

Original Research

## Coronavirus Disease 2019 (COVID-19) Pandemic's Effect on Child and Adolescent Mental Health: Analysis of Pediatric Intensive Care Unit and Consultation-Liaison Psychiatry Service

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### Abstract

The Coronavirus Disease (COVID-19) pandemic has contributed to a co-occurring psychiatric epidemic. Children and adolescents have been particularly impacted, with disruptions in continuity of learning and healthcare. Psychological stressors such as fear of infection, boredom, decreased socialization, supply shortages, and incomplete information have contributed to low mood, irritability, insomnia, and emotional exhaustion. Our study contributes to this research by quantifying the devastating psychiatric toll that the COVID isolation period and virtual schooling had on the mental health of children. The Loyola University Medical Center (LUMC) Consultation-Liaison Psychiatry Service (CLP) (Maywood, IL) designed a study to identify and analyze data regarding the total number of CLP consult



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requests, patient presentations to the emergency department (ED), and admissions to the Pediatrics floor and Pediatric Intensive Care Unit (PICU) during the COVID pandemic.

IRB approval was obtained for this retrospective chart review study. ED visits and Pediatric floor/PICU admissions of all pediatric patients (6-18 years old), specifically those related to mental health, were identified using ICD-9 diagnostic coding for the dates of March 2019 through February 2022. The total number of admissions and encounter diagnoses were analyzed and compared between 3 pandemic periods: Pre-pandemic phase (March 2019-February 2020), acute pandemic phase: isolation/virtual schooling (March 2020-February 2021), and chronic pandemic phase: post-isolation/virtual schooling (March 2021-February 2022). During the chronic pandemic phase, ED visits and Pediatric floor/PICU admissions of all pediatric patients were identified via manual chart review of existing CLP patient lists. The total number of admissions, along with diagnoses during encounters, were compared between the 3 periods and psychiatric admissions were further subcategorized into intentional drug overdoses.

In the pre-pandemic phase, there were 39,304 total encounters for children (6-18 years), with 11,189 ED-only visits, and 3,043 inpatient admissions. In the acute pandemic phase, total encounters fell to 15,779, with 4,631 ED-only visits, and 2,578 inpatient admissions. Pre-pandemic, 0.55% of all pediatric encounters required psychiatry consults compared to 1.32% after the onset of the pandemic. During the pre-pandemic phase, there were 27 PICU admissions for psychiatric-related conditions (i.e. intentional ingestion) or 4.52% of all PICU admissions. During the acute pandemic period, there were 57 PICU admissions for psychiatric-related conditions or 11.19% of all PICU admissions. Specifically, there was a rise in intentional ingestion cases from 25 prior to the pandemic to 44 after the onset of the pandemic. During the chronic pandemic period, there were 43 PICU admissions for psychiatric-related conditions. Of those 43 admissions, 33 were intentional drug overdoses. Total encounters during this phase were comparable to the pre-pandemic phase (39,304 encounters pre-pandemic vs. 32,544 encounters in chronic pandemic phase).

At this large academic medical center, the pandemic has had a clear impact on total pediatric encounters, with a rise in the number of PICU admissions for psychiatric-related conditions. Findings from this study can be used to inform public policy and develop guidelines in preparation for future pandemics. Safeguards should be put in place to address the significant effects that social isolation and virtual schooling have on the mental health of children, including but not limited to widespread therapy sessions incorporated into the virtual school day and socially distanced in-person activities when safe.

### **Keywords**

Covid-19 pandemic; mental health; isolation; suicidality; Consultation-liaison

## **1. Introduction**

In January 2022, UNICEF warned that the COVID pandemic has contributed to a “nearly insurmountable...scale of education loss” such as a decline in children’s social and motor skills [1].

Another study from the IZA World of Labor suggested that the COVID pandemic contributed to “serious long-term damage to psychological development” of children [2]. The Coronavirus Disease (COVID-19) pandemic has contributed to a co-occurring psychiatric epidemic [3]. Children and adolescents have been particularly impacted, with disruptions in continuity of learning and healthcare [4]. Psychological stressors such as fear of infection, boredom, decreased socialization, supply shortages, and incomplete information have contributed to low mood, irritability, insomnia, and emotional exhaustion [5].

Prior to the onset of the COVID-19 pandemic, mental health conditions were already a leading cause of morbidity and mortality among youth in the United States, with many children and adolescents experiencing symptoms related to anxiety, depression, and suicidality. According to the Centers for Disease Control’s Youth Risk Behavior Surveillance Data, more than 1 in 3 high school students had experienced persistent feelings of sadness or hopelessness in 2019, a 40% increase from 2009. This statistic was consistent among students of all ethnic and racial groups, sex, and sexual identity [6]. Additionally, it was reported that between 2009 to 2019 there was a 44% increase in the number of children and adolescents reporting a history of making a suicide plan within the past year. This has translated to 1 in 6 youth reporting suicidal ideation and planning in 2019. Suicide is the second leading cause of death among individuals between the ages of 10 and 34, with the first being unintentional injury [6]. From these studies, it is clear that suicidality is a major risk among children and adolescents, even before the COVID-19 pandemic.

Unfortunately, the COVID-19 pandemic has only exacerbated the pre-existing mental health crisis among youth within the U.S. By disrupting schooling, social opportunities, and access to food, housing, and medical and psychiatric appointments, the pandemic has led to an even worsening psychiatric crisis and has left a negative imprint on the mental health of many children and adolescents in the U.S. Children and adolescents thrive on interacting with their friends and acquaintances, and these interactions were abruptly disrupted by the pandemic, leading to acute exacerbations of mental health concerns in this population.

In a global meta-analysis of 29 studies, Racine et al. found that, among children and adolescents, the prevalence of depression and anxiety symptoms has doubled during the pandemic when compared with pre-pandemic estimates [7]. This increase in symptoms created higher utilization of mental health services. In a population-based cross-section study in Ontario, Canada, Benton et al. found that there was a sustained 10% increase in outpatient mental health service utilization by children and adolescents. This higher rate of utilization is observed for both acute inpatient psychiatric hospitalization and outpatient mental health services [8].

In response to the public health threat, many schools closed, shifting to online-based learning. Not only did this negatively impact learning and socialization, but it also impacted the role that schools play in providing mental health services to students. The National Survey of Drug Use and Health (NSDUH) found that in 2014, 13.2% of adolescents received mental health services from a school setting within the past year [9]. The survey also found that between 2012 to 2015, among all the adolescents that had used some sort of mental health services within the past year, 57% of them received school-based mental health service [9]. This shows that the school closures played an even greater impact in negatively affecting student mental health in that it not only affected student learning and socialization but also access to critical mental health services.

The COVID pandemic, specifically the isolation period in the beginning of March 2020, posed a unique moment in history to observe how children and adolescents interface with technology,

especially as it pertains to virtual schooling. A 2022 study by Guillen et al. highlighted the rise of digital activism during the transition to virtual schooling in the pandemic. While access to technology contributed to a means of social connection across borders, Guillen et al. warned that utilizing technology for prolonged periods of time had drawbacks such as exposing users to anti-COVID rhetoric (i.e. anti-maskers, anti-vaxxers), suggesting that for future situations requiring a virtual classroom, there should be an educational model in place to advise students how to process information on the internet [10].

While the pandemic left unprecedented marks on the physical health of many patients, the psychological toll on healthcare workers, teachers, and students cannot be understated. In a 2022 study, Karakose et al. highlight these very challenges, ranging from the rapidly shifting expectations placed on teachers to be proficient in digital literacy to the increasing levels of stress and anxiety experienced by students with little to no psychological support in place in the educational sector. While the existence of technology allowed for the continuation of education during the pandemic's isolation period, Karakose et al. underscore that the use of technology, including social media, has contributed to psychological distress, addiction, depression, and burnout, arguing that less emphasis should be placed on using social media and the focus should be shifted to physical activity in future situations requiring virtual schooling [11].

Another 2022 study conducted by Lavidas et al. discusses the challenges associated with implementing digital tools for mathematics education during the COVID pandemic. This study discussed how the switch to virtual schooling took away the opportunity to enrich the teaching of mathematical concepts through student exploration and discovery. The transition to digital schooling stripped student creativity and the peer-to-peer interaction required to engage in critical problem-solving, causing education to lose the vital "authentic communication frameworks" that make in-person schooling a more beneficial experience for students [12].

At the onset of the pandemic (March/April 2020), an overall decline in the number of emergency department visits related to children's mental health was reported, likely secondary to the implementation of stay-at-home orders and other community mitigation efforts [13]. However, while the overall number of pediatric ED visits for all causes remained low thereafter, the proportion of visits for mental-health-related causes increased in the period from April to October 2020 nationally [13]. The proportion of mental-health-related ED visits for children aged 5-11 and 12-17 increased by approximately 24% and 31% respectively, from 2019 to 2020 [13].

During the height of the COVID pandemic in March-May 2020, significant declines in psychiatric visits (i.e. mental health concerns) to the ED were cited by the U.S. Morbidity and Mortality Weekly Report. For example, average weekly ED visits in kids <14 years old decreased by 70% from March-April 2020 compared to the corresponding time frame in 2019. There was also a downward trend in average weekly ED visits by children and adults for conditions such as asthma (10%), ear infections (65%), and sprains/strains (~40%), most likely attributed to community-wide implementation of isolation efforts to mitigate spread of COVID. However, weekly ED visits for psychiatric concerns in this population increased by almost 70%. While the total number of child psychiatric ED visits decreased, this study highlighted an increase in the proportion of all child psychiatric ED visits, demonstrating a significantly higher trend from March-October 2020 than its corresponding time frame in 2019 before the pandemic began. This study's quantification of both the total number and proportion of psychiatry-related ED visits demonstrates that these mental health concerns in the

child population were significant, prompting visits to the ED during the height of the COVID pandemic when non-emergent ED visits were not recommended [13].

The Consultation-Liaison Psychiatry (CLP) Service at a large academic medical center observed an increase in pediatric hospitalizations for mental health-related conditions in the months after the onset of the COVID-19 pandemic. During the months of March and April 2020, the pediatric ED seemed quieter than normal, while the pediatric floor and pediatric intensive care unit (PICU) seemed busier than normal with psychiatric consultations. Patient cases related to mental health ranged from children who tested negative for COVID-19 and were seen for primarily acute psychiatric reasons (i.e. suicide attempts) to children who tested positive for COVID-19 and were asymptomatic with mild symptoms with co-morbid depression and/or catatonia. Therefore, this study was designed and implemented to analyze data prior to the COVID-19 pandemic, during the acute phase of the COVID-19 pandemic (isolation period/virtual schooling), and during the chronic phase of the pandemic (post-isolation period/post-virtual schooling) regarding the total number of CLP consult requests, patient presentations to the ED, and admissions to the Pediatrics floor and PICU. While previous studies had quantified the impact of the pandemic on the mental health needs of children, this study helped compare the rates of total pediatric hospitalizations to those related to mental health both prior to and during the pandemic. This study is one of the first to analyze the impact of the pandemic on child and adolescent mental health through the lens of the consultation-liaison psychiatry team. While there have been articles published on the effect of the pandemic on mental health stress in the pediatric population including depression, anxiety, stress, and insomnia, studies are needed to specifically report PICU admissions for overdose.

## **2. Methods**

This single institution retrospective chart review study was approved by the IRB. The institution is a large academic medical center located in an urban, under-resourced neighborhood of Illinois. Three pandemic periods were studied: pre-pandemic phase (March 2019-February 2020), acute pandemic phase: isolation/virtual schooling (March 2020-February 2021), and chronic pandemic phase: post-isolation/virtual schooling (March 2021-February 2022). The total number of all pediatric encounters (ages 6-18) was collected utilizing the institution's Clinical Research Database, a database of de-identified patient encounters in the electronic medical record system. Through this data inquiry, total encounters were collected and then sub-categorized according to encounter location (i.e. ED, Pediatric Floor, PICU, PICU stepdown) and encounter type (i.e. discharge, inpatient, observation). In addition to collecting data on all pediatric encounters for all causes during the pre-pandemic and pandemic years, data on encounters specific to mental health conditions were collected. ED visits and admissions to the floor and PICU were identified using ICD-9 diagnostic coding.

Therefore, data for the chronic pandemic phase is not fully available such as the total number of pediatric encounters using the institution's Clinical Research Database. For this time period, data on the number of pediatric consults and the reason for consulting the Consult-Liaison Psychiatry team was collected manually from patient lists.

### 3. Results

The total number of pediatric encounters for all causes within all hospital settings (including the ED, pediatric floor, and PICU) dropped from 39,304 during the pre-pandemic period to 15,779 during the pandemic period of the study [Table 1]. Prior to the pandemic, there were 11,189 ED encounters, and 3,043 inpatient admissions (597 in the PICU). During the pandemic year, these numbers fell to 4,631 ED encounters, and 2,578 inpatient admissions (509 in the PICU). While there was a significant drop in all encounters associated with the onset of the pandemic, there was not a simultaneous significant drop in PICU admissions. There was a substantial number of intentional ingestions leading to PICU admissions during the pandemic. Despite an overall decline in all hospital pediatric admissions, stability in PICU admissions was noted, likely influenced by the increase in cases related to intentional ingestions.

**Table 1** Admissions for COVID-19 Pre- and Acute Pandemic Phases.

	Pre-pandemic phase <i>March 2019-February 2020</i>	Acute pandemic phase (isolation/virtual schooling): <i>March 2020-February 2021</i>
Total Encounters	39,304	15,779
ED only All causes	11,189	4,631
Inpatient Admit All causes	3,043	2,578
PICU and PICU stepdown Admissions All causes	597	509
PICU and PICU stepdown Admissions for Psychiatry- related causes	27 (4.52% of all PICU admissions)	57 (11.19% of all PICU admissions)

Prior to the pandemic, 217 unique pediatric patients required psychiatry consults while in the ED or pediatric hospital, or 0.55% of all pediatric encounters. In the acute pandemic phase, 209 unique pediatric patients required psychiatry consults or 1.32% of all pediatric encounters. Before the pandemic, 73 pediatric patients required psychotropic medications in the ED, or 0.65% of all pediatric ED visits. After the onset of the pandemic, 73 pediatric patients required psychotropic medications in the ED.

While data for the chronic phase was not fully available through the institution’s Clinical Research Database, total encounters during this period were comparable to the pre-pandemic phase (39,304 encounters pre-pandemic vs. 32,544 in chronic pandemic phase) [Table 2].

**Table 2** Admissions for COVID-19 Chronic Pandemic Phase.

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Chronic pandemic phase (post-isolation/virtual schooling): <i>March 2021-February 2022</i>
Total encounters: 32,544
PICU/Step down: 43

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After COVID isolation ended (March 2021-February 2022), there were 43 PICU admissions for psychiatric-related conditions. Of those 43 admissions, 33 were intentional drug overdoses and the rest were suicide attempts [Table 3].

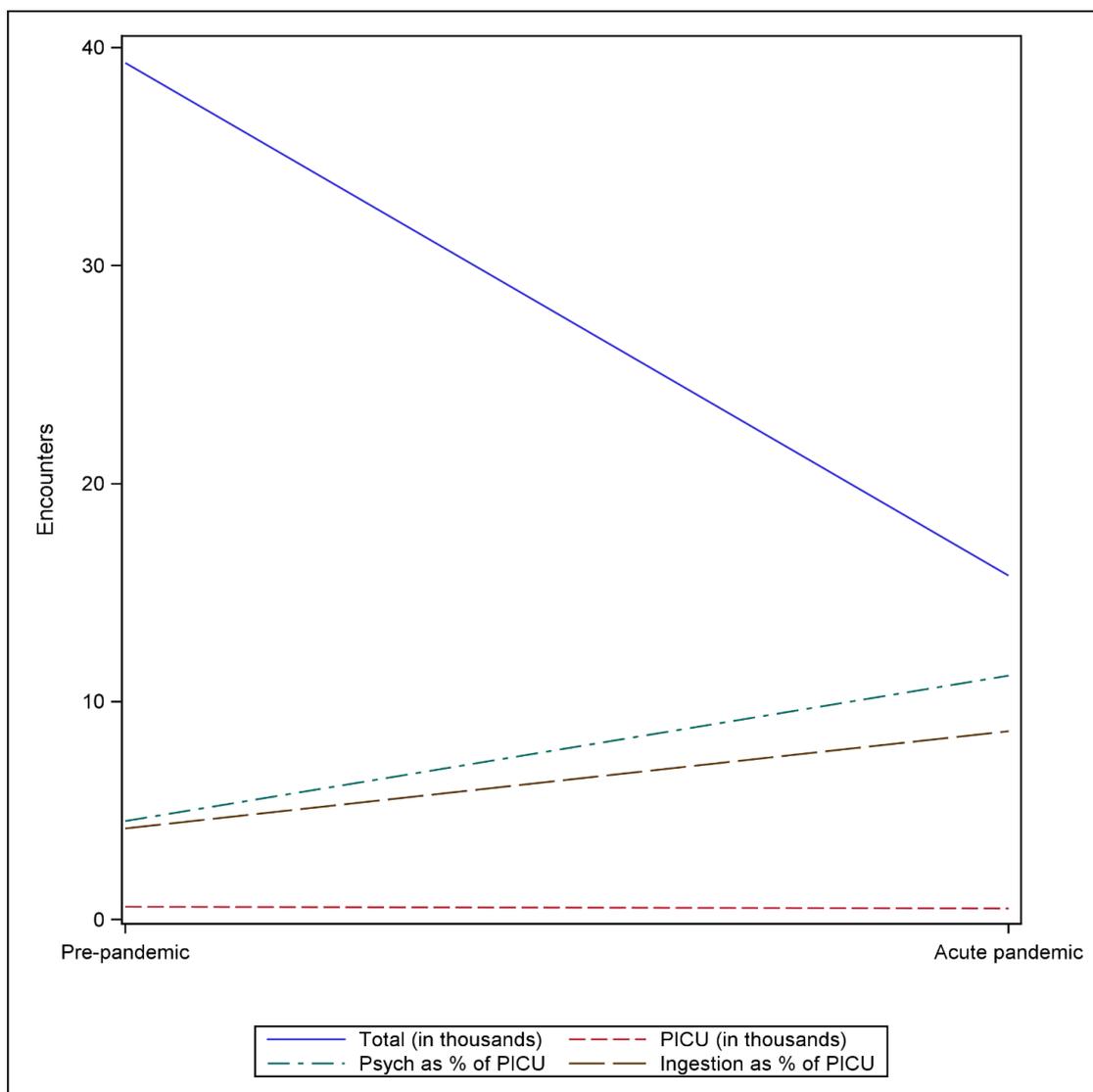
**Table 3** PICU and PICU Stepdown Admissions for Intentional Ingestions Before and During COVID-19.

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	Pre-pandemic phase <i>March 2019- February 2020</i>	Acute pandemic phase (isolation/virtual schooling): <i>March 2020-February 2021</i>	Chronic pandemic phase (post-isolation/virtual schooling): <i>March 2021-February 2022</i>
Intentional ingestions	25	44	33

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Despite a reduction of 23.5 K total encounters (59.8%) from pre-pandemic to acute pandemic, PICU admissions remained stable at 597 (0.6 K) and 509 (0.5 K). However, the percentage of Psych encounters and Ingestion encounters (as % of PICU total) increased from 4.52% to 11.19% and 4.18% to 8.64%, respectively [Figure 1].



**Figure 1** Psychiatric encounters vs. ingestion encounters as percentage of PICU admissions.

#### 4. Discussion

To our knowledge, this study is the first in the U.S. specifically looking at PICU admissions for mental health causes during the pandemic. We searched PubMed, JSTOR, and Google Scholar from January 1, 2020 to February 5, 2022, using the search terms “mental health,” “psychiatry,” “PICU,” “pediatric ICU,” “pandemic” and found only one publication from Bruns et al. that similarly looked at the increase in PICU admissions and suicide attempts during the pandemic in Germany [14].

Our study shows that despite an overall decrease in the number of total pediatric encounters for all causes after the onset of the pandemic, not only did the number of psychiatric-related encounters remain constant, but it also made up a larger proportion of all encounters after the onset of the pandemic. This reinforces the negative impact that the pandemic has had on the mental health of the child and adolescent population, and these findings are undoubtedly valuable for mental health practitioners to internalize when caring for this population to truly understand the psychological toll that social isolation has on the developing mind and to treat it appropriately.

In October 2021, there was a declaration of a pediatric mental health emergency by the American Academy of Pediatrics, the American Academy of Child and Adolescent Psychiatry, and the Children's Hospital Association. Furthermore, in December 2021, the U.S. Surgeon General issued an advisory on the child and adolescent mental health crisis in the U.S., in which he highlighted the urgent need to address the crisis and outlined a series of recommendations to improve mental health of the youth [15]. Recommendations included addressing economic and social barriers that contribute to poor mental health, expansion of the early childhood and education workforce, and assurance that every child has access to high-quality, affordable, and culturally competent mental healthcare. His advisory highlights the youth mental health crisis that was happening during the first year of the pandemic, mainly the isolation period.

This study's theoretical framework focused on identifying recent studies on how the COVID pandemic affected the educational experience of children during the transition to virtual schooling, and how this new educational model contributed to detrimental levels of social isolation contributing to mental health deterioration in this population. According to a study conducted by Lin et al. in May 2021, the four domains affecting mental health in child and adolescent populations were impacted by the pandemic, including the healthcare system and educational, community, and family support. In particular, the educational support domain was severely disrupted during the introduction of a virtual schooling model that reduced opportunities for in-person social connection and shifted children to lead more isolated, sedentary lifestyles [16].

A systematic review conducted by Cachón-Zagalaz et al. concluded that while there is scarce research on the impact of the pandemic's confinement on children, it is clear that virtual schooling has exacerbated psychological distress among youth, causing "over-information, changes of routine, and manifestation of feelings of distress and guilt, as well as the need to see peers", even contributing to the disappearing relationship between grandparent and grandchild [17].

Chu et al.'s study echoed this finding that the pandemic has left lasting impacts on the family unit. The transition from in-person to online schooling has contributed to distress in both parents and children, as parents were worried that children were missing important academic opportunities and lacking motivation, while kids were struggling with the lack of social interaction with peers. This study reiterated that a virtual schooling system could not serve as a substitute for in-person socialization in children and adolescents [18].

Parents also noticed the disruption that the pandemic's social isolation had on their children. An online survey in Mexico with 4,000 responses analyzed how parents perceived the beginning of the pandemic's disruption on their children, namely changes in children's emotional state, learning, and behavior [19]. Parents specifically recognized behavior problems, sleeping disorders, and problems with online homeschooling. Behavioral problems ranged from difficulty in sibling or parental relationships to tantrums [19]. 83.5% of parents in the survey agreed that "the level of learning acquired through online classes was not the same as that of face-to-face" [19]. Parents reported trying to improve mental health by creating home games (51.3%) and performing physical activity (23.6%). This study shows that parents are aware of the mental health difficulties of their children throughout the pandemic isolation and were trying to address them through various activities. It also shows that the children's mental health difficulties affected the entire family unit and were not just isolated to the child. Not only did COVID contribute to worsening social isolation and the loss of mental health services for youth, but the pandemic also prevented children with Individualized

Education Plans (IEPs) from receiving needed services at school, such as speech or occupational therapy for comorbid autism spectrum disorder [19].

Suicidal ideation and attempts were found to be proportionally increased nationwide and globally. Many other studies in different settings, areas of the U.S., and other nations have confirmed the findings that there was an overall increase in the proportion of adolescents hospitalized for mental health conditions [20, 21], while there was not a statistically significant increase in “pandemic-period changes in adolescent outcomes” [22]. Additionally, it was found that youth with no previously documented mental health treatment had more mental health visits in 2020 versus in the same time period in 2019 [21].

Months of significant stress and isolation, such as the beginning of the pandemic also correlated with significant increases in suicide-related behaviors [23], independent of its usual seasonality [24] and trend over a 10 year period. Approximately one in three high school students [25] across all sexes, sexual identities, ethnic and racial identities, self-reported poor mental health (stress anxiety, and depression) during the pandemic. However, these feelings were less prevalent among students that were virtually connected with others or felt close to persons at school.

Social isolation itself is a stressor. The neurobiology of social isolation cannot be discounted. People of all ages need interpersonal relationships for their survival. Insufficient social stimulation affects the brain by affecting hormone homeostasis, reasoning and memory performance, as well as resilience to physical and mental disease. Human resilience depends on social connections and impacts our sense of well-being. As Bzdok et al. have aptly written in their paper, perceived social isolation (i.e., loneliness) may be the most potent threat to survival and longevity [26].

The disruption that the pandemic had on children’s sleep may be a contributing factor to the worsening mental health of children and adolescents. Poor sleep quality and insomnia are associated with decreased school performance and increased psychopathology, self-harm, and suicidal ideation [27, 28]. In a population-based study of adolescents in Norway, there was a consistent dose-response association between sleep and self-harm – the more sleep problems adolescents had, the higher frequency of self-harm. The study found that the prevalence of insomnia among adolescents reporting an overdose was 47%, compared with 43.3% among those reporting self-cutting, and 16.6% of those reporting no self-harm [28].

The pandemic also drastically affected children, and more than 140,000 children in the U.S. experienced the death of primary caregivers, including at least one parent or custodial grandparent [29]. According to Hillis et al., the risk for loss of a caregiver was 1.1 to 4.5 times higher among children of racial and ethnic minority groups compared to non-Hispanic Caucasian children. As COVID-19 can lead to death within weeks, families have little time to prepare children for the trauma when a caregiver dies. Children losing primary caregivers have a higher risk of experiencing mental health problems.

With discussions of differential risk, some subcategories of youth groups were more affected than others, even without something as disruptive as the pandemic. Per the CDC’s Youth Risk Behavior Surveillance Data (2009-2019), lesbian, gay, bisexual, or female students were more likely to report feelings of sadness and hopelessness [4]. Almost half of these students (lesbian, gay, or bisexual) also reported “they had seriously considered suicide” [4] and Black students who reported attempting suicide increase by almost 50% [4]. As seen from this surveillance data, minority and disadvantaged populations are more likely to have mental health issues, even without something as disruptive as the pandemic. A systematic review and meta-analysis of 68 studies, including 4.3

million patients, found that Hispanic, African American, and Asian American individuals had a higher risk of COVID-19 positivity and ICU admission but lower mortality rates than Caucasian individuals. COVID-19 infection rates in racial and ethnic minority groups are associated with low socioeconomic status and income [30].

Limited access to outpatient psychiatric services during the pandemic remains an ongoing issue. Scheiner et al.'s paper emphasized the importance of psychological stress of the COVID-19 pandemic. Pandemics in general and COVID-19 have caused increased morbidity among patients with serious mental illness, the public, and healthcare workers. Much of the existing literature demonstrates post-traumatic stress symptoms, anxiety, and depression [31].

As previously discussed, the pandemic is associated with various stressors: financial burden, fear of infection, and social isolation. However, the role that COVID-19 had on patients infected by COVID-19 cannot be discounted. A systematic review of the COVID-19 pandemic and its mental health consequences found high levels of post-traumatic stress symptoms in COVID-19 patients and a significantly higher level of depressive symptoms. They also found that patients with preexisting psychiatric disorders reported worsening psychiatric symptoms [32]. Additionally, the neuropsychiatric effects of COVID-19 also need to be considered. Case reports have shown that COVID-19 may precipitate neuropsychiatric symptoms, such as psychosis, in COVID-19 seropositive yet asymptomatic patients. The pattern of psychotic symptoms seems similar across all cases, with most patients presenting with extreme anxiety, agitation, paranoia, auditory hallucinations, and suicidal ideation [33, 34]. Although the case reports are focused on adults, the link between coronavirus-associated inflammatory response precipitating psychosis in seropositive patients cannot be discounted in the pediatric population. Anecdotally, many children who came to the hospital for mental health crises tested positive for COVID-19 but were asymptomatic.

The second key point is the importance of screening for and prompt treatment of anxiety in patients with less severe COVID-19 disease.

## **5. Limitations**

This is a retrospective analysis [35]. There was a subgroup of patients in overlapping admissions groups between the ED, Pediatric floor, and PICU. This study was conducted at a single center with a catchment area that serves a large Medicaid population, so it may be difficult to generalize these findings to other centers. This is an assumption that with our large Medicaid population, many of the students were in public schools, which were closed to in-person schooling. It is known that some private schools had in-person or hybrid school throughout the pandemic, but no official data on how many of these students experienced some sort of in-person schooling during the pandemic, especially in our catchment area.

Additionally, lack of internet access also comes to attention as a social determinant of health, especially during the pandemic where it was important for schooling, telehealth exams, and work. With our large Medicaid population, there is a high density of children in the Western Suburbs of Chicago (our catchment area) that did not have access to broadband internet during the pandemic [36].

Other limitations include not having data on if the children who presented for mental illness (especially those in the PICU after intentional ingestion) had identified psychiatric illnesses (i.e. ADHD, learning disorders, major depressive disorder) or other disabilities for which they received

accommodations in school or for which they had received outpatient psychiatric treatment pre-pandemic, but could not access those services during the pandemic (i.e. quarantine, financial strain and loss of insurance, no access to internet or telehealth).

The goal of this study was to look at the data as a whole and data were not collected in a way that was conducive for statistical techniques such as null-hypothesis testing or complex modeling. The aim of this study was to summarize the yearly encounters and was not statistically powered to determine statistical significance. The differences we have found are clinically significant.

## **6. Conclusion**

This study at a large academic center highlights the increased proportion of pediatric hospitalizations, especially in the PICU, for mental health conditions during the COVID-19 pandemic. Based on the data, we have observed high proportions of hospitalizations associated with intentional overdoses during the pandemic. These findings support the need for mental health services for pediatric and adolescent populations at baseline and even more so for unprecedented times of extreme stress and social isolation, such as the COVID-19 pandemic.

The COVID-19 pandemic has changed the world in ways we could never expect. Our youth and adolescents have been particularly vulnerable to the isolation introduced by this infectious disease. More research is needed to understand how to improve the limitations in mental health access to better support the mental health of our children and adolescents.

DeLeo et al.'s article from 2021 touches upon how the COVID-19 pandemic is considered a "focusing event." A focusing event is characterized as "capable of yielding broad social and political change across virtually every sector of society." This article emphasizes how greatly the COVID-19 pandemic has impacted society and the addition of many new federal laws [37]. Findings from this study can be used to inform public policy and develop guidelines in preparation for future pandemics. Safeguards should be put in place to address the significant effects that social isolation and virtual schooling have on the mental health of children, including but not limited to widespread therapy sessions incorporated into the virtual school day and socially distanced in-person activities when safe.

It may be helpful to consider including the demographic variable of race to our study to see if there is any significant difference regarding those children who presented to our ER for psychiatric concerns and those who were admitted to our PICU due to intentional ingestion. If there is a notable difference for example in Black children presenting more often than white children, this may be reflective of the repercussions of the COVID-19 pandemic itself as a traumatic event and one more adverse childhood experience (ACE) [38] for Black children in particular where there are already disparities regarding social determinants of health. A proposed policy change may be universal screening for depression in schools at critical developmental periods, including transition from grammar school to middle school and from middle school to high school and before high school graduation, as we know 75% of all lifetime cases of mental illness present by age 24 years and 50% by age 14 [39].

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## Author Contributions

Ellen Kuo – Literature review, data collection, manuscript drafting and submission. Esther Belogolovsky – Literature review, data collection, manuscript drafting and submission. Sarah Fracci – Literature review, data collection, manuscript drafting. Amy Wozniak – Data analysis, manuscript editing. Marina Feffer – Data analysis, manuscript editing. Rachel Klauber – Study design and data collection. Theodote K. Pontikes – Literature review, manuscript editing. Edwin Meresh – Study design, data collection and analysis, manuscript drafting and submission.

## Competing Interests

The authors have declared that no competing interests exist.

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