Cost of Youth Depression Related Mental Healthcare During the COVID-19 Pandemic

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ABSTRACT:

OBJECTIVES: Depression is the most common behavioral health condition affecting children and adolescents in the US. We examined the cost related to healthcare utilization to examine if there were changes to all cause and depression related healthcare services visit costs during the COVID-19 restrictions.

METHODS: IQVIA Claims data was used to study youth cohort 10-17 years old with depression related mental health outpatient and inpatient encounters. This study compares depression related and total healthcare costs for youth during Baseline 2019 with COVID period spanning 2020-2022 in two ways: four predefined periods based on levels of community social restrictions; and each full year.

RESULTS: Cost of all healthcare ($2823.93), depression related inpatient ($1005.41) and outpatient ($866.51) care per youth enrolled remains lower than Baseline through the changing levels of social restriction phases. Without factoring the effects of any predictors, the total annual cost for a youth's depression related outpatient care is $758.32 (95%CI: $720.11 to $798.55). Variation in cost was observed based on gender, US region, year when service took place and insurance type (public vs private). The per-enrollee average weekly cost is highest $249.87(all-cause) and $133.69 (depression) during Presocial restriction phase (Jan to mid-March 2020) when the enrollee count is lowest.

CONCLUSION: Given similar effectiveness throughout Baseline and COVID-19 social restriction periods, incremental costs related to administration of healthcare are lower with higher number of youth enrollees. Cost of healthcare is closely related to quality of care. The variation in costs due to youth characteristics and location also has implications for health equity.

INTRODUCTION:

- **COVID-19 period went through changing community and school social restriction phases affecting pediatric healthcare utilization**
- **Excessive health care spending is a measure of health care quality**
- **The ratio of quality to cost is a definition of efficiency in healthcare (Lazar et al., 2013)**
- **This study examines patient cost of pediatric mental healthcare services for depression based on predictor characteristics**
  - Patient demographics
  - Insurance type
  - Geographic location
  - Each year (2020, 2021, 2022) of COVID-19 compared to 2019 baseline
- **If some identifiable group has overall costs that are well above the norm, this indicates quality of care is sup-optimal (Marrast et al., 2016, Townsend 2012). Reasons may be:**
  - Weak screening programs
  - Lack of care coordination including polypharmacy
  - Other aspects of the health care system (Yucel et al., 2020, Upadhyay et al., 2021).

METHODS:

Study Population and Measures

- Retrospective cohort of US youth (IQVIA PharMetrics® Plus for Academics Data) commercial insurance, or Medicaid/Medicare managed care plan enrollees during 2019-2022
- Youth demographic characteristics: sex (M,F), age grouped based on risk for depression (10-14 years old; 15-17 years old), US region (Midwest, South, West, East) and insurance type (private, public)
- Cohort inclusion criteria: a child (age 10-17 years) a depression diagnosis noted on healthcare encounter either as a primary reason for a health service visit or, secondary or tertiary designation in the healthcare encounter
- Outpatient visit: all health services within a 24-hour day
- Inpatient visit: inpatient events in all consecutive days as one visit (gap of at least 2 days = separate inpatient visit (HEDIS definition))

COVID Social Restriction Phases

- Overlayed the typical US school calendar, information on school closures/reopening dates, and community restrictions to define social restriction phases (Burbio 2021)
  - Baseline (January 2019-December 2019)
  - Pre-social restriction phase 1 (January 2020 – early March 2020),
  - Acute social restriction phase 2 (mid-March 2020 June 2020),
  - Relaxed social restriction phase 3 (July 2020 – Aug 2021), this period is the summer prior to commencement of in-person schooling and
  - Discontinuation of social restriction phase 4 (September 2021 – June 2022) this includes the 2021- 22 school year.

Statistical Analysis

The costs of outpatient and inpatient healthcare services in each COVID-19 phase were estimated for both depression related care and all causes. Aggregated costs per period and each week of the period were calculated. Data generation and calculation was conducted using R Tidy verse package tools.

A generalized linear model (GLM) with log link and gamma distribution was used for analyzing total cost of outpatient care. This model uses natural log to give us an estimate of the percent change in total cost for each unit change in predictor(β) variables in our model, and the variance is proportional to the square of the mean. We predicted average effects across clusters of the same person's visits across years. We used syntax to allow us to keep zero cost observations in the model to manage heteroscedasticity present in cost data. The estimates are in log scale, and we exponentiated the coefficients to interpret on the original scale. SAS Studio was used for this portion of analysis

RESULTS:

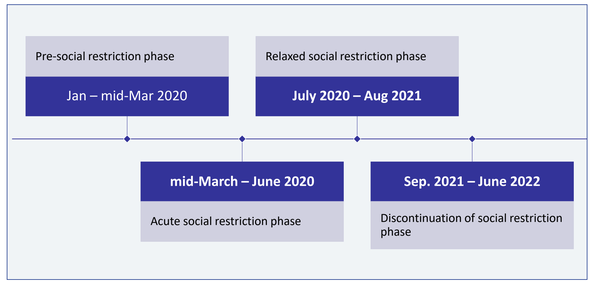

Figure 1: COVID-19 Social Restriction Phases

- $\log(\text{costs}) = \beta 0 + \beta\phi\ \phi_i + \beta\gamma\ \gamma_i + \beta\theta\ \theta_i + \varepsilon 1_i$
- ϕ=demographic characteristics of the youth (age, sex)
- γi =type of insurance (Public, Private)
- θi = location of visit
- E1i=error

Figure 2: Cost Equation

Periods	Enrollees	Depression Outpatient Cost (per enrollee)	Depression Inpatient Cost (per enrollee)	All Depression (per enrollee)	All Depression Cost per week	All Healthcare (per enrollee)	All Healthcare cost per week	All Dep Cost/All Healthcare cost
Baseline	24,130	$866.51	$1,005.41	$1,922.41	$36.96	$2,823.93	$54.31	68.07%
Presocial	4,557	$655.51	$981.24	$1,636.75	$148.78	$2,748.65	$2,49.87	59.55%
Acute	6,323	$476.92	$581.08	$1,058.00	$71.16	$1,874.39	$133.89	53.14%
Relaxed	23,271	$631.39	$903.85	$1,535.24	$24.53	$2,289.79	$38.10	64.71%
Discontinuation	15,411	$641.71	$1107.48	$1,749.19	$39.75	$2478.90	$56.34	70.56%

Table 2: Costs of Outpatient and Inpatient Healthcare Services for All Causes and Depression

Cohort Size (75,360)	Baseline 2019 (full year)	Presocial Jan—mid-Mar 2020	Acute mid-Mar — June 2020	Relaxed July 2020—Aug 2021	Discontinued Sep 2021—June 2022
Sex					
Female	14,895	3,239	3,240	15,987	10,396
Male	9,235	1,964	2,325	7,832	5,485
Age					
10-14yrs old	9,475	1,703	2,373	10,125	6,789
15-17yrs old	14,655	2,854	3,649	13,146	8,622
Insurance					
Commercial	21,807	4,737	5,809	22,057	16,198
Public	2,323	467	517	1,764	1,257
US Region					
E	2,516	511	614	2,567	1,847
MW	11,522	2,374	2,896	11,172	7,459
S	5,440	1,272	1,453	5,254	3,509
W	4,541	1,032	1,324	4,727	3,011

0.62% Missing Data

Table 1: Cohort Descriptive Information

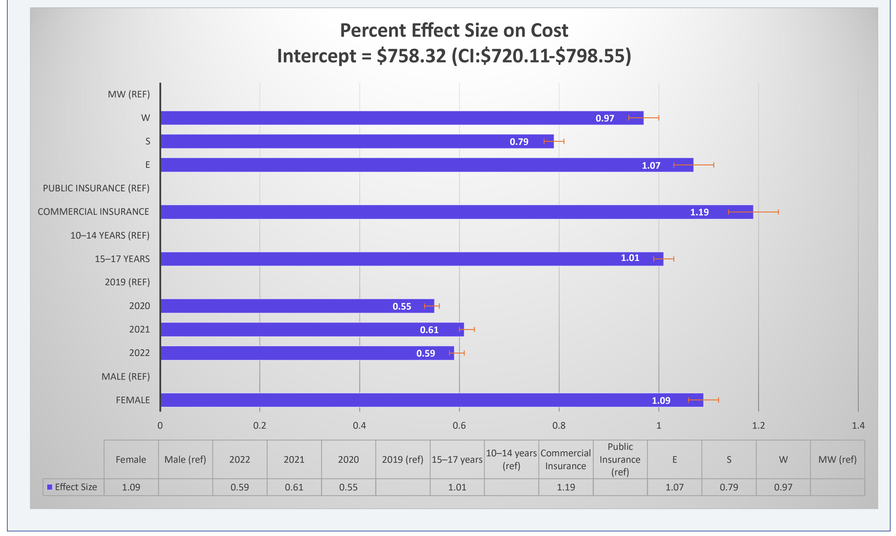

Figure 2: Cost of Outpatient Depression Health Services for Youth 10-17 years old 2019-2022

CONCLUSIONS:

- **Utilization of depression healthcare services among youth compared to the need has been low for a long time (SAHMSA 2022).**
- **The environmental and lifestyle changes during COVID-19 pandemic added stressors that increased needs and demand for mental healthcare services.**
- **Ratio of behavioral health costs to all costs was smaller in the COVID-19 social-restriction phases, indicating depression care for children was impacted more then overall healthcare.**
- **Variation in cost across the regions have implications for cost barriers to access and quality of services.**
- **Reduction in cost may indicate efficiency and higher quality healthcare services.**
- **Given COVID-19, we can also surmise reduced costs may represent unmet need for utilization of depression care.**

References and Additional Information Available at