Multisystem Inflammatory Syndrome in Children (MIS-C)

Annual Report (April 2020 to June 2021)

Summary

Early in the COVID-19 pandemic, reports of a rare but serious syndrome associated with previous SARS-CoV-2 infection emerged among the pediatric population. This condition, Multisystem Inflammatory Syndrome in Children (MIS-C) is characterized by fever for over 24 hours, evidence of inflammation in two or more systems, and hospitalization that often requires intensive care and life support measures. The Chicago Department of Public Health (CDPH) has been monitoring suspected cases of MIS-C since April 2020. Clinicians should continue to report suspect MIS-C cases to CDPH by following the instructions on the Chicago Health Alert Network: https://www.chicagohan.org/covid-19/mis-c.

This report will highlight the demographics (page 2), geographic distribution (page 3), complications, management, and outcomes (page 4), and organ/system involvement (page 5) of the reported MIS-C cases among Chicago children under 21 years-old during this time period.

Epidemiological Trends as of June 21, 2021

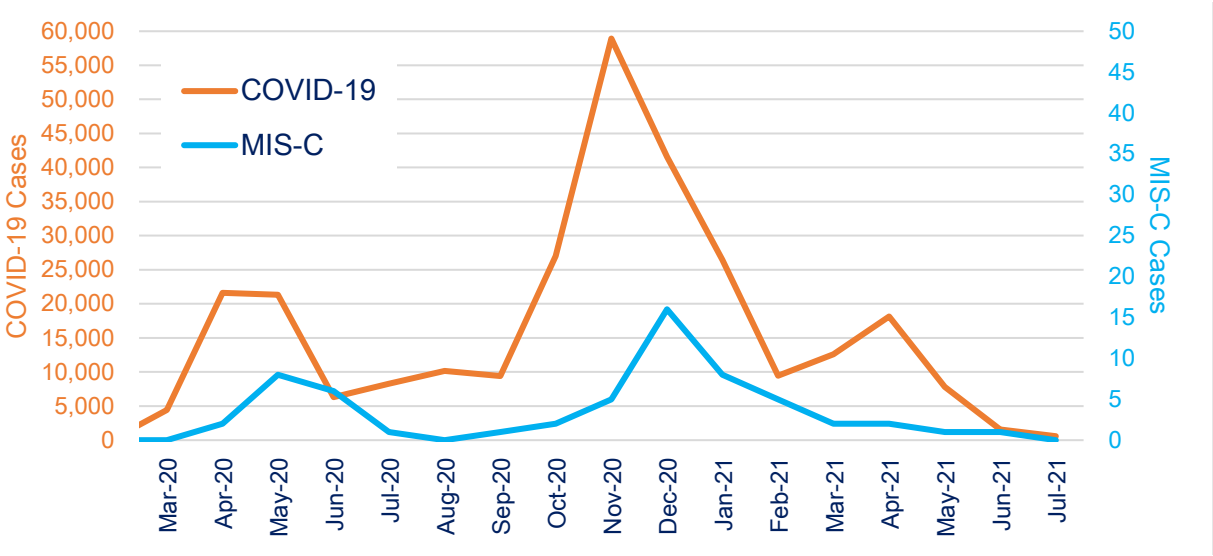
TOTAL MIS-C CASES MEETING CASE DEFINITION	TOTAL MIS-C DEATHS MEETING CASE DEFINITION
60	0

Between April 2020 when reporting began and June 2021, there were 60 reported patients in Chicago residents that met the case definition for MIS-C[1]. No deaths related to MIS-C were reported. Typically, the onset of MIS-C is several weeks after an initial SARS-CoV-2 infection, which is often mild or asymptomatic. In Chicago, 31 of 59 (52%) cases did not report having a preceding COVID-like illness. Determination of a previous COVID-19 infection is often through serological testing; 53 of 60 (88%) of the Chicago cases had a positive SARS-CoV-2 serology test. In Chicago and nationally[2], increases in MIS-C cases are seen 3 to 4 weeks following surges in COVID-19 cases in the community, reflecting the delay between initial SARS-CoV-2 infection and subsequent inflammatory response (Figure 1).

Clinicians should have heightened awareness for MIS-C following surges in COVID-19 cases.

[1] https://www.cdc.gov/mis/hcp/index.html
[2] https://covid.cdc.gov/covid-data-tracker/#mis-national-surveillance

Figure 1. Monthly Chicago MIS-C cases and COVID-19 cases, March 2020 to July 2021



Note: COVID-19 cases were counted based on specimen collection date. MIS-C cases were counted based on MIS-C illness onset date, fever onset date if illness onset date was unknown, or hospital admission date if both fever and illness onset dates were unknown.

Demographics

Among reported MIS-C cases in Chicago children < 21 years-old, the majority (65%) were among children ages 5-14 years old, and the median age was 10 (IQR=7.2). The majority (62%) of reported cases were among males. 50% of cases were among Black, non-Latinx children, 37% were children of Latinx descent, and 7% of cases were among White, non-Latinx children (Table 1). Latinx and Black, non-Latinx children have also been disproportionally affected by COVID-19 overall in Chicago.

Forty-six (77%) cases had no reported comorbid conditions. The most commonly identified comorbidity among cases was obesity; 15% (n=9) of cases had a BMI greater than 30.

Table 1. Demographic characteristics of MIS-C cases in Chicago (n=60)

Characteristic	N	%
Sex		
Male	37	62%
Female	23	38%
Race-Ethnicity		
Black, non-Latinx	30	50%
Latinx	22	37%
White, non-Latinx	4	7%
Asian, non-Latinx	1	2%
Unknown	3	5%

Characteristic	N	%
Age Group		
< 1 year	3	5%
1 to 4 years	13	22%
5 to 9 years	16	27%
10 to 14 years	23	38%
15 to 20 years	5	8%

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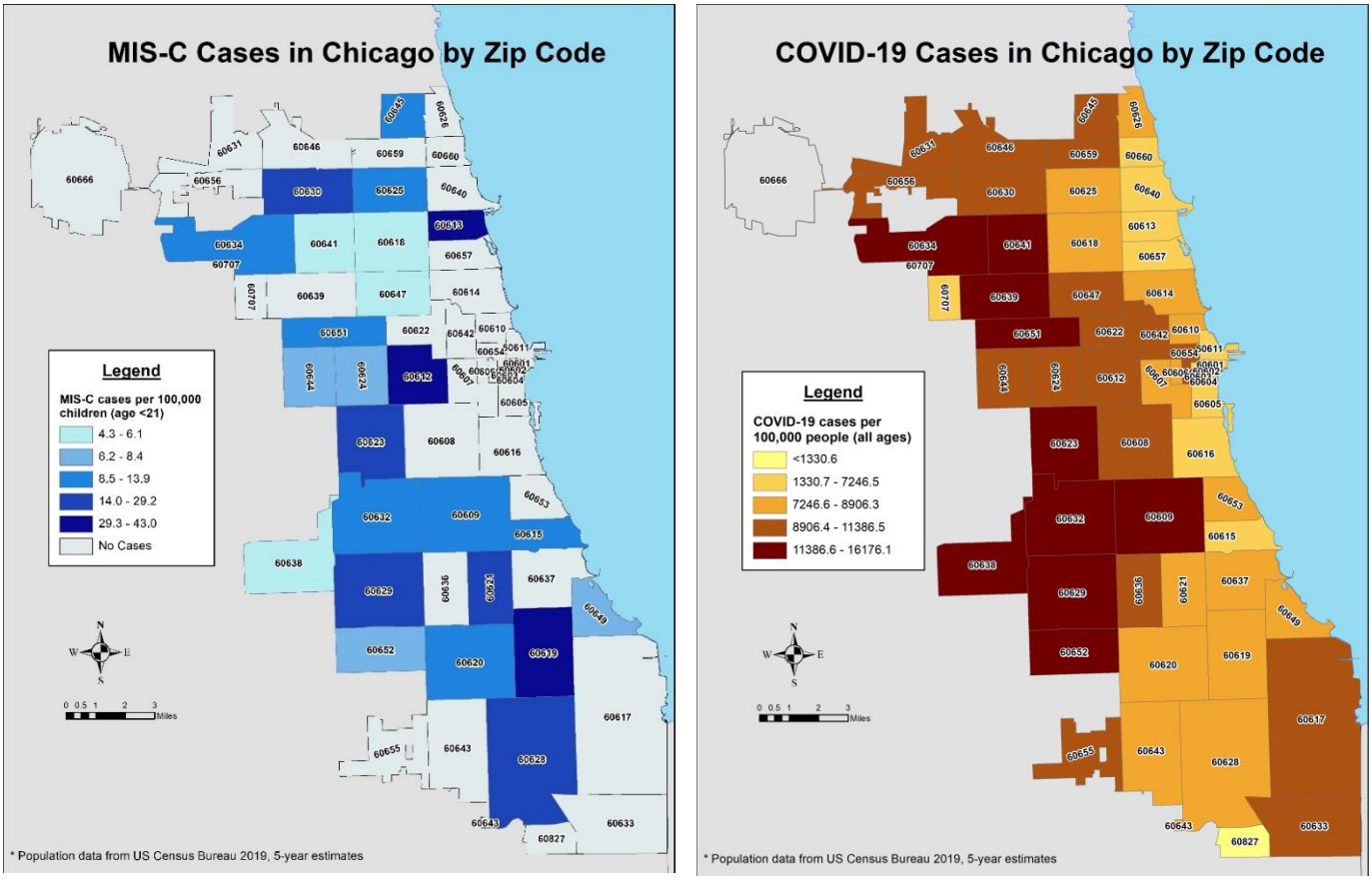
Geographic Distribution of MIS-C Cases in Chicago

Higher rates of MIS-C were reported in the Southwest and West sides of Chicago, similar to the overall rates of COVID-19 disease in these regions (Figure 2).

Figure 2. Geographic distribution of MIS-C and COVID-19 cases in Chicago by ZIP code of residence, March 2020 to July 2021



MIS-C Complications, Management, and Outcomes

The median number of days between MIS-C illness onset and hospital admission was 3 days (IQR, 3 days) for 58 cases with a known MIS-C onset date. Among the 56 cases with a known hospital discharge date, cases were hospitalized for a median of 6 days (range, 2 to 42 days). Forty-four (77%) of cases were admitted to intensive care units (ICU). The median length of ICU stay was 6 days (range, 0 to 42 days) among 17 cases with a known ICU discharge date.

The most frequently reported compilations in this cohort included shock (52%), acute kidney injury (27%), and decreased cardiac function as defined by decreased right or left ventricular function (23%) (Table 2). Less common complications reported included myocarditis (13%), coronary dilation or aneurysms (10%), and acute respiratory distress syndrome (5%). Treatment of MIS-C almost universally included use of steroids (93%) and administration of intravenous immunoglobulin (88%), with more severe cases receiving a second dose of IVIG (27%) and/or additional immune modulators such as anakinra or tocilzumab (20%); 48% of patients received vasoactive medications.

Table 2. Complications and management of MIS-C cases in Chicago (n=60)

Complications	Management
52% shock	93% received steroids
27% acute kidney injury	88% received intravenous immunoglobulin (IVIG)
23% decreased cardiac function	27% received a second dose of IVIG
13% myocarditis	20% received immune modulators
10% coronary artery abnormality	48% received vasoactive medications
5% acute respiratory distress syndrome (ARDS)	15% intubated
	10% non-invasive mechanical ventilation

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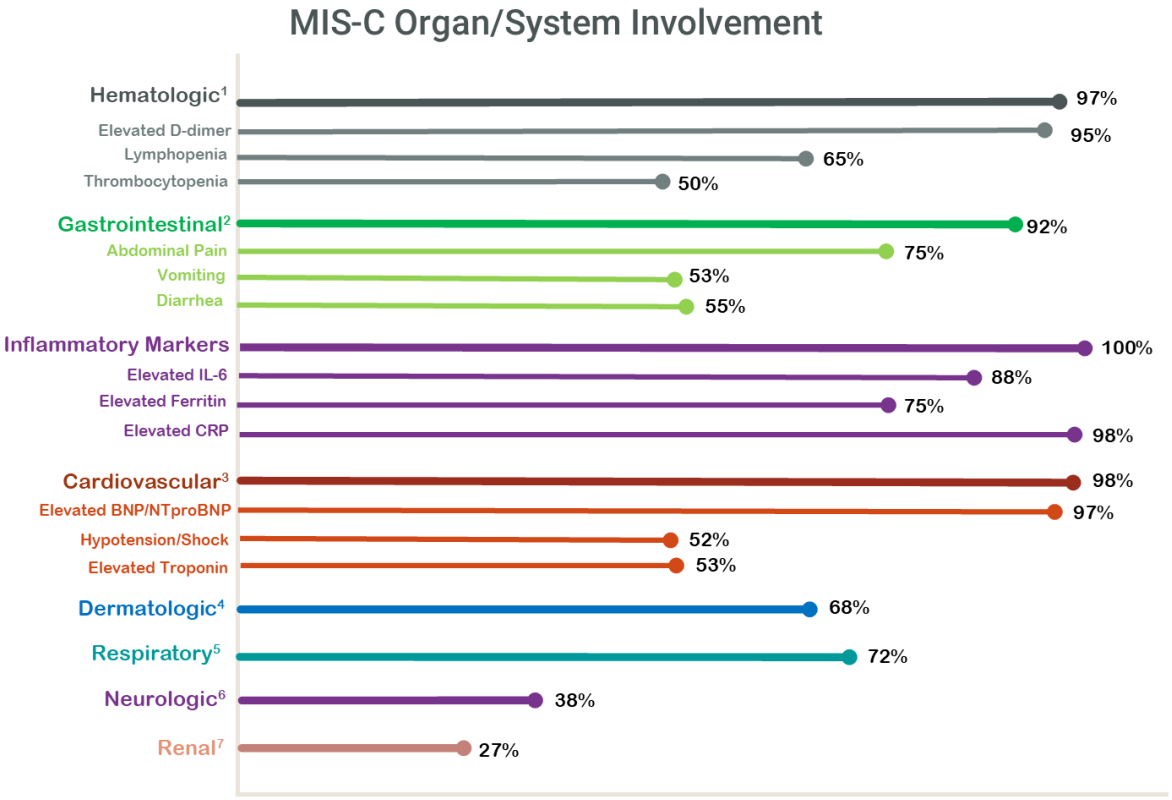
MIS-C Organ/System Involvement

MIS-C by case definition affects multiple (>2) organ systems; however, symptom presentation varies. In this cohort, 98% of children presented with laboratory or clinical evidence of cardiac involvement and 92% with gastrointestinal involvement (Figure 3). The most frequently reported abnormal laboratory values among MIS-C cases included elevated C-reactive protein (CRP) (98%), elevated BNP/NT proBNP (97%), and elevated D-dimer (95%).

Figure 3. Organ and system involvement in MIS-C cases (n=60)



[1]Pulmonary embolism, deep vein thrombosis, elevated D-dimer, thrombophilia, thrombocytopenia or lymphopenia.

[2]Abdominal pain, vomiting, diarrhea, elevated bilirubin, elevated liver enzymes, liver failure or free fluid noted in abdominal imaging.

[3]Elevated troponin, elevated BNP or NT proBNP, myocarditis, pericarditis, arrhythmias, coronary artery aneurism or dilation, decreased cardiac function, pericardial effusion, mitral valve regurgitation, shock, hypotension or syncope.

[4]Rash, mucocutaneous lesions or conjunctival injection.

[5]Cough, shortness of breath, pneumonia, acute respiratory distress syndrome, pleural effusion or atelectasis.

[6]Headache, meningitis, encephalopathy, encephalitis, cerebrovascular accident or stroke, elevated protein, white blood cell count or glucose in cerebral spinal fluid studies.

[7]Acute kidney injury or renal failure.