Objective:** to develop and validate a prognostic model to	**Population:** N=10,454 patients **Setting:** NR **Location:** Spain **Study dates:** March 6, 2020-May 7, 2020 **Inclusion criteria:** patients with COVID-19 infection confirmed by RT-PCR on nasal or throat swab	**Medical Condition:** Asthma: 288/10,454 (2.8%) **Control/Comparison group:** No Asthma: 10,166/10,454 (97.2%)	**Medical Condition(s):** *(ICPC-2 codes)* *Asthma*: ICPC-2 code R96; data extracted from electronic health records **Severity Measure(s):** NR **Clinical marker**: NR **Treatment/ Associated Therapy**: NR **Outcome Definitions:** COVID-19: a positive reverse transcription polymerase chain reaction (RT-PCR) test on samples	**Severe COVID-19:** *Multivariable logistic regression [OR] (95% CI)* **unadjusted Odds Ratio (95% CI)* *Mortality, n/N (%):* 544/10,454 (5.2%) *Mortality (medical conditions), n/N (%):* Asthma: • 13/288 (4.5%) • *OR: 0.86 (95% CI: 0.49-1.40) *ICU Admission*: 284/10,454 (2.7%)

Study	Population and Setting	Intervention	Definitions	Outcomes
identify patients with Covid-19 infection at a higher risk of hospitalization, ICU admission and death, based on their age, sex, comorbidities and geographic place of residence **IVA Score:** 24 (moderate)	samples; data were collected from the Galician Health Service database (SERGAS), a longitudinal Galicia data of the population **Exclusion criteria:** NR		obtained from nasal or throat swabs performed in accordance with WHO protocol *Hospitalization*: NR *ICU Admission*: the patient was a candidate for ICU admission if they required mechanical ventilation or had a fraction of inspired oxygen of≥60% *Ventilation*: ND *Intubation*: ND *Mortality*: death of any cause after RT-PCR diagnosis **Comments:** none	*ICU Admission among hospitalized patients (medical conditions), n/N (%):* Asthma: • 14/103 (13.6%) • *OR: 1.23 (95% CI: 0.69-2.19) *Hospitalization*: 2,492/10,454 (23.8%) Asthma: • 103/288 (35.7%) • OR: 2.08 (95% CI: 1.57-2.75) • *OR: 1.81 (95% CI: 1.41-2.31) **Severity of Condition:** NR **Duration of Condition:** NR **Treatment/ Associated Therapy:** NR **Comorbid Conditions:** Charlson index: *Mortality, n/N (%)* Score of 0: 1/119 (0.8%) Score of 1-2: 18/442 (4.07%) Score of 3-4: 211/1408 (14.9%) Score of ≥5: 160/633 (25.2%) *ICU admission, n/N (%)* Score of 0: 8/119 (6.7%) Score of 1-2: 55/442 (12.4%) Score of 3-4: 163/1408 (11.5%) Score of ≥5: 58/633 (9.1%) *Hospitalization, n/N (%)* Score of 0: 119/2078 (5.7%) Score of 1-2: 442/3445 (12.8%) Score of 3-4: 1408/3875 (36.3%) Score of ≥5: 633/1056 (59.9%) Charlson Comorbidity Index predicts 10-year life expectancy of patients with multiple comorbidities **Risk Markers:** NR

Study	Population and Setting	Intervention	Definitions	Outcomes
				Long-term Sequelae: NR
Author: Hansen[11] **Year:** 2021 **Data Extractor:** CS **Reviewer:** DOS **Study design:** Retrospective cohort study **Study Objective:** To determine the risk of severe outcomes of COVID-19 among patients with asthma and COPD. To investigate whether eosinophilic inflammation was associated with frequency of severe outcomes of COVID-19. **IVA Score:** 25 (moderate)	**Population:** N=5,104 **Setting:** Nationwide healthcare registries **Location:** Denmark **Study dates:** February 1-July 10, 2020 **Inclusion criteria:** All patients with a COVID-19 diagnosis (ICD-10 codes B342A, B972, and B972A) registered in the Danish registers were included. **Exclusion criteria:** NR	**Medical Condition, n/N (%):** Asthma: 354/5,104 (6.9%) **Control/Comparison group, n/N (%):** No asthma/COPD: 4,318/5,104 (84.6%)	**Medical Condition(s):** *Asthma:* ICD-10 code J45 or patients were defined with asthma if they had filled a minimum of two prescriptions of inhaled corticosteroids or leukotriene receptor antagonists without concurrent use of long-acting muscarinergic antagonists within the last year **Severity Measure(s):** NR **Clinical marker:** NR **Treatment/ Associated Therapy:** NR **Outcome Definitions:** *Mortality:* death within the first 30 days *ICU admission:* admission to ICU within the first 30 days *Intubation:* NR *Ventilation:* NR *Hospitalization:* NR *Non-elective readmissions*: NR **Comments:** None	**Severe COVID-19:** *aHR: Adjusted Hazard Ratio; Cox proportional hazards model adjusted for age, sex, education level, and a combined covariate for cardiac disease (heart failure, atrial fibrillation or flutter, or ischemic heart disease)* *Risk difference* *Age standardized risk estimates* *Mortality, n/N (%):* Asthma • aHR: 1.01 (95%CI: 0.66-1.56); p=0.95 • Risk difference: patients with asthma did not have increased risk of death compared to patients without asthma or COPD • Asthma: 22/354 (6.2%) • No asthma/COPD: 419/4318 (9.7%) *ICU admission, n/N (%):* Asthma • aHR: 1.07 (95%CI: 0.65-1.75); p=0.79 • Risk difference: no differences in risk of admission to ICU compared to those without asthma or COPD • Asthma: 17/354 (4.8%) • No asthma/COPD: 252/4318 (5.8%) **Severity of Condition:** NR **Duration of Condition:** NR **Treatment/ Associated Therapy:** NR **Comorbid Conditions:** NR **Risk Markers:** *Mortality:* Asthma: 30 years • Age standardized risk: 0.4 (95%CI: 0.0-0.7) 50 years • Age standardized risk: 15.2 (95%CI: 1.0-29.4) 70 years • Age standardized risk: 51.9 (95%CI: 3.7-100.0)

Study	Population and Setting	Intervention	Definitions	Outcomes
				Patients without asthma or COPD: 30 years • Age standardized risk: 0.0 (95%CI: 0.0-0.7) 50 years • Age standardized risk: 1.3 (95%CI: 0.8-1.8) 70 years • Age standardized risk: 55.2 (95%CI: 18.8-91.6) *ICU admission:* Asthma: 30 years • Age standardized risk: 1.1 (95%CI: 0.0-2.1) 50 years • Age standardized risk: 12.5 (95%CI: 3.1-21.8) 70 years • Age standardized risk: 46.1 (95%CI: 9.6-82.5) Patients without asthma or COPD: 30 years • Age standardized risk: 0.7 (95%CI: 0.2-1.2) 50 years • Age standardized risk: 8.5 (95%CI: 6.9-10.1) 70 years • Age standardized risk: 38.6 (95%CI: 21.2-55.9) **Long-term Sequelae:** NR
Author: Hassaan[44] **Year:** 2021 **Data Extractor:** MW **Reviewer:** DOS **Study Design:** Ecologic **Study Objective:** To model different environmental, socioeconomic, and demographic factors; health security capacity; comorbidities; and social mobility as predictors of	**Population:** N=NR **Setting:** NR **Location:** African countries **Study dates:** Up to August 16, 2020 **Inclusion criteria:** Data of the total confirmed cases and deaths at the national level retrieved from World Health Organization portal and data of predictor variables acquired form The	**Medical Condition, n/N (%):** Asthma: NR **Control/Comparison group, n/N (%):** No asthma: NR	**Medical Condition(s):** *Asthma:* ND **Severity Measure(s):** NR **Clinical marker:** NR **Treatment/ Associated Therapy:** NR **Outcome Definitions:** *Mortality:* COVID-19 case fatality rate *ICU admission:* NR *Intubation:* NR *Ventilation:* NR *Hospitalization:* NR *Non-elective readmissions*: NR **Comments:** None	**Severe COVID-19:** B_{OLS}: β-coefficient from *Ordinary Least Squares Regression model (OLS) evaluating the relationship between predictors and COVID-19 fatality* B_{GWR}: β-coefficient from *geographically weighted regression model (GWR) estimating the predictive power of variables locally for each country* *Mortality:* Asthma prevalence: • β_{OLS}: 0.00420 • β_{GWR}: 0.00162 COVID-19 fatality was found to be positively related to asthma prevalence (β_{OLS}=0.00420). The relationship between COVID-19 fatality and asthma prevalence can be more accurately captured in the north-eastern African countries.

Study	Population and Setting	Intervention	Definitions	Outcomes
the geospatial incidence and fatality of COVID-19. **IVA Score:** 19 (Moderate)	World Bank Group and The Global Health Observatory. **Exclusion criteria:** Spatial and statistical outlier records in COVID-19 incidence and case fatality rate.			**Severity of Condition:** NR **Duration of Condition:** NR **Treatment/ Associated Therapy:** NR **Comorbid Conditions:** NR **Risk Markers:** NR **Long-term Sequelae: NR**
Author: Hippisley-Cox[69] **Year:** 2021 **Data Extractor:** CNS **Reviewer:** DOS **Study Design:** Cohort **Study Objective:** To develop and validate two new QCovid risk algorithms, based on data from the second pandemic wave in England, to identify those groups at highest risk of severe covid-19 outcomes: QCovid2 (based on unvaccinated patients) and QCovid3 (based on vaccinated patients). **IVA Score:** Asthma: 22 (moderate) COPD: 23 (moderate)	**Population:** N=6,952,440 COVID-19+, N = NR **Setting:** 1,336 practices **Location:** England **Study dates:** September 1, 2020-June 15, 2021 **Inclusion criteria:** All adults aged 19-100 years in the QResearch database who had one or two doses of the ChAdOx1 nCoV-19 (Oxford-AstraZeneca) or BNT162b2 (Pfizer-BioNTech) vaccine between December 8, 2020 - June 15, 2021. Individuals were followed from 14 days after receiving each vaccine dose until they had the outcome of interest, died, or reached the end of the study period. The unvaccinated cohort included people aged 19-100 years and observed between September 1, 2020 - May 31, 2021, but	**Medical Condition, n/N (%):** Asthma: NR **Control/Comparison group, n/N (%):** Asthma: NR	**Medical Condition(s):** *Asthma:* ND **Severity Measure(s):** NR **Clinical marker:** NR **Treatment/ Associated Therapy:** NR **Outcome Definitions:** *Mortality:* • Time to COVID-19 related death in or out of hospital as recorded on the death certification 14 days or more after vaccination, or death within 28 days of a SARS-CoV-2 infection confirmed by RT-PCR • COVID-19 related death in unvaccinated patients with a SARS-CoV-2 positive test *ICU admission:* NR *Intubation:* NR *Ventilation:* NR *Hospitalization:* hospital admission with confirmed or suspected covid-19 on ICD-10 codes U071 and U072, or new hospital admission associated with a confirmed SARS-CoV-2 infection in the preceding 14 days in unvaccinated patients with a SARS-CoV-2 positive test *Non-elective readmissions*: NR **Comments:** None	**Severe COVID-19:** *aHR1: Adjusted Cox Proportional Hazard Ratio for COVID-19 related death in those with a SARS-CoV-2 positive test; model mutually adjusted and included fractional polynomial terms for age, body mass index, vaccination dose, and background infection rate at time of vaccination* *aHR2: Adjusted Cox Proportional Hazard Ratio for COVID-19 related death/hospitalization in unvaccinated patients with a SARS-CoV-2 positive test; model mutually adjusted and included fractional polynomial terms for age and body mass index* **Severity of Condition:** NR **Duration of Condition:** NR **Treatment/ Associated Therapy:** NR **Comorbid Conditions:** NR **Risk Markers:** *Mortality:* *Asthma, men:* • aHR2: 0.89 (95% CI: 0.82-0.97), p=NR *Asthma, women:* • aHR: 0.98 (95% CI: 0.91-1.07), p=NR *Hospitalization, n/N (%):* *Asthma, men:* • aHR2: 0.91 (95% CI: 0.85-0.98), p=NR *Asthma, women:* • aHR2: 1.08 (95% CI: 1.01-1.16), p=NR **Long-term Sequelae:** NR

Study	Population and Setting	Intervention	Definitions	Outcomes
	people who were subsequently vaccinated were censored on the date of their first vaccination. **Exclusion criteria:** Patients that had a covid-19 associated hospital admission before their start of follow-up (14 days after the first or second dose of vaccination).			
Author: Ho[12] **Year:** 2021 **Data Extractor:** MC **Reviewer:** DOS **Study design:** Retrospective cohort **Study Objective:** The primary aim was to evaluate the outcomes of patients presenting to the Mount Sinai Health System with a diagnosis of asthma and COVID-19 infections. The secondary objective was to determine if peripheral blood eosinophil levels were associated with outcomes in hospitalized patients with COVID-19	**Population:** N= 10,523 **Setting:** 6 large academic hospitals **Location:** New York, USA **Study dates:** March 7 - June 7, 2020 **Inclusion criteria:** All adults (≥18 years of age) with reverse transcriptase polymerase chain reaction-confirmed SARS-CoV-2 infection by the nasopharyngeal or oropharyngeal swab. Patients with a definitive clinical outcome, having been discharged to the outpatient setting or having completed their	**Medical Condition, n/N (%):** Asthma: 468/10,523 (4.45%) 95/233 hospitalized patients with asthma were on corticosteroid medications **Control/Comparison group, n/N (%):** No asthma: 10,055/10,523 (95.55%)	**Medical Condition(s):** *Asthma*: ND **Severity Measure(s):** NR **Clinical marker:** NR **Treatment/ Associated Therapy:** NR **Outcome Definitions:** *Mortality:* in-hospital mortality *ICU admission:* ND *Intubation:* ND *Ventilation:* NR *Hospitalization:* hospital admission *Non-elective readmissions*: NR **Comments:** None	**Severe COVID-19:** *aOR: Multivariable Logistic Regression: Multivariable Logistic Regression* *OR: Univariable Logistic Regression* *Mortality, n/N (%)* • aOR: 0.64 (0.53-0.77), p<0.001 • OR: 0.59 (0.49-0.71), p<0.001 • Asthma: 54/233 (23.18%) • No asthma: 1354/4669 (29.00%) • p=0.06 *ICU admission, n/N (%)* • aOR: 0.51 (0.41-0.64), p<0.001 • OR: 0.89 (0.64-1.26), p=0.53 • Asthma: 45/233 (19.31%) • No asthma: 1005/4669 (21.52%) • p=0.51 *Intubation:* • aOR: 0.56 (0.17-1.86), p=0.35 • OR: 0.54 (0.45-0.67), p<0.001 • Asthma: 28/233 (12.02%) *Hospitalization:* • aOR: 0.43 (0.28-0.64), p<0.001 • OR: 0.82 (0.77-0.87), p<0.001 • Asthma: 233/468 (49.8%)

Study	Population and Setting	Intervention	Definitions	Outcomes
infection, both with and without asthma. **IVA Score:** 24 (moderate)	hospital course (i.e., discharged alive or died) at the time of analysis (July 7, 2020), were included for further study. **Exclusion criteria:** NR			• No asthma:4669/10055 (46.4%) **Severity of Condition:** NR **Duration of Condition:** NR **Treatment/ Associated Therapy:** NR **Comorbid Conditions:** *Hospitalization, n/N (%):* Hypertension: • Asthma: 141/245 (57.6%) • No asthma: 1444/2417 (59.7%) Diabetes: • Asthma: 86/151 (57.0%) • No asthma: 943/1528 (61.7%) Chronic kidney disease: • Asthma: 54/76 (71.1%) • No asthma: 517/840 (61.5%) Chronic obstructive pulmonary disease: • Asthma: 36/54 (66.7%) • No asthma: 156/232 (67.2%) Obstructive sleep apnea: • Asthma: 21/44 (47.7%) • No asthma: 83/152 (54.6%) **Risk Markers:** NR **Long-term Sequelae:** NR
Author: Huang[45] **Year:** 2021 **Data Extractor:** MC **Reviewer:** DOS **Study Design:** Cohort **Study Objective**: To conduct a population-based study to assess asthma disease status and chronic obstructive pulmonary disease	**Population:** N= 61,338 **Setting:** Large integrated health care system **Location**: Southern California, US **Study dates:** March 1 - August 31, 2020 **Inclusion criteria:** All adult Kaiser Permanente Southern California (KPSC)	**Medical Condition, n/N (%):** Asthma: 5,526/61,338 (9%) • Active asthma: 2,775/61,338 (4.5%) • Inactive asthma: 2,751/61,338 (4.5%) **Control/Comparison group, n/N (%):** No asthma or COPD: 54,992/61,338 (89.7%)	**Medical Condition(s):** *Asthma:* ICD-10 J45; patients were defined as having asthma if they had at least 1 inpatient/emergency department code or at least 2 outpatient codes for asthma prior to COVID-19 diagnosis date **Severity Measure(s):** *Active asthma:* Patients with any scheduled or unscheduled clinical visit with an asthma diagnosis code in the 12 months prior to COVID-19 diagnosis *Inactive asthma:* Patients with no scheduled or unscheduled clinical visit with an asthma diagnosis code in the 12 months prior to COVID-19 diagnosis	**Severe COVID-19:** *aOR: Multivariable Logistic Regression; model included age group, sex, race/ethnicity, income, college education, Medicaid insurance status, BMI category, smoking, and modified Charlson comorbidity score; COPD models run among individuals aged 35 and older* *aHR: Cox regression hazard ratio; COPD models run among individuals aged 35 years and older* **Severity of Condition:** *Mortality, n/N (%)* Active asthma: • aHR: 0.98 (95% CI: 0.76-1.27) • Active asthma; 65/2,775 (2.3%) • No asthma or COPD: 757/54,992 (1.4%) Inactive asthma: • aHR: 0.83 (95% CI: 0.58-1.19)

Study	Population and Setting	Intervention	Definitions	Outcomes
(COPD) in relation to COVID-19 severity. **IVA Score:** Asthma: 24 (Moderate) COPD: 23 (Moderate)	patients with a confirmed COVID-19 diagnosis within study dates. Patients were defined as COVID-19 cases if they had a positive SARS-CoV-2 PCR laboratory test or a diagnosis code for COVID-19. **Exclusion criteria:** Patients who had asymptomatic COVID-19 diagnosis codes and negative laboratory test results within two weeks after the diagnosis. Patients were also excluded if they were nonmembers or members for less than 1 year and thus had incomplete medical data or had other/unknown sex.		**Clinical marker:** NR **Treatment/ Associated Therapy:** *Medication use*: Patients with and without medication use in the past 12 months; medications included bronchodilators, leukotriene receptor antagonists, and corticosteroids **Outcome Definitions:** *Mortality:* Death within 60 days of COVID-19 diagnosis *ICU admission:* ICU admission within 30 days of COVID-19 diagnosis *Intubation:* NR *Ventilation:* Intensive respiratory support, which included invasive mechanical ventilation, noninvasive ventilation, high-flow mask, or high-flow nasal cannula, within 30 days of COVID-19 diagnosis *Hospitalization:* hospitalization within 30 days of COVID-19 diagnosis *Non-elective readmissions*: NR **Comments:** None	• Inactive asthma: 31/2,751 (1.1%) • No asthma or COPD: 757/ 54,992 (1.4%) *ICU admission, n/N (%)* Active asthma: • aOR: 1.47 (95% CI: 1.14-1.89) • Active asthma: 78/2,775 (2.8%) • No asthma or COPD: 796/54,992 (1.4%) Inactive asthma: • aOR: 0.81 (95% CI: 0.56-1.20) • Inactive asthma: 29/2,751 (1.1%) • No asthma or COPD: 796/54,992 (1.4%) *Ventilation (IRS), n/N (%)* Active asthma: • aOR: 1.49 (95% CI: 1.21-1.83) • Active asthma: 118/2,775 (4.3%) • No asthma or COPD: 1,242/54,992 (2.3%) Inactive asthma • aOR: 0.83 (95% CI: 0.61-1.12) • Inactive asthma: 48/2,751 (1.7%) • No asthma or COPD: 1,242/54,992 (2.3%) *Hospitalization, n/N (%)* Active asthma • aOR: 1.66 (95% CI: 1.45-1.89) • Active asthma: 330/2,775 (11.9%) • No asthma or COPD: 3,404/54,992 (6.2%) Inactive asthma • aOR: 0.95 (95% CI: 0.80-1.13) • Inactive asthma: 154/2,751 (5.6%) • No asthma or COPD: 3,404/54,992 (6.2%) **Duration of Condition:** NR **Treatment/ Associated Therapy:** NR *Mortality, n/N (%)* Active asthma with medication: • aHR: 0.86 (95% CI: 0.63-1.18) • Active asthma with medication: 43/2,286 (1.9%) • No asthma or COPD: 757/ 54,992 (1.4%) Active asthma without medication: • aHR: 1.33 (95% CI: 0.87-2.05) • Active asthma without medication: 22/489 (4.5%) • No asthma or COPD: 757/ 54,992 (1.4%) Inactive asthma with medication: • aHR: 0.77 (95% CI: 0.47-1.27) • Inactive asthma with medication: 16/1,320 (1.2%) • No asthma or COPD: 757/ 54,992 (1.4%)

Study	Population and Setting	Intervention	Definitions	Outcomes
				Inactive asthma without medication: • aHR: 0.91 (95% CI: 0.54-1.51) • Inactive asthma without medication: 15/1,431 (1.0%) • No asthma or COPD: 757/ 54,992 (1.4%) *ICU admission, n/N (%)* Active asthma with medication: • aOR: 1.20 (95% CI: 0.89-1.62) • Active asthma with medication: 52/2,286 (2.3%) • No asthma or COPD: 796/54,992 (1.4%) Active asthma without medication: • aOR: 2.75 (95% CI: 1.77-4.27) • Active asthma without medication: 26/489 (5.3%) • No asthma or COPD: 796/54,992 (1.4%) Inactive asthma with medication: • aOR: 0.88 (95% CI: 0.53-1.45) • Inactive asthma with medication: 17/1,320 (1.3%) • No asthma or COPD: 796/54,992 (1.4%) Inactive asthma without medication: • aOR: 0.74 (95% CI: 0.41-1.32) • Inactive asthma without medication: 12/1,431 (0.8%) • No asthma or COPD: 796/54,992 (1.4%) *Ventilation, n/N (%)* Active asthma with medication: • aOR: 1.36 (95% CI: 1.08-1.72) • Active asthma with medication: 88/2,286 (3.8%) • No asthma or COPD: 1,242/54,992 (2.3%) Active asthma without medication: • aOR: 2.06 (95% CI: 1.37-3.10) • Active asthma without medication: 30/489 (6.1%) • No asthma or COPD: 1,242/54,992 (2.3%) Inactive asthma with medication: • aOR: 0.93 (95% CI: 0.63-1.37) • Inactive asthma with medication: 29/1,320 (2.2%) • No asthma or COPD: 1,242/54,992 (2.3%) Inactive asthma without medication: • aOR: 0.71 (95% CI: 0.45-1.14) • Inactive asthma without medication: 19/1,431 (1.3%) • No asthma or COPD: 1,242/54,992 (2.3%) *Hospitalization, n/N (%)* Active asthma with medication: • aOR: 1.56 (95% CI: 1.35-1.81) • Active asthma with medication: 254/2,286 (11.1%) • No asthma or COPD: 3,404/54,992 (6.2%) Active asthma without medication: • aOR: 2.14 (95% CI: 1.62-2.82) • Active asthma without medication: 76/489 (15.5%) • No asthma or COPD: 3,404/54,992 (6.2%)

Study	Population and Setting	Intervention	Definitions	Outcomes
				Inactive asthma with medication: • aOR: 1.02 (95% CI: 0.80-1.28) • Inactive asthma with medication: 86/1,320 (6.5%) • No asthma or COPD: 3,404/54,992 (6.2%) Inactive asthma without medication: • aOR: 0.89 (95% CI: 0.68-1.15) • Inactive asthma without medication: 68/1,431 (4.8%) • No asthma or COPD: 3,404/54,992 (6.2%) **Comorbid Conditions:** NR **Risk Markers:** *Mortality, n/N (%)* Age 35-64 years: Active asthma: • aOR: 1.62 (95% CI: 1.05-2.48) • Active asthma: 25/1,456 (1.7%) • No asthma or COPD: 235/30,886 (0.8%) Inactive asthma: • aOR: 0.81 (95% CI: 0.40-1.64) • Inactive asthma: 8/1,321 (0.6%) • No asthma or COPD: 235/30,886 (0.8%) Age ≥65 years: Active asthma: • aOR: 0.73 (95% CI: 0.52-1.02) • Active asthma: 36/427 (8.4%) • No asthma or COPD: 516/5,509 (9.3%) Inactive asthma: • aOR: 0.81 (95% CI: 0.53-1.24) • Inactive asthma: 23/285 (8.0%) • No asthma or COPD: 516/5,509 (9.3%) *ICU admission, n/N (%)* Age 18-34 years: Active asthma: • aOR: 1.86 (95% CI: 0.76-4.55) • Active asthma: 7/892 (0.8%) • No asthma or COPD: 40/18,597 (0.2%) Inactive asthma: • aOR: 0.99 (95% CI: 0.23-4.17) • Inactive asthma: 2/1,145 (0.2%) • No asthma or COPD: 40/18,597 (0.2%) Age 35-64 years: Active asthma: • aOR: 1.52 (95% CI: 1.07-2.15) • Active asthma: 41/1,456 (2.8%) • No asthma or COPD: 465/30,886 (1.5%) Inactive asthma: • aOR: 0.78 (95% CI: 0.46-1.33)

Study	Population and Setting	Intervention	Definitions	Outcomes
				• Inactive asthma: 15/1,321 (1.1%) • No asthma or COPD: 465/30,886 (1.5%) Age ≥65 years: Active asthma: • aOR: 1.29 (95% CI: 0.86-1.94) • Active asthma: 30/427 (7.0%) • No asthma or COPD: 291/5,509 (5.3%) Inactive asthma: • aOR: 0.87 (95% CI: 0.47-1.59) • Inactive asthma: 12/285 (4.2%) • No asthma or COPD: 291/5,509 (5.3%) *Ventilation (IRS), n/N (%)* Age 18-34 years: Active asthma: • aOR: 1.74 (95% CI: 0.80-3.77) • Active asthma: 9/892 (1.0%) • No asthma or COPD: 59/18,597 (0.3%) Inactive asthma: • aOR: 0.92 (95% CI: 0.28-3.01) • Inactive asthma: 3/1,145 (0.3%) • No asthma or COPD: 59/18,597 (0.3%) Age 35-64 years: Active asthma: • aOR: 1.60 (95% CI: 1.21-2.13) • Active asthma: 62/1,456 (4.3%) • No asthma or COPD: 721/30,886 (2.3%) Inactive asthma: • aOR: 0.97 (95% CI: 0.66-1.43) • Inactive asthma: 29/1,321 (2.2%) • No asthma or COPD: 721/30,886 (2.3%) Age ≥65 years: Active asthma: • aOR: 1.27 (95% CI: 0.91-1.76) • Active asthma: 47/427 (11.0%) • No asthma or COPD: 462/5,509 (8.4%) Inactive asthma: • aOR: 0.66 (95% CI: 0.39-1.11) • Inactive asthma: 16/285 (5.6%) • No asthma or COPD: 462/5,509 (8.4%) *Hospitalization, n/N (%)* Age 18-34 years: Active asthma: • aOR: 2.21 (95% CI: 1.53-3.20) • Active asthma: 40/892 (4.5%) • No asthma or COPD: 274/18,597 (1.5%) Inactive asthma: • aOR: 0.87 (95% CI: 0.50-1.51)

Study	Population and Setting	Intervention	Definitions	Outcomes
				• Inactive asthma: 14/1,145 (1.2%) • No asthma or COPD: 274/18,597 (1.5%) Age 35-54 years: Active asthma: • aOR: 1.76 (95% CI: 1.47-2.09) • Active asthma: 175/1,456 (12.0%) • No asthma or COPD: 2,012/30,886 (6.5%) Inactive asthma: • aOR: 1.11 (95% CI: 0.88-1.39) • Inactive asthma: 93/1,321 (7.0%) • No asthma or COPD: 2,012/30,886 (6.5%) Age ≥65y: Active asthma: • aOR: 1.36 (95% CI: 1.08 -1.72) • Active asthma: 115/427 (26.9%) • No asthma or COPD:1,118/5,508 (20.3%) Inactive asthma: • aOR: 0.77 (95% CI: 0.55-1.07) • Inactive asthma: 47/285 (16.5%) • No asthma or COPD:1,118/5,508 (20.3%) **Long-term Sequelae:** NR
Author: Hussein[13] **Year:** 2020 **Data Extractor:** MW **Reviewer:** CNS **Study Design:** Cohort **Study Objective:** To evaluate hospitalized patients with laboratory-confirmed SARS-CoV-2, focusing on the differing outcomes between asthmatic and non-asthmatic patients and to help further understand asthma's impact on COVID-19 outcomes in order to help enable physicians to tailor management and resource allocation in response to the ongoing pandemic.	**Population:** N=502 **Setting:** One university medical center and three medical centers **Location:** LA, USA **Study dates:** March 15 – June 9, 2020 **Inclusion criteria:** Hospitalized patients ≥ 18 years old with laboratory-confirmed SARS-CoV-2 infection and presented to one of the study's medical centers. **Exclusion criteria:** Patients below 18 years of age or did not have recorded outcome data.	**Medical Condition, n/N (%):** Asthma: 72/502 (14.3%) **Control/Comparison group, n/N (%):** No asthma: 430/502 (85.7%)	**Medical Condition(s):** *Asthma:* ND **Severity Measure(s):** NR **Clinical marker:** NR **Treatment/ Associated Therapy:** NR **Outcome Definitions:** *Mortality:* In-hospital mortality *ICU admission:* ND *Intubation:* Endotracheal intubation *Ventilation:* Mechanical ventilation *Hospitalization:* NR *Non-elective readmissions*: NR **Comments:** None	**Severe COVID-19:** *aOR: adjusted odds ratio; Binary logistic regression analysis including age, sex, obesity* *Mortality, n/N (%):* • Asthma: 7/72 (9.7%) • No asthma: 57/423 (13.5%) • p=0.45 *ICU admission, n/N (%):* • aOR: 1.81 (95% CI: 0.98-3.09), p=0.06 • Asthma: 16/72 (22.2%) • No asthma: 63/423 (14.9%) • p=0.12 *Intubation, n/N (%):* • aOR: 1.77 (95% CI: 0.99-3.04), p=0.06 • Asthma: 29/72 (40.3%) • No asthma: 118/423 (27.9%) • p=0.036 *Ventilation, n/N (%):* • Asthma: 29/72 (40.3%) • No asthma: 109/423 (25.8%) • p=0.039 **Severity of Condition:** NR **Duration of Condition:** NR

Study	Population and Setting	Intervention	Definitions	Outcomes
IVA Score: 24 (Moderate)				**Treatment/ Associated Therapy:** NR **Comorbid Conditions:** *Mortality, n/N (%):* • Asthma & obesity: 6/54 (11.1%) • Asthma & no obesity: 1/18 (5.6%) *ICU admission, n/N (%):* • Asthma & obesity: 26/54 (48.1%) • Asthma & no obesity: 4/18 (22.2%) *Intubation, n/N (%):* • Asthma & obesity: 23/54 (42.6%) • Asthma & no obesity: 6/18 (33.3%) *Ventilation, n/N (%):* • Asthma & obesity: 24/54 (44.4%) • Asthma & no obesity: 5/18 (27.8%) **Risk Markers:** NR **Long-term Sequelae:** NR
Author: Jung[64] **Year:** 2021 **Data Extractor:** JH **Reviewer:** DOS **Study Design:** Cohort **Study Objective:** To evaluate and estimate the association between previous asthma/COPD and the susceptibility of patients to COVID-19 in a nationwide cohort and the severity and mortality of COVID-19. **IVA Score:** Asthma: 24 (Moderate) COPD: 23 (Moderate)	**Population:** N= 4066 **Setting:** Hospital/ residential center **Location:** Korea **Study dates:** January 1 – June 4, 2020 **Inclusion criteria:** Patients with confirmed COVID-19 via RT-PCR of nasal or pharyngeal swabs during the study dates with previously diagnosed asthma/COPD. **Exclusion criteria:** NR	**Medical Condition, n/N (%):** Asthma: 362/4066 (8.9%) • Mild: 322/4066 (7.9%) • Severe: 40/4066 (1.0%) **Control/Comparison group, n/N (%):** No Asthma: 3704/4066 (91.1%)	**Medical Condition(s):** *Asthma:* Patients who were treated for asthma (ICD-10: J45) or status asthmaticus (J46) ≥ 2 times with asthma-related medications **Severity Measure(s):** *Mild-asthma:* not using ICSs/LABAs + long-acting muscarinic antagonists (LAMAs), ICSs/LABAs + LTRAs, ICSs/LABAs + xanthine, nor corticosteroids for over 90 days medications within previous two years *Severe-asthma:* using ICSs/LABAs + long-acting muscarinic antagonists (LAMAs), ICSs/LABAs + LTRAs, ICSs/LABAs + xanthine, or corticosteroids for over 90 days medications within previous two years **Clinical marker:** NR **Treatment/ Associated Therapy:** NR **Outcome Definitions:** *Mortality:* ND *ICU admission:* NR *Intubation:* NR *Ventilation:* NR *Hospitalization:* NR	**Severe COVID-19:** *aOR1: adjusted odds ratio (model included age, sex, income, obesity, smoking, alcohol consumption, systolic blood pressure, diastolic blood pressure, fasting blood glucose, total cholesterol, CCI scores, number of NSAIDs used, number of steroids used, hypertension, asthma, and COPD)* *aOR2: adjusted odds ratio (model included age, sex, income, obesity, smoking, alcohol consumption, systolic blood pressure, diastolic blood pressure, fasting blood glucose, total cholesterol, CCI scores, number of NSAIDs used, number of steroids used, and hypertension)* **Severity of Condition:** *Mortality, n/N (%):* Mild-asthma: • aOR1: 0.85 (95% CI: 0.45-1.60), p=0.605 • aOR2: 0.96 (95% CI: 0.52-1.74), p=0.880 • OR: 2.21 (95%CI: 1.35-3.60), p=0.002 • Mild-asthma: 20/322 (6.2%) • Non-asthma: 108/3704 (2.9%) Severe-asthma: • aOR1: 0.70 (95% CI: 0.13-3.68), p=0.672 • aOR2: 1.03 (95% CI: 0.22-4.75), p=0.972 • OR: 3.70 (95%CI: 1.29-10.58), p=0.015 • Severe-asthma: 4/40 (10%) • Non-asthma: 108/3704 (2.9%) **Duration of Condition:** NR

Study	Population and Setting	Intervention	Definitions	Outcomes
			0Non-elective readmissions: NR **Comments:** None	**Treatment/ Associated Therapy:** NR **Comorbid Conditions:** NR **Risk Markers:** NR **Long-term Sequelae:** NR
Author: Khose[46] **Year:** 2020 **Data Extractor:** MC **Reviewer:** DOS **Study design:** Ecological study **Study Objective:** To determine county level variations in initial COVID-19 incidence and case fatality risk indexed to the start of epidemic in each county, and to identify the predictors for county level variations in initial incidence and case fatality risk of COVID-19. **IVA Score:** 24 (moderate)	**Population:** N= 1,052 counties **Setting:** Nationwide **Location:** Multiple locations, USA **Study dates:** June 1 - June 29, 2020 **Inclusion criteria:** Data obtained from the COVID19 Data Repository by the Center for Systems Science and Engineering at Johns Hopkins University. Counties with at least 100 cases on June 1, 2020 to allow for 4-week period before we obtained the data. **Exclusion criteria:** NR	**Medical Condition, mean prevalence (standard deviation):** Asthma: 5.0% (1.0) **Control/Comparison group:** NR	**Medical Condition(s):** *Asthma*: ND **Severity Measure(s):** NR **Clinical marker:** NR **Treatment/ Associated Therapy, n/N (%):** NR **Outcome Definitions:** *Mortality:* • *Case fatality risk:* ratio of number of new deaths and new confirmed cases, expressed as a percentage *ICU admission:* NR *Intubation:* NR *Ventilation:* NR *Hospitalization:* NR *Non-elective readmissions*: NR **Comments:** Author's note: Asthma, COPD, and CKD data obtained from Medicare beneficiary data and is not generalizable to general population.	**Severe COVID-19:** *aOR: Adjusted odds ratio; multinomial logistic regression using quartiles of case fatality risk as a dependent variable; 1st quartile is reference category* *Case fatality risk:* Asthma: • 2nd Quartile, aOR: 0.90 (95% CI: 0.73-1.10) • 3rd Quartile, aOR: 1.06 (0.86-1.30) • 4th Quartile, aOR: 0.91 (95% CI: 0.74-1.12) **Severity of Condition:** NR **Duration of Condition:** NR **Treatment/ Associated Therapy:** NR **Comorbid Conditions:** NR **Risk Markers:** NR **Long-term Sequelae:** NR
Author: Kim[65] **Year:** 2020 **Data Extractor:** CS **Reviewer:** MW	**Population:** N=2959 **Setting:** National database; Clinical Epidemiological Information provided by the	**Medical Condition, n/N (%):** Asthma: 80/2959 (2.7%) **Control/Comparison group, n/N (%):** No asthma: 2879/2959 (97.3%)	**Medical Condition(s):** *Asthma:* ND **Severity Measure(s):** NR **Clinical marker:** NR	**Severe COVID-19:** *ICU admission, n/N (%)* Asthma: • ICU: 5/133 (3.8%) • General ward: 75/2826 (2.7%) • p=0.406

Study	Population and Setting	Intervention	Definitions	Outcomes
Study design: Retrospective cohort study **Study Objective:** To answer important questions on COVID-19 progression and outcomes, as well as potential risk factors to intensive care unit admission. To analyze risk factors on the progression to severity stages of COVID-19 while using national data. **IVA Score:** 20 (moderate)	Korea Disease Control and Prevention Agency **Location:** South Korea **Study dates:** up to April 30, 2020 **Inclusion criteria:** All patients with confirmed COVID-19 who were released from isolation or dead until April 30, 2020 were included. **Exclusion criteria:** Patients with pregnancy-related variables or missing values for other variables were excluded.		**Treatment/ Associated Therapy:** NR **Outcome Definitions:** *Mortality:* NR *ICU admission:* ND *Intubation:* NR *Ventilation:* NR *Hospitalization:* NR *Non-elective readmissions*: NR **Comments:** None	**Severity of Condition:** NR **Duration of Condition:** NR **Treatment/ Associated Therapy:** NR **Comorbid Conditions:** NR **Risk Markers:** NR **Long-term Sequelae:** NR
Author: Ko[29] **Year:** 2021 **Data Extractor:** DOS **Reviewer:** CNS **Study Design:** Cohort **Study Objective:** To better understand the independent association of age, sex, race/ethnicity, and underlying medical conditions with COVID-19-associated hospitalization relative to	**Population:** N=5,416 **Setting:** Hospitals **Location:** California, Colorado, Connecticut, Georgia, Maryland, Michigan, Minnesota, New Mexico, New York, Oregon, Tennessee, and Utah, US **Study dates:** March 1 - June 23, 2020 **Inclusion criteria:** Adults with laboratory-confirmed COVID-19-associated	**Medical Condition, n/N (%):** COVID-NET patients: Asthma: 702/5,416 (13%) **Control/Comparison group, n/N (%):** BRFSS estimates: Asthma: n/N = NR (10%)	**Medical Condition(s):** *Asthma:* ND; collected from medical record for COVID-NET patients; self-reported based on answer to question "Has a doctor, nurse, or other health professional told you that you still have asthma?" for BRFSS patients **Severity Measure(s):** NR **Clinical marker:** NR **Treatment/ Associated Therapy:** NR **Outcome Definitions:** *Mortality:* NR *ICU admission:* NR *Intubation:* NR *Ventilation:* NR	**Severe COVID-19:** *aRR: Adjusted rate ratio; Generalized Poisson Regression Model; model included age, sex, and race/ethnicity* *RR: Rate ratio* *Hospitalization, n/N (%):* Asthma: • aRR: 1.4 (95% CI: 1.1-1.7); p=NR • RR: 1.4 (95% CI: 0.6-3.1); p=NR **Severity of Condition:** NR **Duration of Condition:** NR **Treatment/ Associated Therapy:** NR **Comorbid Conditions:** NR **Risk Markers:** NR

Study	Population and Setting	Intervention	Definitions	Outcomes
the non-hospitalized community-dwelling population. **IVA Score:** Asthma: 23 (moderate) COPD: 22 (moderate)	hospitalizations from 70 counties in 12 states participating in COVID-NET. COVID-NET is a population-based surveillance system capturing patients with a positive SARS-CoV-2 test no more than 14 days before admission or during hospitalization who were a resident of the preidentified surveillance catchment area and were admitted to a hospital where residents of the surveillance catchment area receive care. Behavioral Risk Factor Surveillance System (BRFSS) data were used to estimate community-dwelling adults ≥18 identified from COVID-NET catchment area. **Exclusion criteria:** Adults whose primary residence was a facility, home with services, hospice, homeless/shelter, corrections facility, other or unknown residence. Adults with primary residence information and underlying medical condition data yet to be abstracted. Adults with missing data on all the underlying medical conditions.		*Hospitalization:* laboratory-confirmed COVID-19-associated hospitalization *Non-elective readmissions*: NR **Comments:** None	**Long-term Sequelae:** NR
Author: Kolivand[47] **Year:** 2021	**Population:** N= 960 **Setting:** University healthcare centers	**Medical Condition, n/N (%):** Asthma: 23/960 (2.4%) **Control/Comparison group, n/N (%):**	**Medical Condition(s):** *Asthma:* ND **Severity Measure(s):** NR	**Severe COVID-19:** *aHR: adjusted hazard ratio (model included intubation, PaO2, history of kidney disease, history of pulmonary disease other than asthma, O2 therapy early at admission, symptomatic days*

Study	Population and Setting	Intervention	Definitions	Outcomes
Data Extractor: JH **Reviewer:** DOS **Study Design:** Cohort **Study Objective:** To assess the risk for mortality of COVID-19 among patients with a history of sulfur mustard exposure. **IVA Score:** 22 (moderate)	**Location:** Iran **Study dates:** October 2020 – May 2021 **Inclusion criteria:** Patients hospitalized with COVID-19 infection confirmed with positive RT-PCR test of specimens from the upper respiratory tract and a positive chest CT. **Exclusion criteria:** NR	No Asthma: 937/960 (97.6%)	**Clinical marker:** NR **Treatment/ Associated Therapy:** NR **Outcome Definitions:** *Mortality:* death within 28 days of admission *ICU admission:* NR *Intubation:* NR *Ventilation:* NR *Hospitalization:* NR *Non-elective readmissions*: NR **Comments:** None	*before admission, previous exposure to Sulfur Mustard, temperature, age, respiratory rate, and asthma)* *Mortality, n/N (%)* Asthma • aHR: 3.76 (95% CI: 1.69-8.36); p=0.001 • Dead: 7/124 (5.6%) • Alive: 16/836 (1.9%) • p=0.026 Intubation was included in the model [aHR: 7.34 (95% CI: 4.65-11.58), p<0.001]. **Severity of Condition:** NR **Duration of Condition:** NR **Treatment/ Associated Therapy:** NR **Comorbid Conditions:** NR **Risk Markers:** NR **Long-term Sequelae:** NR
Author: Kompaniyets[30] **Year:** 2021 **Data Extractor:** JKK **Reviewer:** CNS **Study Design:** Cross-sectional **Study Objective:** To describe common underlying medical conditions and medical complexity as well as their associations with the risk of hospitalization or severe illness among children seeking care in the hospital. **IVA Score:** 25 (moderate)	**Population:** N=43,465 **Setting:** 872 geographically dispersed US hospital inpatient and emergency departments **Location:** US **Study dates:** March 1, 2020 – January 31, 2021 **Inclusion criteria:** Patients aged 18 years or younger with inpatient or ED encounter with a primary or secondary COVID-19 discharge during the study dates; COVID-19 was defined as ICD-10-CM codes B97.29 or U07.1.	**Medical Condition, n/N (%):** Asthma: 4,416/43,465 (10.2%) **Control/Comparison group, n/N (%):** No asthma: 39,049/43,465 (89.8%)	**Medical Condition(s):** *Asthma*: ICD-10-CM codes **Severity Measure(s):** NR **Clinical marker:** NR **Treatment/ Associated Therapy:** NR **Outcome Definitions:** *Mortality*: NR *ICU admission:* NR *Intubation:* NR *Ventilation:* NR *Hospitalization:* inpatient visit/encounter *Non-elective readmissions*: NR **Comments:** None	**Severe COVID-19:** *aRR1: Adjusted risk ratio;* single generalized linear model with Poisson distribution and log link function *adjusted for frequent underlying medical conditions, age group, sex, race/ethnicity, payer type, hospital urbanicity, hospital US Census region, admission month, and admission month squared* *aRR2: Adjusted risk ratio;* single generalized linear model with Poisson distribution and log link function *adjusted for frequent underlying medical conditions, sex, race/ethnicity, payer type, hospital urbanicity, hospital US Census region, admission month, admission month squared, and prematurity (gestational age <37 weeks at birth)* *Hospitalization, n/N (%):* • aRR1: 1.23 (95% CI: 1.13-1.34), p=NR **Severity of Condition:** NR **Duration of Condition:** NR **Treatment/ Associated Therapy:** NR **Comorbid Conditions:** NR **Risk Markers:** *Hospitalization, n/N (%):* Asthma among age ≤1 year:

Study	Population and Setting	Intervention	Definitions	Outcomes
	Exclusion criteria: Patients with missing sex information or non-ED outpatient encounters.			• aRR2: 1.34 (95% CI: 1.00-1.80), p<0.05 Asthma among age 2-5 years: • aRR1: 1.88 (95% CI: 1.43-2.48), p<0.05 Asthma among age 6-11 years: • aRR1: 1.40 (95% CI: 1.15-1.71), p<0.05 Asthma among age 12-18 years: • aRR1: 1.06 (95% CI: 0.96-1.18), p=NR **Long-term Sequelae:** NR
Author: Lee[66] **Year:** 2020 **Data Extractor:** MW **Reviewer:** DOS **Study design:** Retrospective cohort **Study Objective:** To analyze the impact of asthma on the morbidities and mortalities of COVID-19 patients. **IVA Score:** 24 (moderate)	**Population:** N=7,272 **Setting:** Nationwide **Location:** South Korea **Study dates:** January 20 - May 27, 2020 **Inclusion criteria:** Data from national database of the Health Insurance Review and Assessment (HIRA). Confirmed COVID-19 patients aged ≥20 years were included. COVID-19 was defined by the following diagnostic codes using the HIRA dataset: B342, B972, B18, U181, U071. All diagnoses were confirmed by RT-PCR testing for SARS-CoV-2. **Exclusion criteria:** Patients under	**Medical Condition, n/N (%):** Asthma: 686/7,272 (9.4%) **Control/Comparison group, n/N (%):** No asthma: 6,586/7,272 (90.6%)	**Medical Condition(s):** *Asthma:* Both diagnostic codes (primary or secondary diagnostic code for asthma: J45.x, J46.x) and medication codes were simultaneously identified more than twice during the premeasurement period (January 1 - December 31, 2018) **Severity Measure(s):** *Charlson comorbidity index (CCI):* calculated by the summation of the scores of each comorbidity (ICD-10 diagnostic codes obtained during premeasurement period (January 1 - December 31, 2018)) calculated by the summation of the scores of each comorbidity (ICD-10 diagnostic codes obtained during premeasurement period (January 1 - December 31, 2018)) *Mild asthma:* patient was prescribed at least one asthma medication, excluding ICS/LABA inhalers, low-dose systemic corticosteroids (defined as a prednisolone equivalent of <10 mg/day for at least 2 weeks), and tiotropium; severity established during measurement period (January 1 - December 31, 2019) *Moderate asthma:* patient was prescribed a low-dose or high-dose ICS/LABA inhaler, but not tiotropium	**Severe COVID-19:** *aOR1: Adjusted odds ratio; multivariable logistic regression model includes age, sex, hypertension, diabetes, dyslipidemia, IHD, heart failure, and malignancies* *aOR2: Adjusted odds ratio; multivariate logistic regression model includes age, sex, CCI, and asthma* *Mortality, n/N (%):* Asthma: • aOR1: 1.28 (95% CI: 0.84-1.94), p=0.240 • aOR2: 1.06 (95% CI: 0.71-1.59), p=0.759 • Asthma: 44/686 (6.4%) • No asthma: 183/6586 (2.7%) • p<0.001 *ICU admission, n/N (%):* • Asthma: 27/686 (3.9%) • No asthma: 163/6586 (2.4%) • p=0.022 *Mechanical ventilation, n/N (%):* • Asthma: 19/686 (2.7%) • No asthma: 99/6586 (1.5%) • p=0.012 *ECMO, n/N (%):* • Asthma: 6/686 (0.8%) • No asthma: 15/6586 (0.2%) • p=0.002 **Severity of Condition:**

Study	Population and Setting	Intervention	Definitions	Outcomes
	20 years of age, those with an observation period of less than 1 year, and patients with other respiratory ailments, such as COPD, bronchiectasis, and interstitial lung disease were excluded.		or low-dose oral corticosteroids (OCSs), severity established during measurement period (January 1 - December 31, 2019) *Severe asthma:* patient was prescribed an ICS/LABA inhaler and received at least one prescription of tiotropium or a low-dose OCS; severity established during measurement period (January 1 - December 31, 2019) **Clinical marker:** NR **Treatment/ Associated Therapy:** NR **Outcome Definitions:** *Mortality:* ND *ICU admission:* ND *Intubation:* NR *Ventilation:* Cases of mechanical ventilation or extracorporeal membrane oxygenation (ECMO) were defined as patients who experienced respiratory failure *Hospitalization:* NR *Non-elective readmissions*: NR **Comments:** None	*aOR3: Adjusted odds ratio; multivariable logistic regression analysis in patients with asthma; model includes age, sex, and number of acute exacerbations (0 vs. ≥1)* *Mortality, n/N (%):* CCI: • aOR2: 1.18 (95% CI: 1.11–1.25), p<0.001 Moderate to severe vs. mild asthma: • aOR1: 2.12 (95% CI: 0.97–4.64), p=0.059 • aOR3: 1.33 (95% CI: 0.54–3.30), p=0.526 • Moderate to severe asthma: 10/72 (13.8%) • Mild asthma: 34/614 (5.5%) • p=0.006 *ICU admission, n/N (%):* • Moderate to severe asthma: 2/72 (2.7%) • Mild asthma: 25/614 (4.0%) • p=0.593 *Mechanical ventilation, n/N (%):* • Moderate to severe asthma: 2/72 (2.7%) • Mild asthma: 17/614 (2.7%) • p=0.996 *ECMO, n/N (%):* • Moderate to severe asthma: 1/72 (1.3%) • Mild asthma: 5/614 (0.8%) • p=0.620 **Duration of Condition:** NR **Treatment/ Associated Therapy:** NR **Comorbid Conditions:** NR **Risk Markers:** NR **Long-term Sequelae:** NR
Author: Mahdavinia[48] **Year:** 2020	**Population:** N= 935 **Setting:** University medical enter	**Medical Condition, n/N (%):** Asthma: 241/935 (25.8%)	**Medical Condition(s):** *Asthma:* diagnosis based on Global Initiative for Asthma (GINA) guidelines; 20% of medical charts	**Severe COVID-19:** *aOR: Multivariable Logistic Regression* *Mortality, n/N (%)*

Study	Population and Setting	Intervention	Definitions	Outcomes
Data Extractor: TR **Reviewer:** DOS **Study design:** Retrospective cohort **Study Objective:** To study the role of asthma in the outcome of COVID-19 patients. **IVA Score:** 23 (moderate)	**Location:** Illinois, USA **Study dates:** March 12 – April 3, 2020 **Inclusion criteria:** Patients who were tested by the on-demand COVID telemedicine clinic or the emergency room through an EMR algorithm for COVID-19 and had a positive COVID-19 test result. **Exclusion criteria:** Patients without completed data on demographic variables, asthma, and COVID-19 management.	**Control/Comparison group, n/N (%):** No asthma: 694/935 (74.2%)	were randomly checked by a board-certified practicing allergist immunologist to confirm diagnosis **Severity Measure(s):** NR **Clinical marker:** NR **Treatment/ Associated Therapy:** NR **Outcome Definitions:** *Mortality:* Death *ICU admission:* NR *Intubation:* Prolonged intubation *Ventilation:* NR *Hospitalization:* ND *Non-elective readmissions*: NR **Comments:** None	• aOR: 2.56 (95% CI: 0.57-11.5), p= 0.22 • Asthma: 2/241 (1.1%) • No asthma: 16/694 (3.0%) *Intubation, n/N (%)* • aOR: 1.18 (95% CI: 0.45-1.32), p= 0.35 • Asthma: 23/241 (9.7%) • No asthma: 56/694 (8.3%) *Hospitalization, n/N (%)* • aOR: 1.08 (95% CI: 0.77-1.53), p= 0.65 • Asthma: 73/241 (30.7%) • No asthma: 224/694 (32.8%) **Severity of Condition:** NR **Duration of Condition:** NR **Treatment/ Associated Therapy:** NR **Comorbid Conditions:** NR **Risk Markers:** *Mortality, n/N (%)* Age 18-49: • Asthma: 0/138 (0%) • No asthma: 3/364 (1.1%) Age 50-64: • aOR: 1.19 (95% CI: 0.21-6.67), p=0.85 • Asthma: 2/65 (3.7%) • No asthma: 7/213 (4.1%) Age above 65: • Asthma: 0/38 (0%) • No asthma: 6/117 (6.5%) *Intubation, n/N (%)* Age 18-49: • aOR: 1.04 (95% CI: 0.34-2.62), p=0.91 • Asthma: 6/138 (4.4%) • No asthma: 14/364 (3.9%) Age 50-64: • aOR: 1.24 (95% CI: 1.00-1.50), p=0.09 • Asthma: 11/65, (17.2%) • No asthma: 22/213, (10.7%)

Study	Population and Setting	Intervention	Definitions	Outcomes
				Age above 65: • aOR: 1.14 (95% CI: 0.40-3.25), p=0.81 • Asthma: 6/38, (15.8%) • No asthma: 20/117, (17.7%) *Hospitalization, n/N (%)* Age 18-49: • aOR: 0.98 (95% CI: 0.58-1.66), p=0.93 • Asthma:30/138, (22.2%) • No asthma: 75/364, (20.9%) Age 50-64: • aOR: 1.17 (95% CI: 0.62-2.19), p=0.63 • Asthma: 22/65, (33.8%) • No asthma: 80/213, (33.3%) Age above 65: • aOR: 1.37 (95% CI: 0.63-3.01), p=0.43 • Asthma: 21/38, (55.3%)**Long-term Sequelae:** NR
Author: Mallow[49] **Year:** 2020 **Data Extractor:** CO **Reviewer:** CS/DOS **Study design:** Retrospective cohort **Study Objective:** To quantify the role of the number of CDC risk factors on in-hospital mortality in a large and geographically diverse group of hospitalized COVID-19 patients. **IVA Score:** 26 (moderate)	**Population:** N= 21,676 patients **Setting:** 276 acute care hospitals **Location:** USA **Study dates:** March 15-April 30, 2020 **Inclusion criteria:** All hospitalizations with a confirmed COVID-19 diagnosis identified using ICD-10 code U07 and discharged between March 15-April 30, 2020. **Exclusion criteria:** NR	**Medical Condition, n/N (%):** Moderate to severe asthma: 100/21,676 (0.5) **Control/Comparison group:** No Moderate to severe asthma: 21,576/21,676 (99.5)	**Medical Condition(s):** *Moderate to severe asthma*: ND; data retrieved from electronic medical records **Severity Measure(s):** NR **Clinical marker:** NR **Treatment/ Associated Therapy:** NR **Outcome Definitions:** Mortality: ND ICU Admission: ND **Comments:** none	**Severe COVID-19, n/N (%):** *aOR: Multivariable logistic regression [OR] (95% CI), n/N (%) associated with mortality* *Mortality:* Moderate to severe asthma: • aOR: 1.10 (95% CI: 0.60-2.04), p= 0.754 **Severity of Condition:** NR **Duration of Condition:** NR **Treatment/ Associated Therapy:** NR **Comorbid Conditions:** NR **Risk Markers:** NR **Long-term Sequelae:** NR
Author: Manohar[31]	**Population:** N=11,930	**Medical Condition, n/N (%):** Asthma: 1,130/11,930 (9.47%)	**Medical Condition(s):** *Asthma:* ICD-10 J45	**Severe COVID-19:**

Study	Population and Setting	Intervention	Definitions	Outcomes
Year: 2021 **Data Extractor:** DOS **Reviewer:** JKK **Study Design:** Cohort **Study Objective:** To use real-world healthcare data to quantify the impact of demographic, clinical, and social determinants associated with adverse COVID-19 outcomes, to identify high-risk scenarios and dynamics of risk among racial and ethnic groups. **IVA Score:** Asthma: 25 (moderate) COPD: 24 (moderate)	**Setting:** Academic medical center **Location:** New York, US **Study dates:** March - August 2020 **Inclusion criteria:** Patients that had nasopharyngeal swab PCR testing performed with "Detected" results or those who received a COVID-19 ICD-10 diagnosis. **Exclusion criteria:** Patients who received a COVID-19 ICD-10 diagnosis that was also confirmed as "Not Detected" by PCR assay.	**Control/Comparison group, n/N (%):** No asthma: 10,800/11,930 (90.53%)	**Severity Measure(s):** NR **Clinical marker:** NR **Treatment/ Associated Therapy:** NR **Outcome Definitions:** *Mortality:* death following a COVID-19 diagnosis, without regard to hospitalization *ICU admission:* NR *Intubation:* NR *Ventilation:* NR *Hospitalization:* ND *Non-elective readmissions*: NR **Comments:** None	*aOR: Multivariable Logistic Regression; model includes age, sex, race/ethnicity, clinical characteristics, BMI, smoking status, neighborhood deprivation index, hospital site, and insurance type* *Mortality, n/N (%):* Asthma: • aOR: 0.88 (95% CI: 0.69-1.1); p=0.27 • Died: 111/1,654 (6.71%) • Survived: 1,019/10,276 (9.92%) *Hospitalization, n/N (%):* Asthma: • aOR: 1.19 (95% CI: 0.92-1.55); p=0.191 • Hospitalized: 439/4,895 (8.97%) • Not hospitalized: 691/7,035 (9.82%) **Severity of Condition:** NR **Duration of Condition:** NR **Treatment/ Associated Therapy:** NR **Comorbid Conditions:** NR **Risk Markers:** *Mortality:* Asthma among non-Hispanic-White: • aOR: 0.88 (95% CI: 0.55-1.39); p=0.604 Asthma among non-Hispanic-Black: • aOR: 0.81 (95% CI: 0.44-1.42); p=0.473 Asthma among non-Hispanic-Asian: • aOR: 1.19 (95% CI: 0.56-2.45); p=0.637 Asthma among Hispanic: • aOR: 0.75 (95% CI: 0.5-1.11); p=0.167 *Hospitalization:* Asthma among non-Hispanic-White: • aOR: 1.28 (95% CI: 0.73-2.27); p=0.392 Asthma among non-Hispanic-Black: • aOR: 0.84 (95% CI: 0.47-1.48); p=0.537 Asthma among non-Hispanic-Asian: • aOR: 1.77 (95% CI: 0.59-5.55); p=0.322 Asthma among Hispanic: • aOR: 0.97 (95% CI: 0.59-1.61); p=0.909 **Long-term Sequelae:** NR
Author: Mather[50]	**Population:** N=1,045	**Medical Condition, n/N (%):**	**Medical Condition(s):**	**Severe COVID-19:**

Study	Population and Setting	Intervention	Definitions	Outcomes
Year: 2021 **Data Extractor:** JKK **Reviewer:** CNS **Study Design:** Cohort **Study Objective:** To examine the impact of asthma on clinical outcomes in a COVID-19 hospitalized cohort. **IVA Score:** 25 (moderate)	**Setting:** Tertiary care medical center **Location:** CT, US **Study dates:** February 20 – November 3, 2020 **Inclusion criteria:** Patients who tested positive for SARS-CoV-2 by nasopharyngeal polymerase chain reaction and who required inpatient admission; 1:15 propensity-matched cohort of 88 asthmatic patients and 957 non-asthmatics; propensity score was developed by modeling asthma as the dependent variable and age, sex, and history of atrial fibrillation as the covariates. **Exclusion criteria:** Patients with ICD-10-CM codes for chronic obstructive lung disease, emphysema, or chronic bronchitis.	Asthma: 88/1,045 (8.4%) **Control/Comparison group, n/N (%):** No asthma: 957/1,045 (91.6%)	*Asthma:* ICD-10-CM codes extracted from the EMR; J45.20, J45.21, J45.30, J45.31, J45.40, J45.41, J45.901, J45.909, J45.991 **Severity Measure(s):** NR **Clinical marker:** NR **Treatment/ Associated Therapy:** *Inhaled corticosteroids (IC):* documented use within a seven-day window around COVID-19 testing **Outcome Definitions:** *Mortality:* in-hospital death *ICU Admission:* NR *Intubation:* NR *Ventilation:* mechanical ventilation *Hospitalization:* NR *Non-elective readmissions:* NR **Comments:** None	*aOR1: Multivariate Logistic Regression; adjusted for NR* *aOR2: Multivariate Logistic Regression; adjusted for age, race, history of atrial fibrillation, cancer, diabetes, heart failure, hypertension, CKD, obesity, and NLR* *Mortality, n/N (%):* • aOR1: 0.32 (95% CI: 0.13-0.78), p=0.013 • Asthma: 7/88 (8.0%) • No asthma: 157/957 (16.4%) • p=0.37 *Mechanical Ventilation, n/N (%):* • Asthma: 16/88 (18.2%) • No asthma: 165/957 (17.2%) • p=0.82 **Severity of Condition:** NR **Duration of Condition:** NR **Treatment/ Associated Therapy:** *Mortality, n/N (%):* Asthma + No IC (control group: No Asthma + No IC) • aOR2: 0.23 (95% CI: 0.05-1.01), p=0.051 Asthma + IC (control group: No Asthma + No IC) • aOR2: 0.46 (95% CI: 0.18-2.2), p=NR **Comorbid Conditions:** NR **Risk Markers:** NR **Long-term Sequelae:** NR
Author: Messiah[32] **Year:** 2021 **Data Extractor:** DOS **Reviewer:** MW **Study Design:** Cohort **Study Objective:** To report the estimated prevalence of and risk factors for COVID-19	**Population:** N=22,377 COVID-19+, N=3,126 **Setting:** Large pediatric healthcare system **Location:** Texas, US **Study dates:** March 1, 2020 - March 31, 2021 **Inclusion criteria:** Any child who aged 0-19 years presenting for	**Medical Condition, n/N (%):** Asthma: 100/3,126 (3.20%) **Control/Comparison group, n/N (%):** No asthma: 3,026/3,126 (96.80%)	**Medical Condition(s):** *Asthma:* ICD-10 J45 **Severity Measure(s):** NR **Clinical marker:** NR **Treatment/ Associated Therapy:** NR **Outcome Definitions:** *Mortality:* NR *ICU admission:* ICU admission due to COVID-19 *Intubation:* NR	**Severe COVID-19:** *aOR: Stepwise multivariable logistic regression; model included age, sex, race/ethnicity, BMI percentile, and comorbidities* *ICU admission, n/N (%):* Asthma: • ICU admission: 4/49 (8.2%) • No ICU admission: 70/1,630 (4.3%) • p=0.166 *Hospitalization, n/N (%):* Asthma: • aOR: 2.75 (95% CI: 1.70-4.43); p<0.001 • Hospitalization: 74/1,679 (4.4%)

Study	Population and Setting	Intervention	Definitions	Outcomes
infection, hospitalization, and ICU admission across the three US waves in one of the largest pediatric healthcare systems in the nation. **IVA Score:** 24 (moderate)	medical care study hospitals or ambulatory clinics for any reason during study dates. All children were tested regardless of symptoms of COVID-19. COVID-19 infection status was confirmed using a nasopharyngeal swab specimen with either a rapid antigen test or real-time RT-qPCR test. **Exclusion criteria:** Patients aged greater than 19 years old.		*Ventilation:* NR *Hospitalization:* hospitalization due to COVID-19 *Non-elective readmissions*: NR **Comments:** None	• No hospitalization: 26/1,447 (1.8%) • p<0.001 **Severity of Condition:** NR **Duration of Condition:** NR **Treatment/ Associated Therapy:** NR **Comorbid Conditions:** NR **Risk Markers:** NR **Long-term Sequelae:** NR
Author: Millar[51] **Year:** 2021 **Data Extractor:** MW **Reviewer:** DOS **Study Design:** Ecological study **Study Objective:** To use a lag-adjusted case fatality rate (CFR) to conduct a county-level mortality risk factor analysis of demographic, socioeconomic, and health-related variables in the US during the first wave of the COVID-19 pandemic.	**Population:** N=1779 counties or county-equivalents with 1,968,739 cases and 106,279 deaths **Setting:** Nationwide **Location:** US **Study dates:** March 28, 2020 - June 12, 2020 **Inclusion criteria:** Counties or county-equivalents with Federal Information Processing Standards (FIPS), and publicly available aggregate data were used. Only variables with publicly available data sources at the	**Medical Condition, n/N (%):** Asthma: NR **Control/Comparison group, n/N (%):** No asthma: NR	**Medical Condition(s):** *Asthma:* ND **Severity Measure(s):** NR **Clinical marker:** NR **Treatment/ Associated Therapy:** NR **Outcome Definitions:** *Mortality:* percent change in COVID-19 lag-adjusted CFR (laCFR) given a 1 unit increase in the variable; calculated by using Nishiura et al.'s method and expanded upon by Russell et al. to account for the delay between COVID-19 diagnoses and deaths; approach was updated by using time-from-hospitalization-to-death from the US population *ICU admission:* NR *Intubation:* NR *Ventilation:* NR *Hospitalization:* NR *Non-elective readmissions*: NR	**Severe COVID-19:** *Negative binomial linear model included percentage of population aged 65+, percentage of population Black or African American, hospitals per 10,000 persons, asthma prevalence, total number of hospitals, ban on religious gatherings indicator, percentage of housing stock that were mobile homes, and percentage of population without health insurance* *Mortality:* Asthma: 9.1% increase (95% CI: 3.9%-14%) in COVID-19 laCFR given a 1% increase in asthma prevalence, assuming all other variables remain constant (p<0.001) **Severity of Condition:** NR **Duration of Condition:** NR **Treatment/ Associated Therapy:** NR **Comorbid Conditions:** NR **Risk Markers:** *Mortality:*

Study	Population and Setting	Intervention	Definitions	Outcomes
IVA Score: 21 (moderate)	county- or state-level were included, as well as data that contained FIPS county codes to identify case and death locations. **Exclusion criteria:** NR		**Comments:** None	Age > 65: 4.4% increase (95% CI: 3%-5.9%) in COVID-19 laCFR given a 1% increase in population over age 65) assuming all other variables remain constant (p<0.001) Black of African American: 0.97% increase (95% CI: 0.63%-1.3%) in COVID-19 laCFR given a 1% increase in black or African American population) assuming all other variables remain constant (p<0.001) Mobile homes housing units population: 0.79% decrease (95% CI: -1.5%-0.1%) in COVID-19 laCFR given a 1% increase in population with mobile home units) assuming all other variables remain constant (p<0.001) Population without health insurance: 1.5% decrease (95% CI: -2.9%-0.02%) in COVID-19 laCFR given a 1% increase in population without health insurance) assuming all other variables remain constant (p<0.001) **Long-term Sequelae:** NR
Author: Mollalo[52] **Year:** 2021 **Data Extractor:** DOS **Reviewer:** CS **Study design:** mixed-effects multinomial logistic regression model **Study Objective:** to apply spatial and statistical analysis to better understand the geospatial distributions of the COVID-19 mortality rate (MR) and case fatality rate (CFR) in US	**Setting:** nationwide **Location:** US **Study dates:** January 22 – November 22, 2020 **Inclusion criteria:** cumulative COVID-19 cases and deaths collected from *USA Facts*; age-adjusted mortality rates of 20 covariates collected from *University of Washington Global Health Data Exchange* **Exclusion criteria:** counties with less than 16 reported deaths were	**Medical Condition:** Asthma: NR High-high (HH): counties with high COVID-19 mortality surrounded by counties with high COVID-19 mortalities Low-low (LL): counties with low COVID-19 mortality surrounded by counties with low COVID-19 mortalities **Control/Comparison group:** Non-significant (NS): non-significant counties	**Medical Condition(s):** *Asthma*: ND **Severity Measure(s):** NR **Clinical marker:** NR **Treatment/ Associated Therapy:** NR **Outcome Definitions:** *COVID-19 case fatality ratio (CFR):* proportion of recorded death over the confirmed cases *COVID-19 Mortality rate (MR):* mean COVID-19 mortality rate per 100,000 individuals **Comments:** none	**Severe COVID-19:** *Mixed-effects multinomial logistic regression model odds ratio [OR] (95% CI) for association between COVID-19 CFR classification (HH or LL) and mortalities of other diseases:* Asthma: • HH: 4.584 (95% CI: 2.583-8.137), p<0.001 • LL: 0.818 (95% CI: 0.461-1.452), p=0.492 **Severity of Condition:** NR **Duration of Condition:** NR **Treatment/ Associated Therapy:** NR **Comorbid Conditions:** NR **Risk Markers:** NR **Long-term Sequelae:** NR

Study	Population and Setting	Intervention	Definitions	Outcomes
IVA Score: 22 (moderate)	excluded from subsequent analyses			
Author: Momeni-Boroujeni[53] **Year:** 2021 **Data Extractor:** MW **Reviewer:** JKK **Study Design:** Cohort **Study Objective:** To develop a prognostic Markov model for hospitalized COVID-19 patients which incorporates dynamic laboratory value data along with patients' admission profiles, to identify key determinants of risk. **IVA Score:** COPD: 24 (Moderate) Asthma: 25 (Moderate)	**Population:** N=553 **Setting:** Medical Center **Location:** NY, US **Study dates:** February – March 2020 **Inclusion criteria:** Patients admitted with COVID-19-related symptoms and confirmed Polymerase Chain Reaction (PCR)-positive between the study dates. **Exclusion criteria:** Patients whose outcome was unknown or who were missing data.	**Medical Condition, n/N (%):** Asthma: 24/553 (4.3%) **Control/Comparison group, n/N (%):** No asthma: 529/553 (95.7%)	**Medical Condition(s):** *Asthma:* ND **Severity Measure(s):** NR **Clinical marker:** NR **Treatment/ Associated Therapy:** NR **Outcome Definitions:** *Mortality:* COVID-19 related mortality *ICU admission:* NR *Intubation:* NR *Ventilation:* NR *Hospitalization:* NR *Non-elective readmissions*: NR **Comments:** Univariate survival analysis is reported as an odds ratio in the study; ERT relabeled as hazard ratio.	**Severe COVID-19:** *aOR1: Multivariable Logistic Regression including age, sex, ethnicity, day of hospital admission, recorded comorbidities, initial measurements for each patient for each of the 28 included clinical tests, and percent changes in each clinical test measurement from the initial values for each patient using the last recorded measurement for each patient* *aOR2: Markov model including age, sex, ethnicity, day of hospital admission, recorded comorbidities, initial measurements for each patient for each of the 28 included clinical tests, and percent changes in each clinical test measurement from the initial values for each patient using the last recorded measurement for each patient* *HR: Hazard Ratio; Univariable (Univariate) Survival Analysis* *OR: Univariable (Univariate) Logistic Regression* *Mortality:* Asthma: • aOR1: 0.99 (95% CI: NR), p=NR • aOR2: 1.22 (95% CI: NR), p=NR • HR: 1.04 (95% CI: NR), p=0.921 • OR: 0.84 (95% CI: NR), p=NR **Severity of Condition:** NR **Duration of Condition:** NR **Treatment/ Associated Therapy:** NR **Comorbid Conditions:** NR **Risk Markers:** NR **Long-term Sequelae:** NR
Author: Naqvi[54] **Year:** 2021 **Data Extractor:** MC **Reviewer:** CNS/MW **Study Design:** Prospective cohort	**Population:** N=261 **Setting:** COVID-19 intensive care unit (ICU) at a university hospital **Location:** Pakistan	**Medical Condition, n/N (%):** Asthma: 27/261 (10.3%) **Control/Comparison group, n/N (%):** No asthma: 234/261 (89.7%)	**Medical Condition(s):** *Asthma:* ND **Severity Measure(s):** NR **Clinical marker:** NR **Treatment/ Associated Therapy:** NR **Outcome Definitions:** *Mortality:* ND	**Severe COVID-19:** *aOR: Multivariable Logistic Regression; models adjusted for NR* *OR: Univariate Logistic Regression* *Mortality, n/N (%):* Asthma • aOR: 4.183 (95% CI: 1.027-17.047), p = 0.046 • OR: 1.671 (95% CI: 0.735-3.802), p=0.221 • Deceased: 17/135 (12.6%) • Survived: 10/126 (7.9%) • p=0.217

Study	Population and Setting	Intervention	Definitions	Outcomes
Study Objective: Describe various patterns of coagulopathy (CAC) and thromboembolism in severely ill patients with COVID-19 and to evaluate CAC, thromboembolism, and various comorbidities as predictors of mortality among severely ill COVID-19 patients. **IVA Score:** Asthma: 23 (Moderate) COPD: 23 (Moderate)	**Study dates:** September 1 – November 30, 2020 **Inclusion criteria:** All confirmed severe COVID-19 patients aged ≥18 years that were admitted to the COVID-19 ICU during the study period who gave consent. Patients were confirmed in accordance to WHO guidance where RNA of SARS-CoV-2 was detected by RT-PCR. **Exclusion criteria:** All patients having known coagulation disorders like protein C, S deficiency, parahaemophilia, malignancy, and patients having a history of thromboembolism and already on anticoagulation.		*ICU admission:* NR *Intubation:* NR *Ventilation:* NR *Hospitalization:* NR *Non-elective readmissions*: NR **Comments:** None	**Severity of Condition:** NR **Duration of Condition:** NR **Treatment/ Associated Therapy:** NR **Comorbid Conditions:** NR **Risk Markers:** NR **Long-term Sequelae:** NR
Author: Oh[55] **Year:** 2021 **Data Extractor:** MW **Reviewer:** CS **Study design:** Retrospective cohort **Study Objective:** To investigate various chronic respiratory diseases (CRDs) that affect the risk of COVID-19 among the general population in	**Population:** N=122,040 n=7,780 COVID-19 + **Setting:** National Health Insurance Service database **Location:** South Korea **Study dates:** January 1-June 26, 2020 **Inclusion criteria:** Individuals ≥20 years old, had a	**Medical Condition, n/N (%):** Asthma: 33,858/122,040 (27.2%) **Control/Comparison group, n/N (%):** No asthma: 88,182/122,040 (72.3%)	**Medical Condition(s):** *Asthma:* ICD-10 code J45 **Severity Measure(s):** NR **Clinical marker:** NR **Treatment/ Associated Therapy:** NR **Outcome Definitions:** *Mortality:* ND *ICU admission:* NR *Intubation:* NR *Ventilation:* NR *Hospitalization:* NR *Non-elective readmissions*: NR **Comments:** None	**Severe COVID-19:** *aOR: Multivariable Logistic Regression: Multivariable Logistic Regression* *Mortality:* Asthma: • aOR: 1.03 (95% CI: 0.76-1.41), p=0.834 **Severity of Condition:** Charlson comorbidity index: comorbidity index: • aOR: 1.80 (95% CI: 1.32-2.44), p<0.001 **Duration of Condition:** NR **Treatment/ Associated Therapy:** NR **Comorbid Conditions:** NR

Study	Population and Setting	Intervention	Definitions	Outcomes
South Korea, and to examine the effect of different CRDs on hospital mortality among patients with COVID-19 in South Korea. **IVA Score:** 25 (moderate)	respiratory disease diagnosis by the International Classification of Diseases codes, and prescription information concerning drugs and/or procedures from 2015-2020 were included. COVID-19 negative individuals were extracted from the national database using stratification methods with regard to age, sex, and residence in February 2020. **Exclusion criteria:** NR			**Risk Markers:** NR **Long-term Sequelae:** NR
Author: Pandita[56] **Year:** 2021 **Data Extractor:** MC **Reviewer:** CNS **Study Design:** Cohort **Study Objective**: To identify patient demographics and comorbidities associated with severe disease and death, and presenting symptoms and vital signs that predicted progression to severe disease and death in persons with COVID-19 that were hospitalized in Rhode Island.	**Population:** N= 259 **Setting:** Academic hospitals **Location:** RI, US **Study dates:** February 1 - May 18, 2020 **Inclusion criteria:** All 106 eligible patients who were hospitalized between February 17 to April 3 and a random sample of patients hospitalized between April 4 and May 18 of all ages who presented to the hospital with symptoms of COVID-19	**Medical Condition, n/N (%):** Asthma: 30/259 (11.6%) **Control/Comparison group, n/N (%):** No asthma: 229/259 (88.4%)	**Medical Condition(s):** *Asthma:* ND **Severity Measure(s):** NR **Clinical marker:** NR **Treatment/ Associated Therapy:** NR **Outcome Definitions:** *Mortality:* In-hospital mortality *ICU admission:* NR *Intubation:* NR *Ventilation:* NR *Hospitalization:* NR *Non-elective readmissions*: NR **Comments:** None	**Severe COVID-19:** *aOR: Multivariable Logistic Regression; model included age at admission, hospitalized from skilled nursing facility, hypertension, diabetes mellitus, hyperlipidemia, peripheral vascular disease, and hematological disorders* *Mortality, n/N (%):* Asthma: • aOR: 0.12 (95% CI: 0.01-1.14), p=0.0644 • Deceased: 1/38 (2.6%) • Alive: 29/221 (13.1%) **Severity of Condition:** NR **Duration of Condition:** NR **Treatment/ Associated Therapy:** NR **Comorbid Conditions:** NR **Risk Markers:** NR

Study	Population and Setting	Intervention	Definitions	Outcomes
IVA Score: 23 (Moderate)	and had a positive real time polymerase chain reaction (RT-PCR) result for SARS-CoV-2. **Exclusion criteria:** Patients with asymptomatic infection, those who developed symptoms of COVID-19 after the first 48 hours of hospitalization, or those who met criteria for severe disease or died on the day of admission.			**Long-term Sequelae:** NR
Author: Parra-Bracamonte[57] **Year:** 2020 **Data Extractor:** MC **Reviewer:** DOS **Study design:** Retrospective cohort **Study Objective:** To identify characteristics of patients who are current positive cases of COVID-19 in Mexico and assess risk factors for mortality. **IVA Score:** 25 (moderate)	**Population:** N= 331,298 **Setting:** Database including information from 475 monitoring units from public and private health sectors **Location:** Mexico **Study dates:** January 13 - July 17, 2020 (database accessed July 18, 2020) **Inclusion criteria:** Patients diagnosed positively to COVID-19 included in the Epidemiologic Surveillance Source of Respiratory Viral Diseases (Sistema de	**Medical Condition, n/N (%):** Asthma: 8983/331,298 (2.7%) **Control/Comparison group, n/N (%):** No asthma: 322,315/331,298 (97.3%)	**Medical Condition(s):** *Asthma*: chronic inflammatory disease of the aerial via, characterized by an exacerbated response of tracheobronchial tree with hyper-reactivity to determine stimulus conducting to airflow obstruction. **Severity Measure(s):** NR **Clinical marker:** NR **Treatment/ Associated Therapy:** NR **Outcome Definitions:** *Mortality:* ND *ICU admission:* NR *Intubation:* NR *Ventilation:* NR *Hospitalization:* NR *Non-elective readmissions*: NR **Comments:** None	**Severe COVID-19:** *aOR: Multivariable Logistic Regression* *OR: Univariable (Univariate) Logistic Regression* *Mortality, n/N (%)* Asthma: • aOR: 0.949 (95% CI: 0.832-1.082), p<0.0306 • OR: 0.721 (95% CI: 0.670-0.777) • Died: 777/38,310 (2.0%) • Survived: 8206/292,988 (2.8%) **Severity of Condition:** NR **Duration of Condition:** NR **Treatment/ Associated Therapy:** NR **Comorbid Conditions:** NR **Risk Markers:** NR **Long-term Sequelae:** NR

Study	Population and Setting	Intervention	Definitions	Outcomes
	Vigilancia Epidemiologica de Enfermedades Respiratorias Virales). All positive cases to COVID-19 were diagnosed using real-time PCR and were officialized by the National Network for Epidemiologic Surveillance (Red Nacional de Laboratorios de Vigilancia Epidemiologica). **Exclusion criteria:** NR			
Author: Perez-Sastre[14] **Year:** 2020 **Data Extractor:** MW **Reviewer:** CS **Study design:** Retrospective cohort **Study Objective:** To identify which clinical characteristics are related to COVID-19 and to determine if age acts as an effect-modifier in the relationship between cardio metabolic comorbidities and COVID-19 progression.	**Population:** N=155,017 **Setting:** National database by the General Directorate of Epidemiology of the Ministry of Health and the Viral Respiratory Disease Epidemiological Surveillance System database **Location:** Mexico **Study dates:** January 6 – June 21, 2020 **Inclusion criteria:** Participants ≥20 years old with confirmed SARS-	**Medical Condition, n/N (%):** Asthma: 4,340/155,017 (2.8%) **Control/Comparison group, n/N (%):** No asthma: 150,677/155,017 (97.2%)	**Medical Condition(s):** *Asthma:* ND **Severity Measure(s):** NR **Clinical marker:** NR **Treatment/ Associated Therapy:** NR **Outcome Definitions:** *Mortality:* ND *ICU admission:* ND *Intubation:* ND *Ventilation:* NR *Hospitalization:* ND *Non-elective readmissions*: NR **Comments:** None	**Severe COVID-19:** *aRR: Adjusted Risk Ratio; Poisson regression model (model with cardio-metabolic comorbidity interaction with age)* **Numerators for proportions calculated by ERT using percentages from Tables 3 and 4; n/N (%)* *Mortality, n/N (%):* Asthma: • aRR:0.81, p<0.001 • Asthma: 425/4,340 (9.8%) • No asthma: 20,191/150,677 (13.4%) • p<0.001 *ICU admission, n/N (%)* Asthma: • aRR: 0.98, p≥0.05 • Asthma: 178/4,340 (4.1%) • No asthma: 4,219/150,677 (2.8%) • p≥0.05 *Intubation, n/N (%)* Asthma: • aRR: 0.77, p<0.01

Study	Population and Setting	Intervention	Definitions	Outcomes
IVA Score: 25 (moderate)	CoV2 infection after January 6, 2020 were included. **Exclusion criteria:** Records prior to January 6 and subjects younger than 20 years were excluded.			• Asthma: 87/4,340 (2.0%) • No asthma: 4,520/150,677 (3.0%) • p<0.05 *Hospitalization, n/N (%)* Asthma: • aRR: 0.87, p<0.001 • Asthma: 1,172/4,340 (27.0%) • No asthma: 50,025/150,677 (33.2%) • p<0.001 **Severity of Condition:** NR **Duration of Condition:** NR **Treatment/ Associated Therapy:** NR **Comorbid Conditions:** *Mortality, n/N (%)* Cardio-metabolic comorbidity: Two or three: • aRR: 8.97, p<0.001 • 6,384/22,167 (28.8%) One: • aRR: 4.45, p<0.001 • 7,024/39,684 (17.7%) None: • 6,987/93,165 (7.5%) • p<0.001 Other comorbidities: Yes: • aRR: 4.86, p<0.001 • 32.3% No: • 11.9% • p<0.001 *ICU admission, n/N (%)* Cardio-metabolic comorbidity: Two or three: • aRR: 5.95, p<0.001 • 1,197/22,167 (5.4%) One: • aRR: 3.91, p<0.001

Study	Population and Setting	Intervention	Definitions	Outcomes
				• 1,587/39,684 (4.0%) None: • 1,584/93,165 (1.7%) • p<0.001 Other comorbidities: Yes: • aRR: 3.03, p<0.001 • 5.3% No: • 2.7% • p<0.001 *Intubation, n/N (%):* Cardio-metabolic comorbidity: Two or three: • aRR: 6.66, p<0.001 • 1,286/22,167 (5.8%) One: • aRR: 3.78, p<0.001 • 1,667/39,684 (4.2%) None: • 1,677/93,165 (1.8%) • p<0.001 Other comorbidities: Yes: • aRR: 3.33, p<0.001 • 5.7% No: • 2.8% • p<0.001 *Hospitalization, n/N (%)* Cardio-metabolic comorbidity: Two or three: • aRR: 3.99, p<0.001 • 12,702/22,167 (57.3%) One: • aRR: 2.45, p<0.001 • 16,469/39,684 (41.5%) None: • 21,707/93,165 (23.3%) • p<0.001 Other comorbidities:

Study	Population and Setting	Intervention	Definitions	Outcomes
				Yes: • aRR: 2.69, p<0.001 • 60.8% No: • 31.0% • p<0.001 **Risk Markers:** NR **Long-term Sequelae:** NR
Author: Ramos-Martinez[36] **Year:** 2021 **Data Extractor:** CNS **Reviewer:** MW **Study Design:** Cohort **Study Objective:** To analyze the clinical characteristics of patients with COVID-19 who were readmitted to the hospital during the first 30 days after being discharged, determine the proportion of COVID-19 patients who were readmitted after discharge, the causes of readmission, and factors associated with this poor outcome. **IVA Score:** Asthma: 24 (moderate) COPD: 23 (moderate)	**Population:** N=7,137 **Setting:** 147 hospitals; SEMI-COVID-19 Network Registry collects data on 10% of admitted patients **Location:** Spain **Study dates:** March 1-April 30, 2020 **Inclusion criteria:** All consecutive patients admitted to hospitals and discharged with confirmed COVID-19 disease by RT-PCR of a nasopharyngeal or sputum sample and were included in the SEMI-COVID-19 Registry during the study dates. **Exclusion criteria:** Missing data or death during initial hospital admission.	**Medical Condition, n/N (%):** Asthma: 594/7,137 (8.3%) **Control/Comparison group, n/N (%):** No asthma: 6,543/7,137 (91.7%)	**Medical Condition(s):** *Asthma:* ND **Severity Measure(s):** NR **Clinical marker:** NR **Treatment/ Associated Therapy:** NR **Outcome Definitions:** *Mortality:* NR *ICU admission:* NR *Intubation:* NR *Ventilation:* NR *Hospitalization:* NR *Non-elective readmissions*: patients with COVID-19 who were readmitted to the hospital during the first 30 days after being discharged. Patients who were attended in the emergency department after hospital discharge but not admitted, were not considered readmitted patients. **Comments:** None.	**Severe COVID-19:** *aOR: Multivariable Logistic Regression included variables Age, Charlson Comorbidity Index score, diabetes, COPD, asthma, solid neoplasia, hypertension, dementia, duration of symptoms before admission, hemoglobin level and platelets count at admission, ground-glass infiltrate at admission, acute cardiac injury, acute kidney failure and glucocorticoid treatment* **Severity of Condition:** NR **Duration of Condition:** NR **Treatment/ Associated Therapy:** NR **Comorbid Conditions:** NR **Risk Markers:** NR **Long-term Sequelae:** Non-elective readmissions Asthma: • aOR: 1.52 (95% CI: 1.04-2.22), p=0.031 • Readmission: 37/298 (12.4%) • No readmission: 554/6,839 (8.1%) • p=0.008
Author: Ren[33] **Year:** 2021 **Data Extractor:** JH **Reviewer:** JKK	**Population:** N=70,557; COVID+ n=15,690 **Setting:** UK Biobank assessment centers **Location:** England	**Medical Condition, n/N (%):** Asthma: 1,823/15,690 (11.6%) **Control/Comparison group, n/N (%):** No Asthma or Allergic Rhinitis (AR): 13,066/15,690 (83.3%)	**Medical Condition(s):** *Asthma:* Either self-reported asthma history from baseline questionnaires or ICD-10 code J45 or ICD-9 code 493 **Severity Measure(s):** NR	**Severe COVID-19:** *aRR1: Adjusted Relative Risk including age, sex, Townsend deprivation index, education, BMI, ethnic background, smoking status, drinking status, and preexisting comorbidities* *aRR2: Adjusted Relative Risk including sex, age, Townsend deprivation index, education, BMI and ethnic background* *aRR3: Adjusted Relative Risk including sex and age*

Study	Population and Setting	Intervention	Definitions	Outcomes
Study Design: Cohort **Study Objective:** To investigate the role of AR and/or asthma in the risk of infection, severity, and mortality of COVID-19 based on a large prospective cohort in UK Biobank (UKB), and to evaluate whether long-term medications for AR and/or asthma would affect the clinical manifestation and outcomes of COVID-19. **IVA Score:** 25 (Moderate)	**Study dates:** March 16 – December 31, 2020 **Inclusion criteria:** Participants aged 40 to 69 years when recruited at baseline (in 2006-2010) with matching SARS-CoV-2 results (whether reported as positive or negative for SARS-CoV-2) tested during study dates in England; COVID-19 infection was defined as at least 1 positive test result of SARS-CoV-2. **Exclusion criteria:** Individuals who died before the pandemic (set as February 1, 2020), whose location belonged to UKB assessment centers in Scotland and Wales (where no SARS-CoV-2 testing data were available), and who were diagnosed with AR and/or asthma after February 1, 2020, which was set as the beginning of the pandemic.		**Clinical marker:** NR **Treatment/ Associated Therapy:** *Antihistamines*: allergy relief antihistamine 4mg tablet, vantage antihistamine 4mg tablet, pollenase antihistamine 4mg tablet, antihistamine 60mg tablet, care cetirizine hayfever relief 10mg tablet, cetirizine, levocetirizine, loratadine, loratadine product, desloratadine, azelastine, and/or rhinolast 0.1% nasal spray code *Glucocorticoids*: prednisone, prednisolone, prednisolone product, methylprednisolone, budesonide, budesonide product, novolizer budesonide 200mg/dose cartridge+inhaler, respiratory mometasone, mometasone, fluticasone, salmeterol+fluticasone propionate, rino clenil 50mg nasal spray, beclomethasone, beclomethasone diproprionate+salbutamol, pulvinal beclomethasone diprop 100mcg breath-act dry pdr inh, triamcinolone, syntaris 25mg nasal spray, flixonase 50mg aqueous nasal spray, beconase 50mg nasal spray, rhinocort 50mg nasal spray, dexa-rhinaspray nasal spray, zonivent aquanasal 50mg spray, nasobec aqueous 50mg spray, nasocort 55mg aqueous nasal spray, nasonex 0.05% aqueous nasal spray, beclo-aqua 50 nasal spray, beclomist 50mg nasal spray, vivabec 50mg nasal spray, dexa-rhinaspray duo aqueous nasal spray, pollenase 50mg nasal spray, and/or care hayfever relief 50mg nasal spray *Inhaled Corticosteroids*: respiratory mometasone, rino clenil 50micrograms nasal spray, pulvinal beclomethasone diprop 100mcg breath-act dry pdr inh, syntaris 25micrograms nasal spray, flixonase 50micrograms aqueous nasal spray, beconase 50micrograms nasal spray, rhinocort 50micrograms nasal spray, dexa-rhinaspray nasal spray, nasobec aqueous 50micrograms nasal spray, nasacort 55micrograms aqueous nasal spray, nasonex 0.05% aqueous nasal spray, beclo-aqua 50 nasal spray, beclomist 50micrograms nasal spray, vivabec 50micrograms nasal spray, dexa-rhinaspray duo aqueous nasal spray, pollenase	*RR: Relative Risk* *Mortality, n/N (%)* Asthma • aRR1: 0.96 (95% CI: 0.77-1.21), p=0.74 • aRR2: 1.15 (95% CI: 0.93-1.43), p=0.20 • aRR3: 1.26 (95% CI: 1.02-1.55), p=0.036 • RR: 1.45 (95% C: 1.17-1.79), p=0.001 *Hospitalization, n/N (%)* Asthma • aRR1: 1.11 (95% CI: 1.02-1.20), p=0.016 • aRR2: 1.26 (95% CI: 1.16-1.36), p<0.001 • aRR3: 1.34 (95% CI: 1.24-1.45), p<0.001 • RR: 1.42 (95% CI: 1.32-1.54), p<0.001 **Severity of Condition:** NR **Duration of Condition:** NR **Treatment/ Associated Therapy:** *Mortality, n/N (%):* Asthma Antihistamine: • Asthma: 4/100 (4.0%) • No Asthma or AR: 119/2,367 (5.0%) • p=NR Systemic Glucocorticoids: • Asthma: 18/228 (7.9%) • No Asthma or AR: 102/2,228 (4.6%) • p=NR Inhaled Corticosteroids: • Asthma: 6/103 (5.8%) • No Asthma or AR: 116/2,380 (4.9%) • p=NR β2 adrenoceptor agonists • Asthma: 57/318 (17.9%) • No Asthma or AR: 200/2,190 (9.1%) • p=NR Beclomethasone • Asthma: 3/64 (4.7%) • No Asthma or AR: 119/2,433 (4.9%) • p=NR Fluticasone propionate • Asthma: 3/40 (7.5%) • No Asthma or AR: 119/2,487 (4.8%) • p=NR *Hospitalization, n/N (%):*

Study	Population and Setting	Intervention	Definitions	Outcomes
			50micrograms nasal spray, and/or care hayfever relief 50micrograms nasal spray *β2 Adrenoceptor Agonists*: salbutamol, salbutamol + ipratropium 100micrograms/ 20micrograms inhaler, beclomethasone dipropionate + salbutamol, salbutamol 100micrograms spacehaler, salbutamol product, pulvinal salbutamol 200mcg breath-act dry powder inhaler, beclometasone dipropionate + salbutamol, easyhaler salbutamol 100mcg breath-actuated dry powder inh, sodium cromoglicate + salbutamol, salmeterol, salmeterol product, salmeterol + fluticasone propionate, formoterol, budesonide + formoterol, and/or eformoterol, budesonide + eformoterol, *Beclomethasone*: beclomethasone dipropionate + salbutamol, pulvinal beclomethasone diprop 100mcg breath-act dry pdr inh, beconase 50micrograms nasal spray, rino clenil 50micrograms nasal spray, zonivent aquanasal 50micrograms spray, nasobec aqueous 50micrograms nasal spray, beclo-aqua 50 nasal spray, beclomist 50micrograms nasal spray, vivabec 50micrograms nasal spray, pollenase 50micrograms nasal spray, and/or care hayfever relief 50micrograms nasal spray *Fluticasone Propionate*: salmeterol + fluticasone propionate and/or flixonase 50micrograms aqueous nasal spray **Outcome Definitions:** *Mortality:* patients who died of confirmed COVID-19 using the ICD-10 identifier U07.1 (underlying COVID-19 cause of death) *ICU admission:* NR *Intubation:* NR *Ventilation:* NR *Hospitalization:* SARS-CoV-2-positive patients who progressed to hospitalization were considered “severe COVID-19" *Non-elective readmissions*: NR **Comments:** None	Asthma Antihistamine: • Asthma: 39/100 (39%) • No Asthma or AR: 872/2,367 (36.8%) • p=NR Systemic Glucocorticoids: • Asthma: 109/228 (47.8%) • No Asthma or AR: 813/2,228 (36.5%) • p=NR Inhaled Corticosteroids: • Asthma: 38/103 (36.9%) • No Asthma or AR: 891/2,380 (37.4%) • p=NR β2 adrenoceptor agonists • Asthma: 149/318 (46.9%) • No Asthma or AR: 782/2,190 (35.7%) • p=NR Beclomethasone • Asthma: 21/64 (32.8%) • No Asthma or AR: 910/2,433 (37.4%) • p=NR Fluticasone propionate • Asthma: 18/40 (45%) • No Asthma or AR: 925/2,487 (37.2%) • p=NR **Comorbid Conditions:** NR **Risk Markers:** *Hospitalization, n/N (%):* Asthma Female sex: • aRR1: 1.14 (95%CI: 1.01-1.28), p=0.027 Male sex: • aRR1: 1.05 (95%CI: 0.93-1.18), p=0.443 Age <65 • aRR1: 1.11 (95%CI: 0.96-1.29), p=0.153 Age ≥ 65 • aRR1: 1.09 (95%CI: 0.98-1.20), p=0.115 BMI <30 • aRR1: 1.09 (95%CI: 0.97-1.22), p=0.13 BMI ≥ 30 • aRR1: 1.11 (95%CI: 0.98-1.25), p=0.111 Non-white ethnicity: • aRR1: 0.95 (95%CI: 0.72-1.26), p=0.729 White ethnicity:

Study	Population and Setting	Intervention	Definitions	Outcomes
				• aRR1: 1.11 (95%CI: 1.02-1.21), p=0.018 Smoking never: • aRR1: 1.12 (95%CI: 0.99-1.27), p=0.085 Previous smoking: • aRR1: 1.07 (95%CI: 0.94-1.22), p=0.304 Current smoking: • aRR1: 1.12 (95%CI: 0.88-1.42), p=0.35 **Long-term Sequelae:** NR
Author: Robinson[34] **Year:** 2022 **Data Extractor:** MW **Reviewer:** CNS **Study Design:** Cohort **Study Objective:** To understand the relation of asthma to COVID-19 disease severity in patients with SARS-CoV-2 infection in a large health care system. **IVA Score:** 25 (Moderate)	**Population:** N=3,248 **Setting:** Tertiary care hospitals, community hospitals, and primary and specialty outpatient centers. **Location:** Massachusetts, USA **Study dates:** March 4 - July 2, 2020 **Inclusion criteria:** Patients ≥ 18 years of age and had a positive test result for SARS-CoV-2 by polymerase chain reaction (PCR) clinical assay between the study dates. Identified up to five SARS-CoV-2 infected comparator patients without asthma matched on age group (within 5 years), sex, and date of positive SARS-CoV-2 test (within 7 days) for each asthma patient. The first positive SARS-CoV-2 test date was used for matching. **Exclusion criteria:** Patients with non-asthma chronic lung diseases including chronic obstructive	**Medical Condition, n/N (%):** Asthma: 562/3,248 (17.3%) **Control/Comparison group, n/N (%):** No asthma: 2,686/3,248 (82.7%)	**Medical Condition(s):** *Asthma:* A patient with ≥ 2 diagnosis codes for asthma by ICD-10-CM (J45.x), and prescription of an asthma medication (including short-acting beta agonist, long-acting beta agonist, inhaled-corticosteroid, and montelukast) in the 1 year prior to diagnosis of COVID-19 **Severity Measure(s):** *Severe asthma:* Used asthma biologics (anti-IgE, anti-interleukin-5/interleukin-5 receptor, or anti-interleukin-4 receptor) in the last 1 year or received oral corticosteroids ≥ 3 times in the last 1 year, or received theophylline in the last 1 year *Non-severe asthma:* Patients who did not meet the definition of severe asthma *Allergic asthma*: History of allergic rhinitis by ICD-10-CM diagnosis code (J30.1, J30.2, J30.8x, J30.9) in the last one year or on therapy with oral antihistamine, leukotriene modifier, intranasal corticosteroid spray, or intranasal antihistamine in the last one year. **Clinical marker:** NR **Treatment/ Associated Therapy:** NR **Outcome Definitions:** *Mortality:* ND *ICU admission:* NR *Intubation:* NR *Ventilation:* Mechanical ventilation *Hospitalization:* ND *Non-elective readmissions*: NR **Comments:** None	**Severe COVID-19:** *aHR: Adjusted Hazard Ratio (model included: age, sex, race, ethnicity, payor, smoking status, body mass index, and Charlson comorbidity index)* *HR: Hazard Ratio* *Mortality, n/N (%):* • aHR: 0.30 (95%CI: 0.11 - 0.80), p <0.05 • HR: 0.47 (95%CI: 0.22 - 1.02) • Asthma: 7/562 (1.2%) • No asthma: 69/2,686 (2.6%) *Ventilation, n/N (%):* • aHR: 0.69 (95%CI: 0.36 - 1.29) • HR: 0.67 (95%CI: 0.39 - 1.15) • Asthma: 15/562 (2.7%) • No asthma: 107/2,686 (4.0%) *Hospitalization, n/N (%):* • aHR: 0.99 (95%CI: 0.80 - 1.22) • HR: 1.15 (95%CI: 0.96 - 1.38) • Asthma: 119/562 (21.2%) • No asthma: 487/2,686 (18.1%) **Severity of Condition:** *Mortality, n/N (%):* Severe asthma: • Asthma: 0/44 (0%) • No asthma: 9/210 (4.3%) Non-severe asthma: • aHR: 0.34 (95%CI: 0.12 - 0.96), p < 0.05 • HR: 0.55 (95%CI: 0.25 - 1.20) • Asthma: 7/518 (1.4%) • No asthma: 60/2,476 (2.4%) Allergic asthma: • aHR: 0.82 (95%CI: 0.24-2.75) • HR: 0.92 (95%CI: 0.39-2.16) • Allergic asthma: 6/260 (2%) • Non-allergic asthma: 1/302 (<1%)

Study	Population and Setting	Intervention	Definitions	Outcomes
	pulmonary disease, cystic fibrosis, and interstitial lung disease by International Classification of Diseases, Tenth Revision, Clinical Modification (ICD-10-CM) code. disease (ILD) by International Classification of Diseases, Tenth Revision, Clinical Modification (ICD-10-CM) code.			*Ventilation, n/N (%):* Severe asthma: • aHR: 85.2 (95%CI: 5.55 - 1310) • HR: 1.95 (95%CI: 0.75 - 5.11) • Asthma: 5/44 (11.4%) • No asthma: 12/210 (5.7%) Non-severe asthma: • aHR: 0.47 (95%CI: 0.22 - 1.01) • HR: 0.49 (95%CI: 0.26 - 0.95), p < 0.05 • Asthma: 10/518 (1.9%) • No asthma: 95/2,476 (3.8%) Allergic asthma: • aHR: 0.65 (95%CI: 0.28-1.51) • HR: 0.60 (95%CI: 0.28-1.32) • Allergic asthma: 7/260 (3%) • Non-allergic asthma: 8/302 (3%) *Hospitalization, n/N (%):* Severe asthma: • aHR: 1.99 (95%CI: 0.82 - 4.79) • HR: 1.53 (95%CI: 0.89 - 2.64) • Asthma: 14/44 (31.2%) • No asthma: 45/210 (21.4%) Non-severe asthma: • aHR: 0.94 (95%CI: 0.75 - 1.17) • HR: 1.12 (95%CI: 0.92 - 1.36) • Asthma: 105/518 (20.3%) • No asthma: 442/2,476 (17.9%) Allergic asthma: • aHR: 0.86 (95%CI: 0.64-1.16) • HR: 1.01 (95%CI: 0.76-1.34) • Allergic asthma: 49/260 (19%) • Non-allergic asthma: 70/302 (23%) **Duration of Condition:** NR **Treatment/ Associated Therapy:** NR **Comorbid Conditions:** NR **Risk Markers:** NR **Long-term Sequelae:** NR
Author: Robinson[15] **Year:** 2021 **Data Extractor:** MW	**Population:** N=403 **Setting:** Hospital **Location:** MA, USA	**Medical Condition, n/N (%):** Asthma: 80/403 (19.9%) **Control/Comparison group, n/N (%):** No asthma: 323/403 (80.1%)	**Medical Condition(s):** *Asthma:* ND **Severity Measure(s):** NR **Clinical marker:** NR	**Severe COVID-19:** *aHR1: Adjusted Hazard Ratio, model adjusted for race/ethnicity, body mass index, smoking status, and comorbid conditions (diabetes type II, coronary artery disease or myocardial infarction, liver disease, and rheumatic or autoimmune disease)*

Study	Population and Setting	Intervention	Definitions	Outcomes
Reviewer: CNS **Study Design:** Matched cohort **Study Objective:** To understand the relation of asthma to COVID-19 severity in a registry of hospitalized patients from Massachusetts General Hospital. **IVA Score:** 25 (Moderate)	**Study dates:** March 8 - April 27, 2020 **Inclusion criteria:** adult (≥ 18 years of age) registry patients with a positive SARS-CoV-2 PCR test and diagnosis of asthma by chart review, with chart verification by a board-certified allergist/immunologist (LBR). For each COVID-19 asthma inpatient, up to 5 COVID-19 non-asthma inpatient comparators were identified and matched on age (within 5 years), sex, and date of positive SARS-CoV-2 test (within 7 days). **Exclusion criteria:** Patients with other chronic lung disease (eg, chronic obstructive pulmonary disease, cystic fibrosis, interstitial lung disease) from both asthma and comparator cohorts.		**Treatment/ Associated Therapy:** NR **Outcome Definitions:** *Mortality:* NR *ICU admission:* ND *Intubation:* NR *Ventilation:* NR *Hospitalization:* NR *Non-elective readmissions*: NR **Comments:** None	*aHR2: Adjusted Hazard Ratio, model adjusted for race/ethnicity, body mass index, and smoking status* *HR: Hazard Ratio* *ICU admission, n/N (%):* • aHR1: 0.52 (95%CI: 0.30 - 0.90) • aHR2: 0.53 (95%CI: 0.31 - 0.90) • HR: 0.64 (95%CI: 0.40 - 1.02) • Asthma: 19/80 (23.8%) • No asthma: 108/323 (33.4%) **Severity of Condition:** NR **Duration of Condition:** NR **Treatment/ Associated Therapy:** NR **Comorbid Conditions:** NR **Risk Markers:** NR **Long-term Sequelae:** NR
Author: Rubio-Rivas[16] **Year:** 2021 **Data Extractor:** JKK **Reviewer:** MW **Study Design:** Cohort **Study Objective:** To identify three risk categories for the requirement of high flow nasal cannula,	**Population:** N=17,122 **Setting:** 150 hospitals nationwide **Location:** Spain **Study dates:** March 1 – July 31, 2020 **Inclusion criteria:** Hospitalized patients included in the Spanish SEMI-COVID-19 registry and diagnosed	**Medical Condition, n/N (%):** Asthma: 1,214/17,122 (7.1%) Chronic obstructive pulmonary disease (COPD): 1,155/17,122 (6.7%) **Control/Comparison group, n/N (%):** No Asthma: 15,908/17,122 (92.9%) No COPD: 15,967/17,122 (93.3%)	**Medical Condition(s):** *Asthma*: ND *COPD*: ND **Severity Measure(s):** NR **Clinical marker:** NR **Treatment/ Associated Therapy:** NR **Outcome Definitions:** *Mortality:* in-hospital mortality *ICU admission:* ND *Intubation:* invasive mechanical ventilation	**Severe COVID-19:** *aOR: Multivariable Logistic Regression; adjusted for variables with a significance of <0.10 in the univariate analyses, age, and sex* *OR: Univariate Logistic Regression* *Mortality:* Asthma • OR: 0.62 (95% CI: 0.52-0.73), p<0.001 *ICU Admission:* Asthma • aOR: 1.27 (95% CI: 1.04-1.55), p=0.017 • OR: 1.24 (95% CI: 1.03-1.50), p=0.023

Study	Population and Setting	Intervention	Definitions	Outcomes
mechanical ventilation, ICU admission, and in-hospital mortality based on lymphopenia and inflammatory parameters on admission. **IVA Score:** Asthma: 25 (moderate) COPD: 24 (moderate)	with COVID-19 by PCR test taken from nasopharyngeal sample, sputum, or bronchoalveolar lavage. **Exclusion criteria:** NR		*Ventilation:* high flow nasal cannula (HFNC); non-invasive mechanical ventilation (NIMV) *Hospitalization:* NR *Non-elective readmissions*: NR **Comments:** None	*Intubation:* Asthma • aOR: 1.24 (95% CI: 1.01-1.55), p=0.049 • OR: 1.22 (95% CI: 0.99-1.50), p=0.064 *Ventilation:* HFNC: Asthma • OR: 1.09 (95% CI: 0.89-1.33), p=0.421 NIMV: Asthma • OR: 1.08 (95% CI: 0.84-1.38), p=0.549 **Severity of Condition:** NR **Duration of Condition:** NR **Treatment/ Associated Therapy:** NR **Comorbid Conditions:** NR **Risk Markers:** NR **Long-term Sequelae:** NR
Author: Saatci[17] **Year:** 2021 **Data Extractor:** JH **Reviewer:** JKK **Study Design:** Cohort **Study Objective:** To investigate the association between race and childhood (0-18 years of age) COVID-19 testing and hospital outcomes, while accounting for sociodemographic and clinical factors using linked electronic health record data.	**Population:** N=2,576,353 COVID+ n=26,322 **Setting:** Family Practices **Location:** England **Study dates:** January 24 - November 30, 2020 **Inclusion criteria:** Children aged from birth up through 18 years of age who were registered with participating family practices in the QResearch database	**Medical Condition, n/N (%):** Asthma: 2,962/26,322 (11.3%) **Control/Comparison group, n/N (%):** No Asthma: 23,360/26,322 (88.7%)	**Medical Condition(s):** *Asthma:* ND **Severity Measure(s):** NR **Clinical marker:** NR **Treatment/ Associated Therapy:** NR **Outcome Definitions:** *Mortality:* NR *ICU admission:* ND *Intubation:* NR *Ventilation:* NR *Hospitalization:* any COVID-19 admission with a confirmed positive COVID-19 RT-PCR test result in last 14 days or an ICD-10 diagnosis code of U07.1 or U07.2 *Non-elective readmissions*: NR **Comments:** None	**Severe COVID-19:** *aOR: Adjusted Odds Ratio including age, sex, deprivation level, household size, geographical region, and comorbidities* *aRR: Adjusted Risk Ratio including age, sex, deprivation level, household size, geographical region, and comorbidities* *ICU Admission (among hospitalized), n/N (%):* Asthma: • aOR: 1.17 (95% CI: 0.40-3.41), p=NR • aRR: 1.17 (95% CI: 0.41-3.33), p=NR • ICU Admission: <5/73 (6.8%) *Hospitalization, n/N (%):* Asthma: • aOR: 1.43 (95% CI: 0.95-2.16), p=NR • aRR: 1.43 (95% CI: 0.94-2.19), p=NR • Hospitalized: 25/343 (7.3%) **Severity of Condition:** NR **Duration of Condition:** NR

Study	Population and Setting	Intervention	Definitions	Outcomes
IVA Score: 24 (Moderate)	during study dates with national SARS-CoV-2 testing, hospital admission, and mortality data. **Exclusion criteria:** NR			**Treatment/ Associated Therapy:** NR **Comorbid Conditions:** NR **Risk Markers:** NR **Long-term Sequelae:** NR
Author: Sandoval[37] **Year:** 2021 **Data Extractor:** CNS **Reviewer:** MW **Study Design:** Cohort **Study Objective:** To investigate 30-day COVID-19 disease outcomes among young adults 18–29 years old diagnosed within a large, metropolitan hospital system from March 1 to December 7, 2020. **IVA Score:** 24 (Moderate)	**Population:** N=1,853 **Setting:** One tertiary care hospital within an urban medical center and seven satellite hospitals; Houston Methodist COVID-19 Surveillance and Outcomes Registry (CURATOR) **Location:** TX, US **Study dates:** March 1-December 7, 2020 **Inclusion criteria:** All consecutive patients 18–29 years old diagnosed at a hospital encounter (inpatient, emergency, and observational) with COVID-19 by an RNA PCT test or SARS-CoV-2 antigen test during the study dates. **Exclusion criteria:** Patients who were diagnosed at their appointment or lab encounter (no visit) or other encounter type and/or discharged to another institution. Pregnant patients were excluded from 30-day repeat hospital encounters analyses.	**Medical Condition, n/N (%):** Asthma: 166/1,853 (9.0%) **Control/Comparison group, n/N (%):** No asthma: 1,687/1,853 (91.0%)	**Medical Condition(s):** *Asthma:* ND **Severity Measure(s):** NR **Clinical marker:** NR **Treatment/ Associated Therapy:** NR **Outcome Definitions:** *Mortality:* NR *ICU admission:* NR *Intubation:* NR *Ventilation:* NR *Hospitalization:* NR *Non-elective readmissions*: subsequent hospital encounter within 30 days of initial discharge; pregnant patients were excluded **Comments:** None	**Severe COVID-19:** *aOR: Multivariable Logistic Regression; model adjusted for age at encounter, sex, race/ethnicity, parent hospital, month of diagnostic encounter, social vulnerability index, financial class, body mass index, obesity class, medical history, surgical history, exposure history, symptoms screening, admission category, and therapy administered at initial encounter* *OR: Univariable (Univariate) Logistic Regression* **Severity of Condition:** NR **Duration of Condition:** NR **Treatment/ Associated Therapy:** NR **Comorbid Conditions:** NR **Risk Markers:** NR **Long-term Sequelae:** Non-elective readmissions: Asthma: • aOR: 1.7 (95% CI: 1.1-2.7), p=0.03 • OR: 1.6 (95% CI: 1.0-2.5), p=0.04

Study	Population and Setting	Intervention	Definitions	Outcomes
Author: Santorelli[18] **Year:** 2021 **Data Extractor:** DOS **Reviewer:** JH **Study Design:** Cohort **Study Objective:** To examine the ethnic, demographic, socio-economic and clinical risk factors associated with outcomes of hospital inpatients who tested positive for COVID-19. **IVA Score:** Asthma: 24 (moderate) COPD: 23 (moderate)	**Population:** N=582 **Setting:** Three acute hospitals **Location:** United Kingdom **Study dates:** February 17- August 8, 2020 **Inclusion criteria:** All patients admitted to study hospitals during study dates who tested positive for SARS-CoV-2 using RT-PCR on admission or during their stay. **Exclusion criteria:** Patients with missing ethnicity, comorbidity, and deprivation data or those aged <18 years.	**Medical Condition, n/N (%):** Asthma: 91/582 (15.6%) **Control/Comparison group, n/N (%):** No asthma: 491/582 (84.4%)	**Medical Condition(s):** *Asthma:* ND *COPD:* ND **Severity Measure(s):** NR **Clinical marker:** NR **Treatment/ Associated Therapy:** NR **Outcome Definitions:** *Mortality:* 30-day in-hospital mortality *ICU admission:* ICU admission at any time during inpatient stay *Intubation:* NR *Ventilation:* NR *Hospitalization:* NR *Non-elective readmissions*: NR **Comments:** None	**Severe COVID-19:** *aHR1: Adjusted Hazard Ratio; model included age category on admission sex, South Asian ethnicity, English Indices of Multiple Deprivation quintiles, and pre-existing comorbidities (obesity, type 2 diabetes, hypertension, cardiovascular disease, asthma, COPD, cancer, and renal disease)* *aHR2: Adjusted Hazard Ratio; model included age and sex* *aOR1: Adjusted Odds Ratio; model included age category on admission, sex, South Asian ethnicity, English Indices of Multiple Deprivation quintiles, and pre-existing comorbidities (obesity, type 2 diabetes, hypertension, cardiovascular disease, asthma, COPD, cancer, and renal disease)* *aOR2: Adjusted Odds Ratio; model included age and sex* *Mortality, n/N (%):* Asthma: • aHR1: 0.78 (95% CI: 0.35-1.62); p=NR • aHR2: 0.92 (95% CI: 0.66-1.28); p=NR *ICU admission, n/N (%):* Asthma: • aOR1: 1.67 (95% CI: 0.46-6.06); p=NR • aOR2: 1.28 (95% CI: 0.47-3.48); p=NR **Severity of Condition:** NR **Duration of Condition:** NR **Treatment/ Associated Therapy:** NR **Comorbid Conditions:** NR **Risk Markers:** NR **Long-term Sequelae:** NR
Author: Sohrabi[58] **Year:** 2021 **Data Extractor:** JH **Reviewer:** MW/DOS/CNS **Study Design:** Cohort	**Population:** N=205,654 **Setting:** COVID-19 designated healthcare facilities **Location:** Iran **Study dates:** March – December 2020	**Medical Condition, n/N (%):** Asthma: 2,734/205,654 (1.3%) **Control/Comparison group, n/N (%):** No Asthma: 202,920/205,654 (98.7%)	**Medical Condition(s):** *Asthma:* ND **Severity Measure(s):** NR **Clinical marker:** NR **Treatment/ Associated Therapy:** NR **Outcome Definitions:** *Mortality:* ND	**Severe COVID-19:** *aOR: adjusted odds ratio (model included age, sex, residing area, history of smoking, history of opioids, history of exposure to SARS-CoV-2, chest CT findings, underlying diseases, and symptoms)* *Mortality, n/N (%)* Asthma • aOR: 0.76 (95%CI: 0.649-0.904), p=0.002 • Deceased: 271/20,472 (1.3%) • Survived: 2,463/185,182 (1.3%)

Study	Population and Setting	Intervention	Definitions	Outcomes
Study Objective: To summarize the socio-demographic and clinical characteristics of the patients diagnosed with COVID-19 in Tehran, and to identify the predictors of severe health outcomes. **IVA Score:** 24 (Moderate)	**Inclusion criteria:** All COVID-19 cases either confirmed by PCR test result or diagnosed via chest CT and clinically epidemiological criteria who had visited COVID-19 designated healthcare facilities across the province of Tehran during the study dates were included. **Exclusion criteria:** NR		*ICU admission:* NR *Intubation:* NR *Ventilation:* NR *Hospitalization:* NR *Non-elective readmissions*: NR **Comments:** None	• p=0.93 **Severity of Condition:** NR **Duration of Condition:** NR **Treatment/ Associated Therapy:** NR **Comorbid Conditions:** NR **Risk Markers:** NR **Long-term Sequelae:** NR
Author: Sousa[59] **Year:** 2021 **Data Extractor:** DOS **Reviewer:** MW **Study Design:** Cross-sectional **Study Objective:** To assess risk factors for mortality in COVID-19 hospitalized children and adolescents in Brazil. **IVA Score:** 24 (moderate)	**Population:** N=5,857 **Setting:** Hospitals **Location:** Brazil **Study dates:** January 1 - December 7, 2020 **Inclusion criteria:** All patients younger than 20 years old, hospitalized with PCR-confirmed COVID-19 and with a known outcome. Data from the Brazilian Mistry of Health. **Exclusion criteria:** Patients older than 20 years, patients not admitted to the hospital, and ongoing cases or those without a clear outcome.	**Medical Condition, n/N (%):** Asthma: 455/5,857 (7.8%) **Control/Comparison group, n/N (%):** No asthma: 5,402/5,857 (92.2%)	**Medical Condition(s):** *Asthma:* ND **Severity Measure(s):** NR **Clinical marker:** NR **Treatment/ Associated Therapy:** NR **Outcome Definitions:** *Mortality:* in-hospital mortality *ICU admission:* NR *Intubation:* NR *Ventilation:* NR *Hospitalization:* NR *Non-elective readmissions*: NR **Comments:** None	**Severe COVID-19:** *aOR: Multilevel mixed-effects generalized linear model, assuming municipalities and hospitals as random effects* *Mortality, n/N (%):* • aOR: 0.42 (95% CI: 0.24-0.67); p=NR • Asthma: 19/455 (4.2%) • No asthma: 546/5,402 (10.1%) **Severity of Condition:** NR **Duration of Condition:** NR **Treatment/ Associated Therapy:** NR **Comorbid Conditions:** NR **Risk Markers:** NR **Long-term Sequelae:** NR
Author: Tagarro[19] **Year:** 2021 **Data Extractor:** JH **Reviewer:** DOS	**Population:** N= 1200 **Setting:** 76 hospitals **Location:** Spain **Study dates:** March 12, 2020 – March 22, 2021	**Medical Condition, n/N (%):** Asthma: 85/1,200 (7.1%) **Control/Comparison group, n/N (%):** No Asthma: 1,115/1,200 (92.9%)	**Medical Condition(s):** *Asthma:* ND; included recurrent wheezing **Severity Measure(s):** NR **Clinical marker:** NR	**Severe COVID-19:** *aOR: adjusted odds ratio; model variables NR* *OR: univariate logistic regression* *ICU admission, n/N (%):* Asthma: • aOR: 2.5 (95% CI: 1.2-5.2), p=NR • OR: 2.1 (95% CI: 1.2-3.9), p=NR

Study	Population and Setting	Intervention	Definitions	Outcomes
Study Design: Cohort **Study Objective:** To identify the spectrum of disease in children with COVID-19, and the risk factors for hospitalization and admission in pediatric intensive care units (PICUs) during the first year of the pandemic in Spain. **IVA Score:** 23 (Moderate)	**Inclusion criteria:** Children aged from 0 to 18 years who attended any of the study hospitals during the study period with a SARS-CoV-2 infection confirmed by RT-PCR from nasopharyngeal swabs and tracheal or bronchial aspirates when available, rapid antigen test, or children fulfilling WHO criteria for multisystem inflammatory syndrome in children (MIS-C). **Exclusion criteria:** NR		**Treatment/ Associated Therapy:** NR **Outcome Definitions:** *Mortality:* NR *ICU admission:* admission into a PICU due to COVID-19 *Intubation:* NR *Ventilation:* NR *Hospitalization:* ND *Non-elective readmissions*: NR **Comments:** Children hospitalized were enrolled during the whole year, while children attended in the emergency rooms and discharged without admission were recorded only until October 1, 2020.	• Asthma: 16/85 (18.8%) • No asthma: 107/1,115 (9.6%) *Hospitalization:* Asthma: • Asthma: 53/85 (62.3%) • No asthma: 613/1,115 (55.0%) **Severity of Condition:** NR **Duration of Condition:** NR **Treatment/ Associated Therapy:** NR **Comorbid Conditions:** NR **Risk Markers:** NR **Long-term Sequelae:** NR
Author: Tang[35] **Year:** 2020 **Data Extractor:** JKK **Reviewer:** CNS **Study Design:** Cohort **Study Objective:** To assess outcomes associated with SARS-CoV-2 infection among residents who were tested for SARS-CoV-2 RNA across one nursing home system with both long-term and post-acute rehabilitation services. **IVA Score:** Asthma: 24 (moderate) COPD: 23 (moderate)	**Population:** N=1970; COVID+ n=752 **Setting:** 15 skilled nursing facilities **Location:** WA, US **Study dates:** March 1 – June 16, 2020 **Inclusion criteria:** All residents from 15 skilled nursing facilities who were universally tested for SARS-CoV-2 by RT-PCR using nasopharyngeal or oropharyngeal swabs and had recorded test results during the study dates. **Exclusion criteria:** NR	**Medical Condition, n/N (%):** Asthma: 54/752 (7.2%) **Control/Comparison group, n/N (%):** No Asthma: 698/752 (92.8%)	**Medical Condition(s):** *Asthma*: ICD-10 code J45 **Severity Measure(s):** NR **Clinical marker:** NR **Treatment/ Associated Therapy:** NR **Outcome Definitions:** *Mortality:* ND *ICU admission:* NR *Intubation:* NR *Ventilation:* NR *Hospitalization:* ND *Non-elective readmissions*: NR **Comments:** None	**Severe COVID-19:** *aRR: Adjusted Relative Risk; adjusted for age, sex, race, and facility* *Mortality, n/N (%):* Asthma: • aRR: 0.64 (95% CI: 0.30-1.40), p=NR *Hospitalization, n/N (%):* Asthma: • aRR: 1.27 (95% CI: 0.74-2.18), p=NR **Severity of Condition:** NR **Duration of Condition:** NR **Treatment/ Associated Therapy:** NR **Comorbid Conditions:** NR **Risk Markers:** NR **Long-term Sequelae:** NR
Author: Temkin-Greener[60]	**Population:** N= 3,994	**Medical Condition, mean percentage (SD):** Asthma:	**Medical Condition(s):** *Asthma*: ND	**Severe COVID-19:** *IRR: Incidence rate ratio; adjusted for AL-level resident characteristics and county-level COVID-19 spread*

Study	Population and Setting	Intervention	Definitions	Outcomes
Year: 2020 **Data Extractor:** MC **Reviewer:** DOS **Study Design:** Cohort **Study Objective**: To describe variations in COVID-19 confirmed cases and deaths among assisted living (AL) residents and examine their associations with key AL characteristics. **IVA Score:** Asthma: 24 (Moderate) COPD: 23 (Moderate)	**Setting:** Assisted living communities in seven states **Location:** Colorado, Connecticut, Georgia, North Carolina, New York, Ohio, and South Carolina **Study dates:** March - May 29, 2020 **Inclusion criteria:** Assisted living communities (ALs) that reported COVID-19 cases and/or deaths on their official state websites. **Exclusion criteria:** States that did not report actual numbers of cases in AL residences with fewer than five, states that only provided a range of cases, not the actual counts, states that reported only new outbreaks or weekly cases, but did not report cumulative counts, and states that showed a disproportionately small number of COVID-affected AL residents and cases.	• 1-3 confirmed deaths: 16.9% (14.0) • 4-26 confirmed deaths: 15.8% (13.7) **Control/Comparison group, n/N (%):** Asthma: • 0 confirmed deaths: 14.7% (17.7)	**Severity Measure(s):** NR **Clinical marker:** NR **Treatment/ Associated Therapy:** NR **Outcome Definitions:** *Mortality:* • Incidence rate ratio (IRR): count of deaths among AL facilities with at least one death compared to AL facilities with 0 deaths • Adjusted odds ratio (aOR): likelihood of AL facility having at least one death *ICU admission:* NR *Intubation:* NR *Ventilation:* NR *Hospitalization:* NR *Non-elective readmissions*: NR **Comments:** None	*aOR: Multivariable Logistic Regression; adjusted for AL-level resident characteristics and county-level COVID-19 spread* *Mortality:* Asthma: • IRR: 0.91 (95% CI: 0.83-0.99), p=0.042 • aOR: 1.14 (95% CI: 0.98-1.32), p=0.81 **Severity of Condition:** NR **Duration of Condition:** NR **Treatment/ Associated Therapy:** NR **Comorbid Conditions:** NR **Risk Markers:** NR **Long-term Sequelae:** NR
Author: Wei[61] **Year:** 2021 **Data Extractor:** JH **Reviewer:** DOS **Study Design:** Cohort	**Population:** N= 206,741 **Setting:** Emergency room, urgent care, and other outpatient settings **Location:** US	**Medical Condition, n/N (%):** Asthma: 21,993/206,741 (10.6%) **Control/Comparison group, n/N (%):** No Asthma: 184,748/206,741 (89.4%)	**Medical Condition(s):** *Asthma:* ND **Severity Measure(s):** NR **Clinical marker:** NR **Treatment/ Associated Therapy:** NR **Outcome Definitions:**	**Severe COVID-19:** *aHR: adjusted hazard ratio; model included demographics (age, sex, race/ethnicity, and geographic region), BMI, comorbidities, smoking status, location of first COVID-19 encounter, baseline period resource use (ER/UC hospitalization), and index month* *HR: hazard ratio* *Hospitalization, %:* Asthma:

Study	Population and Setting	Intervention	Definitions	Outcomes
Study Objective: To characterize US patients initially diagnosed with COVID-19 in the outpatient setting and to estimate the 30-day incidence of and risk factors for subsequent COVID-19 related urgent medical visits (UMVs) using a large, national, electronic health records (EHR) database. **IVA Score:** Asthma: 25 (Moderate) COPD: 24 (Moderate)	**Study dates:** June 1 - December 9, 2020 **Inclusion criteria:** Adult patients (aged ≥ 18 years) having their first confirmed COVID-19 diagnosis (ICD-10 code U07.1) or positive SARS-CoV-2 virus test in the outpatient setting during the study period, were a part of an integrated delivery network health system and had ≥ 1 health care encounter within 2 years prior to COVID-19 diagnosis for assessment of medical history. **Exclusion criteria:** Patients who were hospitalized on the index date, had a prior COVID- 19/ coronavirus diagnosis, or a prior positive SARS-CoV-2 virus or antibody test result before June 1, 2020.		*Mortality:* NR *PICU admission:* NR *Intubation:* NR *Ventilation:* NR *Hospitalization:* COVID-19-related hospitalizations within 30 days of an outpatient COVID-19 diagnosis or positive SARS-CoV-2 test *Non-elective readmissions*: NR **Comments:** None	• aHR: 1.07 (95%CI: 1.00-1.15), p=NR • HR: 1.39 (95% CI: 1.30-1.48), p=NR • Asthma: 5.0% • No asthma: 3.7% **Severity of Condition:** NR **Duration of Condition:** NR **Treatment/ Associated Therapy:** NR **Comorbid Conditions:** NR **Risk Markers:** NR **Long-term Sequelae:** NR
Author: Williamson[63] **Year:** 2020 **Data Extractor:** CS **Reviewer:** DOS **Study design:** cohort study **Study Objective:** to determine factors that are associated with	**Population:** N=17,278,392 patients **Setting:** electronic health record system from participating GP surgeries across England; approximately 40% of the English population **Location:** England	**Medical Condition, n/N (%):** Asthma: • No recent oral corticosteroid (OCS) use: 2,454,403/17,278,392 (14.2) • Recent OCS use: 291,670/17,278,392 (1.7) **Control/Comparison group, n/N (%):** *Calculated by ERT No asthma: 14,532,319/17,278,392 (84.1)	**Medical Condition(s):** *Asthma*: grouped by recent use of OCS, where 'recent' refers to during the year before baseline **Severity Measure(s):** *Asthma*: use of oral corticosteroids as an indication of severity **Clinical marker:** NR **Treatment/ Associated Therapy:** NR **Outcome Definitions:**	**Severe COVID-19:** *aHR: Kaplan-Meier hazard ratio (95% CI) adjusted for age, sex, and other covariates; n/N (%)* *^Odds ratio [OR] (95% CI) calculated by ERT* **Severity of Condition:** COVID-19 related mortality: Asthma vs no asthma, no recent OCS use: • aHR: 0.99 (0.93–1.05); 1,211/2,454,403 (0.05) Asthma vs no asthma, recent OCS use: • aHR: 1.13 (1.01–1.26); 335/291,670 (0.11) Recent OCS use versus no recent OCS use:

Study	Population and Setting	Intervention	Definitions	Outcomes
COVID-19-related death in England **IVA** **Score:** 25 (moderate)	**Study dates:** February 1 – May 6, 2020 **Inclusion criteria:** adults ≥18 years old currently registered as active patients with a general practice using TPP software with ≥1 year prior follow-up in the GP practice; patients had to have recorded sex, age and deprivation score **Exclusion criteria:** patients with less than one year of prior follow-up, <18 years old on February 1, 2020, or missing demographic information		*COVID-19*: suspected or laboratory confirmed *Mortality*: ND **Comments:** Author's note: included clinically suspected (non-laboratory confirmed) cases of COVID-19 since testing was not always carried out	• OR (95% CI): 2.33 (2.06-2.63) **Duration of Condition:** NR **Clinical marker:** NR **Treatment/ Associated Therapy:** NR **Comorbid Conditions:** NR **Long-term Sequelae:** NR

B.3.c. Internal Validity Assessments of Extracted Studies

Table 8. Internal Validity Assessments of Extracted Studies reporting the Association between asthma and Severe COVID-19 Outcomes

	Author Year	Aabakke 2021[20]	Abayomi 2021[38]	Adir 2021[67]	Akhtar 2021[1]	Antoon 2021[21]	Aveyard 2021[2]	Beatty 2021[3]	Beken 2021[68]

	Outcome(s)	Hospitalization	Mortality	Mortality	Mortality, ICU Admission, Ventilation	Hospitalization	Mortality, ICU, Hospitalization	Mortality, ICU admission	Hospitalization
Domain	**Signaling question**	data extracted from medical records	EMR	Data obtained from database	Data obtained from patient records	EMR	data extracted from medical records	data from database	clinical and laboratory evaluation 2 months AFTER COVID-19 diagnosis
Study Elements	Design appropriate to research question	1	1	1	1	1	1	1	1
	Well described population	1	1	1	1	1	1	1	1
	Well described setting	1	1	1	1	1	1	1	1
	Well described intervention/ exposure	1	1	1	1	0	1	1	1
	Well described control/ comparator	1	1	0	1	0	1	1	1
	Well described outcome	1	1	1	1	1	1	1	1
	Clear timeline of exposures/ interventions and outcomes	1	1	1	1	1	1	1	0
Selection Bias: Sampling	Randomization appropriately performed	0	0	0	0	0	0	0	0
	Allocation adequately concealed	0	0	0	0	0	0	0	0
	Population sampling appropriate to study design	1	1	1	1	1	1	1	1
Selection Bias: Attrition	Attrition not significantly different between groups	1	1	1	1	1	1	1	1

		Attrition <10-15% of population	1	1	1	1	1	1	1	1
		Attrition appropriately analyzed	1	1	1	1	1	1	1	1
Information Bias: Measurement and Misclassification		Measure of intervention/ exposure is valid	1	0	1	1	1	1	1	1
		Measure of outcome is valid	1	1	1	1	1	1	1	1
		Fidelity to intervention is measured	0	0	0	0	0	0	0	0
		Fidelity to intervention is valid	0	0	0	0	0	0	0	0
		Prospective study	1	1	1	1	1	1	1	0
		Adequately powered to detect result	0	0	1	0	0	0	0	0
Information Bias: Performance & Detection		Outcome assessor blinded	0	0	0	0	0	0	0	0
		Study participant blinded	0	0	0	0	0	0	0	0
		Investigator/ data analyst blinded	0	0	0	0	0	0	0	0
		Data collection methods described in sufficient detail	1	1	1	1	1	1	1	1
		Data collection methods appropriate	1	1	1	1	1	1	1	0
		Sufficient follow up to detect outcome	1	1	1	1	1	1	1	1
Information Bias: Analytic		Appropriate statistical	1	1	1	1	1	1	1	1

	analyses for collected data								
	Appropriate statistical analyses are conducted correctly	1	1	1	1	1	1	1	1
	Confidence interval is narrow	0	0	0	0	1	0	0	0
Confounding	Potential confounders identified	1	1	1	1	1	1	1	1
	Adjustment for confounders in study design phase	0	0	0	0	0	0	0	0
	Adjustment for confounders in data analysis phase	1	1	1	1	1	1	1	0
Reporting Bias	All pre-specified outcomes are adequately reported	1	1	1	1	1	1	1	1
Other Bias	No other sources of bias	1	1	1	1	1	1	1	1
COI	Funding sources disclosed and no obvious conflict of interest	1	1	1	1	1	1	1	1
SCORE	Threat to internal validity	24	23	24	24	23	24	24	20
	Low, Moderate, High	Moderate	Moderate	Moderate	Moderate	Moderate	Moderate	Moderate	Moderate

	Author Year	**Beltramo 2021[4]**	**Bergman 2021[5]**	**Bloom 2021[39]**	**Bloom 2022[62]**	**Calmes 2021[6]**	**Cao 2021[7]**	**Castilla 2021[8]**	**Choi 2021[9]**
	Outcome(s)	Mortality, ICU admission	Mortality, ICU admission, hospitalization	Mortality	Hospitalization	Mortality, ICU admission	Mortality, ICU admission, ventilation, hospitalization	Mortality, ICU admission, Hospitalization	Mortality, ICU admission

Domain	Signaling question	Hospital records	Registries	Data collected from case report forms collected by clinical research staff in a secure online database	Data extracted from primary care electronic medical records	data extracted from medical records	data was extracted from medical records and self-reported in patient interviews	data extracted from medical records	Data collected from patient medical claims records
Study Elements	Design appropriate to research question	1	1	1	1	1	1	1	1
	Well described population	1	1	1	1	1	1	1	1
	Well described setting	1	1	1	0	1	1	1	1
	Well described intervention/ exposure	1	1	1	1	1	1	1	1
	Well described control/ comparator	1	1	1	1	1	1	1	1
	Well described outcome	1	1	1	1	1	1	1	1
	Clear timeline of exposures/ interventions and outcomes	0	1	1	1	1	1	1	1
Selection Bias: Sampling	Randomization appropriately performed	0	0	0	0	0	0	0	0
	Allocation adequately concealed	0	0	0	0	0	0	0	0
	Population sampling appropriate to study design	1	1	1	1	1	1	1	1
Selection Bias: Attrition	Attrition not significantly different between groups	1	1	1	1	1	1	1	1
	Attrition <10-15% of population	1	1	1	1	1	1	1	1

	Attrition appropriately analyzed	1	1	1	1	1	1	1	1
Information Bias: Measurement and Misclassification	Measure of intervention/ exposure is valid	1	1	0	1	1	1	1	1
	Measure of outcome is valid	1	1	1	1	1	1	1	1
	Fidelity to intervention is measured	0	0	0	0	0	0	0	0
	Fidelity to intervention is valid	0	0	0	0	0	0	0	0
	Prospective study	1	1	1	1	1	1	1	1
	Adequately powered to detect result	0	1	1	0	0	0	0	0
Information Bias: Performance & Detection	Outcome assessor blinded	0	0	0	0	0	0	0	0
	Study participant blinded	0	0	0	0	0	0	0	0
	Investigator/ data analyst blinded	0	0	0	0	0	0	0	0
	Data collection methods described in sufficient detail	1	1	1	1	1	1	1	1
	Data collection methods appropriate	1	1	1	1	1	1	1	1
	Sufficient follow up to detect outcome	1	1	1	1	1	1	1	1
Information Bias: Analytic	Appropriate statistical analyses for collected data	1	1	1	1	1	1	1	1
	Appropriate statistical	1	1	1	1	1	1	1	1

	analyses are conducted correctly								
	Confidence interval is narrow	1	1	0	0	0	0	0	0
Confounding	Potential confounders identified	1	1	1	1	1	1	1	1
	Adjustment for confounders in study design phase	0	0	0	1	0	0	0	0
	Adjustment for confounders in data analysis phase	1	1	1	1	1	1	1	1
Reporting Bias	All pre-specified outcomes are adequately reported	1	1	1	1	1	1	1	1
Other Bias	No other sources of bias	1	1	1	1	1	1	1	1
COI	Funding sources disclosed and no obvious conflict of interest	1	1	1	1	1	0	1	0
SCORE	Threat to internal validity	24	26	24	24	24	23	24	23
	Low, Moderate, High	Moderate	Low	Moderate	Moderate	Moderate	Moderate	Moderate	Moderate

	Author Year	**Eggert 2021[22]**	**Experton 2021[40]**	**Ferastraoaru 2021[41]**	**Floyd 2021[23]**	**Gaietto 2021[24]**	**Garcia-Posada 2021[25]**	**Ge 2021[42]**	**Girardin 2021[43]**
	Outcome(s)	Hospitalization	Mortality, Hospitalization	Mortality, hospitalization	Hospitalization	Hospitalization	Mortality, Hospitalization	Mortality	Mortality
Domain	**Signaling question**	EMR	Data extracted from database	electronic health records	data extracted from medical records	electronic health records	Data collected from patients	insurance database	data was extracted from medical records

							admitted to hospital		
Study Elements	Design appropriate to research question	1	1	1	1	1	1	1	1
	Well described population	1	1	1	1	1	1	1	1
	Well described setting	1	0	1	1	1	1	1	1
	Well described intervention/ exposure	1	1	1	1	1	1	1	1
	Well described control/ comparator	1	1	1	1	1	1	1	1
	Well described outcome	1	1	1	1	1	1	1	1
	Clear timeline of exposures/ interventions and outcomes	1	1	1	1	1	1	1	1
Selection Bias: Sampling	Randomization appropriately performed	0	0	0	0	0	0	0	0
	Allocation adequately concealed	0	0	0	0	0	0	0	0
	Population sampling appropriate to study design	1	1	1	1	1	1	1	1
Selection Bias: Attrition	Attrition not significantly different between groups	1	1	1	1	1	1	1	1
	Attrition <10-15% of population	1	1	1	1	1	1	1	1
	Attrition appropriately analyzed	1	1	1	1	1	1	1	1
Information Bias:	Measure of intervention/	1	1	1	1	1	0	1	0

Measurement and Misclassification	exposure is valid								
	Measure of outcome is valid	1	1	1	1	1	1	1	1
	Fidelity to intervention is measured	0	0	0	0	0	0	0	0
	Fidelity to intervention is valid	0	0	0	0	0	0	0	0
	Prospective study	1	1	1	1	1	1	1	1
	Adequately powered to detect result	0	0	0	0	0	0	0	0
Information Bias: Performance & Detection	Outcome assessor blinded	0	0	0	0	0	0	0	0
	Study participant blinded	0	0	0	0	0	0	0	0
	Investigator/ data analyst blinded	0	0	0	0	0	0	0	0
	Data collection methods described in sufficient detail	1	1	1	1	1	1	1	1
	Data collection methods appropriate	1	1	1	1	1	1	1	1
	Sufficient follow up to detect outcome	1	1	1	1	1	1	1	1
Information Bias: Analytic	Appropriate statistical analyses for collected data	1	1	1	1	1	1	1	1
	Appropriate statistical analyses are conducted correctly	1	1	1	1	1	1	1	1

	Confidence interval is narrow	0	1	0	1	0	0	1	1
Confounding	Potential confounders identified	1	1	1	1	1	1	1	1
	Adjustment for confounders in study design phase	0	0	0	0	0	0	0	0
	Adjustment for confounders in data analysis phase	1	1	1	1	1	1	1	1
Reporting Bias	All pre-specified outcomes are adequately reported	1	1	1	1	1	1	1	1
Other Bias	No other sources of bias	1	1	1	1	1	1	1	1
COI	Funding sources disclosed and no obvious conflict of interest	1	1	1	1	1	1	1	1
SCORE	Threat to internal validity	24	24	24	25	24	23	25	24
	Low, Moderate, High	Moderate	Moderate	Moderate	Moderate	Moderate	Moderate	Moderate	Moderate

	Author Year	**Gottlieb 2020[26]**	**Graff 2021[27]**	**Guan 2021[10]**	**Gude-Sampedro 2020[28]**	**Hansen 2021[11]**	**Hassaan 2021[44]**	**Hippisley-Cox 2021[69]**	**Ho 2021[12]**
	Outcome(s)	Hospitalization	ICU admission, Hospitalization, re-admission	Mortality, ICU admission, Ventilation	Mortality; ICU admission; hospitalization	Mortality, ICU admission	Mortality	Mortality, Hospitalization	Mortality, ICU admission
Domain	**Signaling question**	Data retrieved from medical records	data was extracted from medical records	EMR	Data retrieved from medical records	data was extracted from national registries	data retrieved from WHO portal, the world bank group, and the global health observatory	Data retrieved from database	data was extracted from medical records

Study Elements	Design appropriate to research question	1	1	1	1	1	1	1	1
	Well described population	1	1	1	1	1	0	0	1
	Well described setting	1	1	1	1	1	0	1	1
	Well described intervention/ exposure	0	1	1	1	1	1	0	1
	Well described control/ comparator	0	1	1	1	1	1	0	1
	Well described outcome	1	1	1	1	1	1	1	1
	Clear timeline of exposures/ interventions and outcomes	0	1	1	1	1	1	1	1
Selection Bias: Sampling	Randomization appropriately performed	0	0	0	0	0	0	0	0
	Allocation adequately concealed	0	0	0	0	0	0	0	0
	Population sampling appropriate to study design	1	1	1	1	1	1	1	1
Selection Bias: Attrition	Attrition not significantly different between groups	0	1	1	1	1	1	1	1
	Attrition <10-15% of population	0	1	1	1	1	1	1	1
	Attrition appropriately analyzed	0	1	1	1	1	1	1	1
Information Bias: Measurement and	Measure of intervention/ exposure is valid	1	1	1	1	1	0	1	1

Misclassification	Measure of outcome is valid	1	1	1	1	1	0	1	1
	Fidelity to intervention is measured	0	0	0	0	0	0	0	0
	Fidelity to intervention is valid	0	0	0	0	0	0	0	0
	Prospective study	0	1	1	1	1	1	1	1
	Adequately powered to detect result	1	0	0	1	1	0	1	0
Information Bias: Performance & Detection	Outcome assessor blinded	0	0	0	0	0	0	0	0
	Study participant blinded	0	0	0	0	0	0	0	0
	Investigator/ data analyst blinded	0	0	0	0	0	0	0	0
	Data collection methods described in sufficient detail	0	1	1	1	1	1	1	1
	Data collection methods appropriate	1	1	1	1	1	1	1	1
	Sufficient follow up to detect outcome	1	1	1	1	1	1	1	1
Information Bias: Analytic	Appropriate statistical analyses for collected data	1	1	1	1	1	1	1	1
	Appropriate statistical analyses are conducted correctly	1	1	1	1	1	1	1	1
	Confidence interval is narrow	0	0	0	0	0	0	0	0

Confounding	Potential confounders identified	1	1	1	1	1	1	1	1
	Adjustment for confounders in study design phase	0	0	0	0	0	0	0	0
	Adjustment for confounders in data analysis phase	1	1	1	1	1	1	1	1
Reporting Bias	All pre-specified outcomes are adequately reported	1	1	1	1	1	1	1	1
Other Bias	No other sources of bias	1	1	1	1	1	0	1	1
COI	Funding sources disclosed and no obvious conflict of interest	1	1	1	1	1	1	1	1
SCORE	Threat to internal validity	17	24	24	25	25	19	22	24
	Low, Moderate, High	High	Moderate	Moderate	Moderate	Moderate	Moderate	Moderate	Moderate

	Author Year	**Huang 2021[45]**	**Hussein 2020[13]**	**Jung 2021[64]**	**Khose 2020[46]**	**Kim SH 2021[65]**	**Ko 2021[29]**	**Kolivand 2021[47]**
	Outcome(s)	Mortality, ICU admission, ventilation, hospitalization	Mortality, ICU admission, Intubation, Ventilation	Mortality	Case fatality	Mortality	Hospitalization	Mortality
Domain	**Signaling question**	Data was extracted from medical records	data extracted from a web-based data collection platform, RedCap	data retrieved from database	data retrieved from database	data from national dataset	data extracted from COVID-NET, medical records, and BFRSS data	data extracted from patient medical records
Study Elements	Design appropriate to research question	1	1	1	1	1	1	1
	Well described population	1	1	1	1	1	1	1

	Well described setting	1	1	1	0	1	1	1
	Well described intervention/ exposure	1	1	1	1	1	1	1
	Well described control/ comparator	1	1	1	0	1	1	1
	Well described outcome	1	1	1	0	1	1	1
	Clear timeline of exposures/ interventions and outcomes	1	1	1	1	1	1	1
Selection Bias: Sampling	Randomization appropriately performed	0	0	0	0	0	0	0
	Allocation adequately concealed	0	0	0	0	0	0	0
	Population sampling appropriate to study design	1	1	1	1	1	0	1
Selection Bias: Attrition	Attrition not significantly different between groups	1	1	1	1	1	1	1
	Attrition <10-15% of population	1	1	1	1	1	1	1
	Attrition appropriately analyzed	1	1	1	1	1	1	1
Information Bias: Measurement and Misclassification	Measure of intervention/ exposure is valid	1	1	1	1	1	1	1
	Measure of outcome is valid	1	1	1	0	1	1	1
	Fidelity to intervention is measured	0	0	0	0	0	0	0
	Fidelity to intervention is valid	0	0	0	0	0	0	0
	Prospective study	1	1	1	1	1	1	1

	Adequately powered to detect result	0	0	0	0	0	0	0
Information Bias: Performance & Detection	Outcome assessor blinded	0	0	0	0	0	0	0
	Study participant blinded	0	0	0	0	0	0	0
	Investigator/ data analyst blinded	0	0	0	0	0	0	0
	Data collection methods described in sufficient detail	1	1	1	0	1	1	1
	Data collection methods appropriate	1	1	1	0	1	1	1
	Sufficient follow up to detect outcome	1	1	1	0	1	1	1
Information Bias: Analytic	Appropriate statistical analyses for collected data	1	1	1	1	1	1	1
	Appropriate statistical analyses are conducted correctly	1	1	1	1	1	1	0
	Confidence interval is narrow	0	0	0	1	0	0	0
Confounding	Potential confounders identified	1	1	1	1	1	1	1
	Adjustment for confounders in study design phase	0	0	0	1	0	0	0
	Adjustment for confounders in data analysis phase	1	1	1	0	1	1	1
Reporting Bias	All pre-specified outcomes are adequately reported	1	1	1	1	1	1	1
Other Bias	No other sources of bias	1	1	1	1	1	1	0
COI	Funding sources disclosed and no obvious conflict of interest	1	1	1	1	1	1	1

SCORE	Threat to internal validity	24	24	24	18	24	23	22
	Low, Moderate, High	Moderate	Moderate	Moderate	Moderate	Moderate	Moderate	Moderate

	Author Year	**Kompaniyets 2021[30]**	**Lee 2020[66]**	**Mahdavinia 2020[48]**	**Mallow 2020[49]**	**Manohar 2021[31]**	**Mather 2021[50]**	**Messiah 2021[32]**	**Millar 2021[51]**
	Outcome(s)	Hospitalization	Mortality, ICU admission, Ventilation	Mortality, intubation, Hospitalization	Mortality; ICU admission	Mortality, hospitalized	Mortality, ventilation	ICU admission, hospitalization	Mortality
Domain	**Signaling question**	data extracted from database	data extracted from national database	Data extracted from electronic health records	Data retrieved from electronic medical records	data from EMR	Data was extracted from medical records	data from medical records	Data extracted from multiple county level databases
Study Elements	Design appropriate to research question	1	1	1	1		1	1	1
	Well described population	1	1	1	1	1	1	1	0
	Well described setting	1	1	1	1	1	1	1	1
	Well described intervention/ exposure	1	1	1	1	1	1	1	1
	Well described control/ comparator	1	1	1	1	1	1	1	1
	Well described outcome	1	1	1	1	1	1	1	1
	Clear timeline of exposures/ interventions and outcomes	1	1	1	1	1	1	1	1
Selection Bias: Sampling	Randomization appropriately performed	0	0	0	0	0	0	0	0
	Allocation adequately concealed	0	0	0	0	0	0	0	0
	Population sampling	1	1	1	1	1	1	1	1

	appropriate to study design								
Selection Bias: Attrition	Attrition not significantly different between groups	1	1	1	1	1	1	1	1
	Attrition <10-15% of population	1	1	1	1	1	1	1	1
	Attrition appropriately analyzed	1	1	1	1	1	1	1	1
Information Bias: Measurement and Misclassification	Measure of intervention/ exposure is valid	1	1	1	1	1	1	1	0
	Measure of outcome is valid	1	1	1	1	1	1	1	1
	Fidelity to intervention is measured	0	0	0	0	0	0	0	0
	Fidelity to intervention is valid	0	0	0	0	0	0	0	0
	Prospective study	1	1	1	1	1	1	1	1
	Adequately powered to detect result	1	0	0	1	1	0	0	0
Information Bias: Performance & Detection	Outcome assessor blinded	0	0	0	0	0	0	0	0
	Study participant blinded	0	0	0	0	0	0	0	0
	Investigator/ data analyst blinded	0	0	0	0	0	0	0	0
	Data collection methods described in sufficient detail	1	1	1	1	1	1	1	1

	Data collection methods appropriate	1	1	1	1	1	1	1	1
	Sufficient follow up to detect outcome	1	1	1	1	1	1	1	1
Information Bias: Analytic	Appropriate statistical analyses for collected data	1	1	1	1	1	1	1	1
	Appropriate statistical analyses are conducted correctly	1	1	1	1	1	1	1	1
	Confidence interval is narrow	0	0	0	1	0	0	0	0
Confounding	Potential confounders identified	1	1	1	1	1	1	1	1
	Adjustment for confounders in study design phase	0	0	0	0	0	1	0	0
	Adjustment for confounders in data analysis phase	1	1	1	1	1	1	1	1
Reporting Bias	All pre-specified outcomes are adequately reported	1	1	1	1	1	1	1	1
Other Bias	No other sources of bias	1	1	1	1	1	1	1	0
COI	Funding sources disclosed and no obvious conflict of interest	1	1	1	1	1	1	1	1
SCORE	Threat to internal validity	25	24	24	26	25	25	24	21
	Low, Moderate, High	Moderate	Moderate	Moderate	Low	Moderate	Moderate	Moderate	Moderate

	Author Year	Mollalo 2021[52]	Momeni-Boroujeni 2021[53]	Naqvi 2021[54]	Oh 2021[55]	Pandita 2021[56]	Parra-Bracamonte 2020[57]	Perez-Sastre 2020[14]	Ramos-Martinez 2021[36]
	Outcome(s)	Mortality	Mortality	Mortality	Mortality	Mortality	Mortality	Mortality, ICU admission, Intubation, hospitalization	Re-admissions
Domain	**Signaling question**	Data retrieved from USAFacts and University of Washington Global Health Data Exchange	data extracted from medical records	Data was collected prospectively at the time of visit	data was extracted from database	Data extracted from electronic medical records	extracted from open data source	data extracted from database	data extracted from nation-wide registry
Study Elements	Design appropriate to research question	1	1	1	1	1	1	1	1
	Well described population	1	1	1	1	1	1	1	1
	Well described setting	1	1	1	1	1	1	1	1
	Well described intervention/ exposure	1	1	1	1	1	1	1	1
	Well described control/ comparator	1	1	1	1	1	1	1	1
	Well described outcome	1	1	1	1	1	1	1	1
	Clear timeline of exposures/ interventions and outcomes	0	1	1	1	1	1	1	1
Selection Bias: Sampling	Randomization appropriately performed	0	0	0	0	0	0	0	0
	Allocation adequately concealed	0	0	0	0	0	0	0	0
	Population sampling appropriate to study design	1	1	1	1	1	1	1	1
Selection Bias: Attrition	Attrition not significantly different	1	1	1	1	1	1	1	1

	between groups								
	Attrition <10-15% of population	1	1	1	1	1	1	1	1
	Attrition appropriately analyzed	1	1	1	1	1	1	1	1
Information Bias: Measurement and Misclassification	Measure of intervention/ exposure is valid	1	1	0	1	1	0	1	1
	Measure of outcome is valid	0	1	1	1	1	1	1	1
	Fidelity to intervention is measured	0	0	0	0	0	0	0	0
	Fidelity to intervention is valid	0	0	0	0	0	0	0	0
	Prospective study	0	1	1	1	0	1	1	1
	Adequately powered to detect result	0	1	0	1	0	0	1	0
Information Bias: Performance & Detection	Outcome assessor blinded	0	0	0	0	0	0	0	0
	Study participant blinded	0	0	0	0	0	0	0	0
	Investigator/ data analyst blinded	0	0	0	0	0	0	0	0
	Data collection methods described in sufficient detail	1	1	1	1	1	1	1	1
	Data collection methods appropriate	1	1	1	1	1	1	1	1
	Sufficient follow up to detect outcome	1	1	1	1	1	1	1	1

Information Bias: Analytic	Appropriate statistical analyses for collected data	1	1	1	1	1	1	1	1
	Appropriate statistical analyses are conducted correctly	1	1	1	1	1	1	1	1
	Confidence interval is narrow	1	0	0	0	0	1	0	0
Confounding	Potential confounders identified	1	1	1	1	1	1	1	1
	Adjustment for confounders in study design phase	0	0	0	0	0	0	0	0
	Adjustment for confounders in data analysis phase	1	1	1	1	1	1	1	1
Reporting Bias	All pre-specified outcomes are adequately reported	1	1	1	1	1	1	1	1
Other Bias	No other sources of bias	1	1	1	1	1	1	1	1
COI	Funding sources disclosed and no obvious conflict of interest	1	1	1	1	1	1	1	1
SCORE	Threat to internal validity	22	25	23	25	23	24	25	24
	Low, Moderate, High	Moderate	Moderate	Moderate	Moderate	Moderate	Moderate	Moderate	Moderate

	Author Year	**Ren 2021[33]**	**Robinson 2022[34]**	**Robinson 2021[15]**	**Rubio-Rivas 2021[16]**	**Saatci 2021[17]**	**Sandoval 2021[37]**	**Santorelli 2021[18]**	**Sohrabi 2021[58]**

	Outcome(s)	Mortality, Hospitalization	Mortality, Hospitalization, Mechanical ventilation	ICU admission	Mortality, ICU Admission, Intubation, Ventilation	ICU admission, Hospitalization	Re-admission	Mortality, ICU admission	Mortality
Domain	**Signaling question**	Data extracted from UK Biobank	Data extracted from medical records	data extracted from hospital data registry	Data extracted from medical records	data extracted from electronic health records	Data from EMR/Registry	data from EMR	data extracted from registry database
Study Elements	Design appropriate to research question	1	1	1	1	1	1	1	1
	Well described population	1	1	1	1	1	1	1	1
	Well described setting	1	1	1	1	1	1	1	1
	Well described intervention/ exposure	1	1	1	1	1	1	1	1
	Well described control/ comparator	1	1	1	1	1	1	1	1
	Well described outcome	1	1	1	1	1	1	1	1
	Clear timeline of exposures/ interventions and outcomes	1	1	1	1	1	1	1	1
Selection Bias: Sampling	Randomization appropriately performed	0	0	0	0	0	0	0	0
	Allocation adequately concealed	0	0	0	0	0	0	0	0
	Population sampling appropriate to study design	1	1	1	1	1	1	1	1
Selection Bias: Attrition	Attrition not significantly different between groups	1	1	1	1	1	1	1	1
	Attrition <10-15% of population	1	1	1	1	1	1	1	1

	Attrition appropriately analyzed	1	1	1	1	1	1	1	1
Information Bias: Measurement and Misclassification	Measure of intervention/ exposure is valid	1	1	1	1	1	1	1	1
	Measure of outcome is valid	1	1	1	1	1	1	1	1
	Fidelity to intervention is measured	0	0	0	0	0	0	0	0
	Fidelity to intervention is valid	0	0	0	0	0	0	0	0
	Prospective study	1	1	1	1	1	1	1	1
	Adequately powered to detect result	0	0	0	1	0	0	0	0
Information Bias: Performance & Detection	Outcome assessor blinded	0	0	0	0	0	0	0	0
	Study participant blinded	0	0	0	0	0	0	0	0
	Investigator/ data analyst blinded	0	0	0	0	0	0	0	0
	Data collection methods described in sufficient detail	1	1	1	1	1	1	1	1
	Data collection methods appropriate	1	1	1	1	1	1	1	1
	Sufficient follow up to detect outcome	1	1	1	1	1	1	1	1
Information Bias: Analytic	Appropriate statistical analyses for collected data	1	1	1	1	1	1	1	1
	Appropriate statistical	1	1	1	1	1	1	1	1

	analyses are conducted correctly								
	Confidence interval is narrow	1	0	0	0	0	0	0	0
Confounding	Potential confounders identified	1	1	1	1	1	1	1	1
	Adjustment for confounders in study design phase	0	1	1	0	0	0	0	0
	Adjustment for confounders in data analysis phase	1	1	1	1	1	1	1	1
Reporting Bias	All pre-specified outcomes are adequately reported	1	1	1	1	1	1	1	1
Other Bias	No other sources of bias	1	1	1	1	1	1	1	1
COI	Funding sources disclosed and no obvious conflict of interest	1	1	1	1	1	1	1	1
SCORE	Threat to internal validity	25	25	25	25	24	24	24	24
	Low, Moderate, High	Moderate	Moderate	Moderate	Moderate	Moderate	Moderate	Moderate	Moderate

	Author Year	**Sousa 2021[59]**	**Tagarro 2021[19]**	**Tang 2020[35]**	**Temkin-Greener 2020[60]**	**Wei 2021[61]**	**Williamson 2020[63]**
	Outcome(s)	Mortality	PICU admission, Hospitalization	Mortality, Hospitalization	Mortality	Hospitalization	Mortality
Domain	**Signaling question**	data from national dataset	data extracted from electronic data capture system	data extracted from medical records	Data extracted from state public COVID-19 records	Data extracted from electronic health records	Retrieved from medical records

Study Elements	Design appropriate to research question	1	1	1	1	1	1
	Well described population	1	1	1	1	1	1
	Well described setting	1	1	1	1	1	1
	Well described intervention/ exposure	1	1	1	1	1	1
	Well described control/ comparator	1	1	1	1	1	1
	Well described outcome	1	1	1	1	1	1
	Clear timeline of exposures/ interventions and outcomes	1	1	1	1	1	1
Selection Bias: Sampling	Randomization appropriately performed	0	0	0	0	0	0
	Allocation adequately concealed	0	0	0	0	0	0
	Population sampling appropriate to study design	1	0	1	1	1	1
Selection Bias: Attrition	Attrition not significantly different between groups	1	1	1	1	1	1
	Attrition <10-15% of population	1	1	1	1	1	1
	Attrition appropriately analyzed	1	1	1	1	1	1
Information Bias: Measurement and	Measure of intervention/ exposure is valid	1	1	1	1	1	1

Misclassification	Measure of outcome is valid	1	1	1	1	1	1
	Fidelity to intervention is measured	0	0	0	0	0	0
	Fidelity to intervention is valid	0	0	0	0	0	0
	Prospective study	1	1	1	1	1	1
	Adequately powered to detect result	0	0	0	0	0	1
Information Bias: Performance & Detection	Outcome assessor blinded	0	0	0	0	0	0
	Study participant blinded	0	0	0	0	0	0
	Investigator/ data analyst blinded	0	0	0	0	0	0
	Data collection methods described in sufficient detail	1	1	1	1	1	0
	Data collection methods appropriate	1	1	1	1	1	1
	Sufficient follow up to detect outcome	1	1	1	1	1	1
Information Bias: Analytic	Appropriate statistical analyses for collected data	1	1	1	1	1	1
	Appropriate statistical analyses are conducted correctly	1	1	1	1	1	1
	Confidence interval is narrow	0	0	0	0	1	1

Confounding	Potential confounders identified	1	1	1	1	1	1
	Adjustment for confounders in study design phase	0	0	0	0	0	0
	Adjustment for confounders in data analysis phase	1	1	1	1	1	1
Reporting Bias	All pre-specified outcomes are adequately reported	1	1	1	1	1	1
Other Bias	No other sources of bias	1	1	1	1	1	1
COI	Funding sources disclosed and no obvious conflict of interest	1	1	1	1	1	1
SCORE	Threat to internal validity	24	23	24	24	25	25
	Low, Moderate, High	Moderate	Moderate	Moderate	Moderate	Moderate	Moderate

Threat to internal validity measures:

- Low >75% of elements are satisfied indicated by a 1 meaning yes,
- Moderate ≤75% to > 50% of elements are satisfied indicated by a 1 meaning yes.,
- High ≤50% of elements are satisfied, which is indicated by a 1 meaning yes.

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D. Abbreviations

Acronym	Full
95% CI	95% confidence interval
aHR	Adjusted hazard ratio
aOR	Adjusted odds ratio
aRR	Adjusted risk ratio
BMI	Body mass index
CF	Cystic fibrosis
CHF	Chronic heart failure

COI	Conflict of interest
COPD	Chronic obstructive pulmonary disease
ECMO	Extracorporeal membrane oxygenation
EMR	Electronic medical records
ERT	Evidence Review Team
HR	Hazard ratio
ICD-10	International Classification of Diseases, 10th Revision
ICD-9	International Classification of Diseases, 9th Revision
ICS	Inhaled corticosteroid
ICU	Intensive care unit
IVA	Internal Validity Assessment
LABA	Long-acting beta-agonist
LAMA	Long-acting muscarinic antagonist
LTRA	Leukotriene receptor antagonist therapy
MOA	Measure(s) of association
ND	Not defined
NR	Not reported
OCS	Oral corticosteroid
OR	Odds ratio
PECO	Population, exposure, comparator, and outcomes
RR	Risk ratio
RT-PCR	Real-time polymerase chain reaction
SABA	Short-acting beta-agonist
SCIT	Subcutaneous immunotherapy
US	United States