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DOI:

[10.1097/adm.0000000000001122](https://doi.org/10.1097/adm.0000000000001122)

Publication date:

2023

Document Version

Peer reviewed version

[Link to publication in Discovery Research Portal](#)

Citation for published version (APA):

Smarony, S., Parlier-Ahmad, A. B., Shadowen, H., Thakkar, B., Scheikl, M. O., & Martin, C. E. (2023). Assessment of COVID-19–Driven Changes in an Integrated OBGYN-Addiction Treatment Clinic and Future Implications. *Journal of Addiction Medicine*, 17(3), e183-e191. <https://doi.org/10.1097/adm.0000000000001122>

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Journal of Addiction Medicine

Assessment of COVID-19-Driven Changes in an Integrated OBGYN-Addiction Treatment Clinic and Future Implications --Manuscript Draft--

Manuscript Number:	JAM-D-22-00234R1
Full Title:	Assessment of COVID-19-Driven Changes in an Integrated OBGYN-Addiction Treatment Clinic and Future Implications
Short Title:	COVID-19-Driven Clinical Changes in Patients with SUD
Article Type:	Original Research
Keywords:	integrated addiction treatment; women's health; SUD; COVID-19 outcomes
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Order of Authors Secondary Information:	
Manuscript Region of Origin:	UNITED STATES
Abstract:	<p>Objective: The COVID-19 pandemic prompted healthcare delivery changes, but the associated impacts on substance use disorder treatment outcomes among pregnant and parenting people are unknown. This study aims to 1) describe COVID-19-driven clinical practice changes, 2) evaluate clinic-level visit attendance patterns, and 3) compare patient-level treatment engagement outcomes across three COVID-19 pandemic phases in an OBGYN-addiction treatment clinic.</p> <p>Methods: COVID-19 phases include: preCOVID-19 (August 2019-February 2020), earlyCOVID-19 (March 2020-December 2020), and COVID-19-vaccine (January 2021-July 2021). OBGYN-addiction treatment clinical practice changes were summarized. Clinic-level attended medical provider visits were analyzed. Patient-level treatment engagement outcomes (buprenorphine continuation, visit attendance, and virtual visits) were assessed in a cohort of pregnant and parenting people enrolled in a clinic research registry. Mixed level logistic regression models determined the relationship between the COVID-19 phases and the patient-level outcomes.</p> <p>Results: The study site made several COVID-19-driven clinical practice changes, including implementing a hybrid virtual/in-person system for medical visits. Clinic-level medical provider appointments increased between the first and second COVID-19 phases and remained high in the third phase. Among participants included in patient-level outcome analyses (N=27), there were no differences in the earlyCOVID-19 phase compared to preCOVID-19 phase in buprenorphine continuation, any visits, or medical visits. There was a decrease in all patient-level outcomes in the COVID-19-vaccine phase compared to preCOVID-19 ($p < .05$). Virtual visits increased between the first</p>

two phases and remained high during the third.
Conclusion: Within our OBGYN-addiction treatment clinic, implementation of tailored, patient-centered treatment strategies supported clinic- and patient-level treatment engagement throughout the pandemic.

1 **Assessment of COVID-19-Driven Changes in an Integrated OBGYN-Addiction Treatment**
2 **Clinic and Future Implications**

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11 Conflicts of Interest: None

12 Source of Funding: This study was supported by the Jeanann Gray Dunlap Foundation and
13 partially by CTSA award No. UL1TR002649 from the National Center for
14 Advancing Translational Sciences. Parlier-Ahmad is supported by NIDA T32DA007027 (PI: W.
15 Dewey). Smarony was supported by the VCU Undergraduate Fellowship for Clinical and
16 Translational Research. Dr. Martin is supported by NIDA award No. K23 DA053507. For the
17 remaining authors none were declared.

18 Abstract: 250/250

19 Manuscript: 3496/3500

20 References: 40/40

21 Keywords: Integrated addiction treatment, women's health, SUD, COVID-19 outcomes

This is a pre-copyedited, author-produced version of an article accepted for publication in Journal of Addiction Medicine. The published version of record Smarony, Sumaya BS; Parlier-Ahmad, Anna Beth MS; Shadowen, Hannah MPH; Thakkar, Bhushan PT, MS; Scheikl, Marjorie O. MSN, RN; Martin, Caitlin E. MD, MPH. Assessment of COVID-19–Driven Changes in an Integrated OBGYN-Addiction Treatment Clinic and Future Implications. Journal of Addiction Medicine 17(3):p e183-e191, 5/6 2023. | DOI: 10.1097/ADM.0000000000001122 is available online at: https://journals.lww.com/journaladdictionmedicine/abstract/2023/05000/assessment_of_covid_19_driven_changes_in_an.19.aspx

Abstract

22

23 **Objective:** The COVID-19 pandemic prompted healthcare delivery changes, but the associated
24 impacts on substance use disorder treatment outcomes among pregnant and parenting people are
25 unknown. This study aims to 1) describe COVID-19-driven clinical practice changes, 2) evaluate
26 clinic-level visit attendance patterns, and 3) compare patient-level treatment engagement
27 outcomes across three COVID-19 pandemic phases in an OBGYN-addiction treatment clinic.

28 **Methods:** COVID-19 phases include: preCOVID-19 (August 2019-February 2020),
29 earlyCOVID-19 (March 2020-December 2020), and COVID-19-vaccine (January 2021-July
30 2021). OBGYN-addiction treatment clinical practice changes were summarized. Clinic-level
31 attended medical provider visits were analyzed. Patient-level treatment engagement outcomes
32 (buprenorphine continuation, visit attendance, and virtual visits) were assessed in a cohort of
33 pregnant and parenting people enrolled in a clinic research registry. Mixed level logistic
34 regression models determined the relationship between the COVID-19 phases and the patient-
35 level outcomes.

36 **Results:** The study site made several COVID-19-driven clinical practice changes, including
37 implementing a hybrid virtual/in-person system for medical visits. Clinic-level medical provider
38 appointments increased between the first and second COVID-19 phases and remained high in the
39 third phase. Among participants included in patient-level outcome analyses (N=27), there were
40 no differences in the earlyCOVID-19 phase compared to preCOVID-19 phase in buprenorphine
41 continuation, any visits, or medical visits. There was a decrease in all patient-level outcomes in
42 the COVID-19-vaccine phase compared to preCOVID-19 ($p < .05$). Virtual visits increased
43 between the first two phases and remained high during the third.

44 **Conclusion:** Within our OBGYN-addiction treatment clinic, implementation of tailored, patient-
45 centered treatment strategies supported clinic- and patient-level treatment engagement
46 throughout the pandemic.

47

Introduction

48 Within the United States, the COVID-19 pandemic has caused over one million deaths,
49 significantly decreasing the average life expectancy particularly among Black and Latinx
50 communities.^{1,2} Additionally, the pandemic has had substantial medical and social impacts,
51 including dramatic increases in substance use.³ Among people with substance use disorders
52 (SUD), COVID-19 incidence, COVID-19-related morbidity and mortality are high.^{4,5} People
53 with opioid use disorder (OUD) are particularly vulnerable to the negative impacts of COVID-19
54 given the pandemic emerged amid the opioid overdose epidemic. Between 2019-2020, the
55 United States recorded the highest number of overdose deaths in a 12-month period.⁶ Overdose
56 deaths have continued to increase rapidly each year during the COVID-19 pandemic⁷ due to both
57 the direct effects and psychosocial challenges of COVID-19.^{8,9} For this high-risk patient
58 population, accessible healthcare is crucial.

59 In order to prioritize patient and provider safety during the nationwide COVID-19 pandemic
60 lockdown, many healthcare systems transitioned to virtual modalities, offering patients remote
61 visits as alternatives to in-person visits. While the shift to a telehealth system improved access
62 for some individuals, it has exacerbated challenges for others. Patient challenges include lack of
63 access to secure technologies, limited technology literacy, social isolation, and perceived loss of
64 therapeutic rapport.^{10,11} Evidence-based SUD treatments, including medication for opioid use
65 disorder (MOUD) and mental health treatment, reduce overdose risk and improve quality of
66 life.^{12,13} However, only 1 in 10 people with SUD receive specialized SUD treatment, even before
67 COVID-19.¹⁴ Although the conversion to telehealth coinciding with the COVID-19 pandemic
68 has encouraged continuity of care broadly, there is concern that telehealth has made access to
69 SUD treatment more difficult for many people.^{10,11,15}

70 Pregnant and parenting people, a high priority addiction treatment population, are exceptionally
71 vulnerable to the risks associated with both COVID-19 and the overdose epidemic. Overdoses,
72 largely by opioids, have become a leading cause of pregnancy-associated deaths, with the largest
73 proportion occurring in the 7-12 months after delivery and among birthing people not
74 consistently receiving MOUD.^{16,17} Barriers like lack of insurance coverage, lack of
75 transportation, conflict with wait/travel time, and childcare insecurity may place pregnant and
76 parenting people at risk of not accessing or having lapses in life-saving SUD treatment.^{18,19} In
77 addition, pregnant people are highly prone to pandemic-related stressors associated with feeling
78 unprepared for birth in the pandemic and fears of perinatal COVID-19 infection.²⁰ Given the
79 complexities that surround SUD, pregnancy/parenting, *and* the COVID-19 pandemic, it is vital
80 to maintain healthcare access and optimize recovery support for this vulnerable population.

81 Data describing the impact of COVID-19-driven healthcare delivery changes on SUD treatment
82 outcomes is limited. Among Medicaid beneficiaries with OUD in Wisconsin, patients in office-
83 based settings retained access to buprenorphine during COVID-19 at similar levels as
84 preCOVID-19 despite decreases in on-site services like urine drug tests.²¹ Another study
85 analyzed COVID-19-driven shifts in a youth outpatient addiction treatment program and found
86 that the visit attendance rates increased from approximately 60% to 70% after converting to
87 telehealth.²² To our knowledge, only one study has been conducted among pregnant people with
88 OUD. Authors found that with the shift to telehealth at the beginning of the pandemic, group
89 therapy attendance decreased and MOUD doses increased secondary to cravings.²³

90 As telehealth moves into a more permanent place in our healthcare system, we need to consider
91 the impact of COVID-19-driven transitions in healthcare delivery on our most vulnerable
92 populations. To our knowledge, no study has evaluated how pandemic-driven changes in care,

93 including use of virtual modalities, have affected treatment outcomes among pregnant and
94 parenting people with SUD. This study aims to (1) describe COVID-19-driven changes in
95 clinical practices employed by an integrated, interdisciplinary OBGYN-addiction clinic, (2)
96 evaluate clinic-level medical provider visit attendance patterns across three defined phases of the
97 COVID-19 pandemic, and (3) compare patient-level SUD treatment engagement outcomes
98 among a cohort of pregnant and parenting people receiving buprenorphine for OUD across three
99 COVID-19 pandemic phases.

100 **Methods**

101 **Design**

102 This study describes COVID-19-driven clinical practice changes within an OBGYN-addiction
103 treatment clinic and assesses their impact on two levels: (1) clinic-level and (2) patient-level.
104 Both clinic-level and patient-level outcomes were assessed in three phases. The first phase is the
105 preCOVID-19 phase (August 2019-February 2020) which coincides with standardization of
106 clinic procedures and operations due to onboarding of new nurse management. The next phase is
107 the earlyCOVID-19 phase (March 2020-December 2020) which is marked by the World Health
108 Organization's declaration of COVID-19 as a global pandemic in March 2020. The third phase is
109 the COVID-19-vaccine phase (January 2021-July 2021) which coincided with Phase 1c of the
110 CDC's vaccine distribution plan allowing our patient population the option to receive the first
111 dose.²⁴ The independent variable for all three aims was the COVID-19 phases.

112 **Setting**

113 The OBGYN-addiction outpatient treatment clinic is affiliated with a large academic medical
114 center in a Medicaid-expanded southern state. The medical center serves as a safety net for the
115 region and treats predominately low-income, racially and ethnically minoritized people. On-site
116 addiction medicine physicians are board-certified obstetrician-gynecologists, and nursing staff
117 are credentialed in both women’s health and addiction. Most patients are referred from within the
118 academic medical center (e.g., inpatient consults, primary care physicians). At the initial clinic
119 visit, providers complete a comprehensive assessment. All patients diagnosed with OUD are
120 offered buprenorphine. A comprehensive, recovery-oriented care model is utilized throughout
121 treatment in which patients have access to psychiatric, mental health, case management, and
122 social work services. The clinic prioritizes a low-threshold, harm reduction approach, meaning
123 that established patients with recurrence of substance use are not excluded from treatment, but
124 instead provided with increased wrap-around support. For patients who initiate SUD treatment
125 during pregnancy, there is no time limitation on how long patients can continue SUD treatment
126 with the clinic after delivery.

127 **Sample and Data Sources**

128 *Primary aim: Describe COVID-19-driven changes in clinical practices*

129 COVID-19-driven clinical practice methods were summarized across three phases by the
130 research team using clinic-level management records. Summarized COVID-19-driven clinical
131 changes were reviewed and approved by a group of representative stakeholders from the study
132 site including physicians, nurses, and behavioral health providers.

133 *Secondary aim: Evaluate clinic-level medical provider attendance patterns across the COVID-*
134 *19 pandemic*

135 The clinic provides outpatient addiction services for over 180 adults, serving approximately 63
136 patients per month, with nearly all patients being pregnant and/or parenting people with SUD.
137 All OBGYN-addiction clinic medical provider visits from August 2019 to July 2021 were
138 included in the deidentified clinic-level dataset. Number of visits each month was pulled from
139 the health system appointment scheduling database. For this aim, protected health information
140 was not used which limited our access to clinic-level demographics across the COVID-19
141 phases. However, on average, 66% of the clinic patients identify as White and 34% as Black
142 with a mean age of 30.3 years. Most of the patients have at least one comorbid psychiatric
143 diagnosis, and 90% are receiving buprenorphine for OUD. Approximately 87% of the patients
144 are insured with Medicaid, 3% with private insurance, and 10% are uninsured.

145 *Tertiary aim: Compare patient-level SUD treatment engagement outcomes across the COVID-19*
146 *pandemic*

147 For patient-level outcomes, a secondary analysis of a cohort of participants from the OBGYN-
148 addiction treatment clinic research registry was conducted. All patients are invited to participate
149 in the clinic-wide research registry (85% recruitment rate). For registry participants, monthly
150 (30-day) chart abstractions are conducted starting from their initial visit including basic
151 demographics, medical diagnosis, medication history, visit attendance, socioeconomic changes,
152 and comorbidities. The registry is approved by the university's Institutional Review Board.

153 For the current study analyses, registry participants were included if they initiated buprenorphine
154 treatment by January 2020 and had an OUD diagnosis. Analyses included data from the 30-day
155 periods within the study timeframe for N=27 pregnant and parenting people receiving
156 buprenorphine for OUD.

157 **Clinical Variables**

158 *Primary aim:*

159 The clinical practice methods were categorized by department: medical, behavioral health, and
160 care coordination (e.g., clinic management and procedures).

161 *Secondary aim:*

162 The dependent variable for the clinic-level data was the total number of medical provider visits
163 for the OBGYN-addiction treatment clinic per month, including both virtual and in-person visits.
164 All appointments coded as “arrived” were counted as attended and included in the number of
165 appointments.

166 *Tertiary aim:*

167 Demographic, psychosocial, and clinical variables were abstracted from the initial intake visit
168 and included race, age, insurance type, employment status, living situation, number of children in
169 custody, comorbid SUD diagnosis, smoking tobacco (yes/no), psychiatric comorbidity (yes/no)
170 and psychotropic medication (yes/no). Duration of treatment episode was calculated from the
171 initial intake visit to the start of the study (August 2019) in months. Pregnancy status was
172 determined for individual participants for each of the three COVID-19 phases; if a participant
173 was pregnant at any time during a phase, status was coded as pregnant.

174 Patient-level treatment engagement outcomes were buprenorphine continuation, total visit
175 attendance (behavioral health and medical provider visits), medical provider visits, behavioral
176 health visits, and proportion of total attended visits that were virtual for each of the 30-day

177 periods over the three study phases. Buprenorphine continuation (yes/no) was coded as “yes” if
178 the individual started or continued buprenorphine during that 30-day period. Any visit attendance
179 (yes/no) was coded as “yes” if the individual had at least one behavioral health or medical
180 provider visit during the 30-day period. Additionally, medical provider visits (yes/no) and
181 behavioral health provider visits (yes/no) were coded as two separate variables. For all 30-day
182 periods with at least one visit, the percent of medical provider and behavioral health visits
183 attended virtually was calculated.

184 **Data Analysis**

185 *Primary aim:*

186 A qualitative description is provided for clinical practices and COVID-19-driven clinical
187 changes in each category for the study phases.

188 *Secondary aim:*

189 The mean (and standard deviation) number of attended medical provider visits in each COVID-
190 19 phase was calculated. Interrupted time series design was used to analyze differences by
191 COVID-19 phases in the monthly counts of attended visits from August 2019 to July 2021. ITS
192 design was chosen because we have a specific date of “intervention” (COVID-19), include a
193 repeated measure (visit count per month) that did not change in data collection practices over the
194 study period, and use a consistent interval between measurements (month’s duration). This
195 analysis method is similar to that used by other studies evaluating the impact of events that are
196 abrupt and temporary.²⁵

197 *Tertiary aim:*

198 Cohort characteristics at study enrollment are described. For the outcomes of buprenorphine
199 continuation, total visit attendance (including behavioral health and medical provider visits), and
200 percent of visits attended virtually, mixed level logistic regression models with a person level
201 random intercept and random slopes for COVID-19 phases were used due to the heterogeneity of
202 the outcomes throughout COVID-19 phases in each individual. Similar models have been used in
203 work exploring longitudinal datasets and outcomes in questions concerning COVID-19.²⁶
204 Models controlled for fixed effects of pregnancy and duration of treatment episode.²⁷ Percent of
205 visits attended virtually are described descriptively. Analysis for aims 2 and 3 were conducted
206 using STATA 16C with statistical significance set at 0.05.

207 **Results**

208 **Primary aim: Describe COVID-19-driven changes in clinical practices**

209 COVID-19-driven clinical practice changes in the OBGYN-addiction treatment clinic are
210 described in Table 1, with a few that supported continued patient engagement highlighted here.
211 During the earlyCOVID-19 and COVID-19-vaccine phases, medical providers continued to offer
212 limited in-person appointments while behavioral health primarily offered virtual options. Patient
213 care policies were modified. In the preCOVID-19 phase, patients were required to attend at least
214 one in-person medical provider visit and provide a toxicology test every 30-days to receive
215 MOUD and medication for alcohol use disorder prescriptions. In the earlyCOVID-19 and
216 COVID-19-vaccine phases, toxicology testing was extended to every 90-days. The patient care
217 policy was incorporated into a new “Patient Care Agreement” and reviewed with patients by
218 nursing staff during appointments.

219 During the earlyCOVID-19 and COVID-19-vaccine phases, virtual capabilities increased in
220 clinic management. Interdisciplinary plan of care meetings were held virtually which increased
221 attendance and interprofessional communication. HIPAA compliant and synchronized cloud file
222 hosting service was implemented to store and share clinically relevant information.

223 **Secondary aim: Evaluate clinic-level medical provider attendance patterns across the**
224 **COVID-19 pandemic**

225 The number of medical provider visits attended in the OBGYN-addiction treatment clinic per
226 month over the three COVID-19 phases are shown in Figure 1. On average, the clinic had 69.7
227 (SD=11.2) attended appointments in the preCOVID-19 phase, 86.6 (SD=13.8) in the
228 earlyCOVID-19 phase, and 71.1 (SD=6.9) in the COVID-19-vaccine phase. No significant
229 changes in the number of visits each month were identified in the interrupted time series analysis
230 (Appendix 1).

231 **Tertiary aim: Compare patient-level SUD treatment engagement outcomes across the**
232 **COVID-19 pandemic**

233 Participants (N=27) identified as Black (48.2%) or White (51.9%) with a mean age of 31 years
234 (SD=4.0). Most participants had Medicaid insurance (81.5%), were unemployed (66.7%), and
235 living in their homes (81.5%; Table 2). Over 95% of the participants had a mental health
236 comorbidity, and about half were prescribed psychotropic medications (51.9%). Approximately
237 59% of participants were pregnant in the preCOVID-19 phase. Fewer participants were pregnant
238 in the latter two phases. Over half (51.8%) of participants were receiving treatment in the clinic
239 before the study started.

240 The number of participants for the patient-level treatment engagement outcomes varied by month
241 as the inclusion criteria was initiation of care by the end of the first phase (August-October 2019
242 n=16, November 2019 n=20, December 2019 n=21, all other months n=27).

243 In both unadjusted and adjusted models, buprenorphine continuation in a 30-day period was
244 significantly lower in the COVID-19-vaccine phase (74.5%) compared to preCOVID-19
245 (96.5%), but not significantly different between early COVID-19 (91.9%) and preCOVID-19
246 phase (96.5%; Figure 2, Table 3).

247 In both unadjusted and adjusted models, any visit attendance in a 30-day period was significantly
248 lower in COVID-19-vaccine phase (64.4%) compared to the preCOVID-19 phase (89.5%;
249 Figure 2, Table 3).

250 In both unadjusted and adjusted models, medical provider visit attendance was significantly
251 lower in the COVID-19-vaccine (63.9%) phase compared to preCOVID-19 (86.7%), but not
252 significantly different between earlyCOVID-19 (78.9%) and preCOVID-19 phase (86.7% ;
253 Figure 2, Table 3).

254 In both unadjusted and adjusted models, behavioral health visit attendance in a 30-day period
255 was significantly lower in both the early (18.2%) and COVID-19-vaccine (6.5%) phases
256 compared to the preCOVID-19 phase (32.2%;Figure 2, Table 3).

257 The average percentage of behavioral health visits attended virtually increased between the first
258 two phases and remained high during the third (2.7%, 91.5%, 91.1%). A similar trend was seen
259 for the average percentage of medical provider visits attended virtually (0.0%, 42.8%, 34.7%).

260 Additional information for all full regression analyses can be found in Appendices 2-3.

261

Discussion

262 This study describes COVID-19-driven clinical changes in an OBGYN-addiction treatment
263 clinic and summarizes patterns in clinic-level and patient-level outcomes throughout the
264 pandemic. During the unprecedented COVID-19 pandemic and nationwide shutdown, the study
265 site promptly adapted to a hybrid telehealth/in-person system to prioritize safety and patient
266 needs. With these changes, clinic-level visits remained consistent over three COVID-19 phases.
267 Although treatment engagement by participants in our small cohort of pregnant and parenting
268 people decreased over the study timeframe, engagement with medical providers remained
269 relatively high, especially in the context of similar reported treatment retention rates for this
270 unique patient population.^{21,26} These clinic- and patient-level findings support that healthcare
271 accessibility can be achieved for this vulnerable population in a hybrid telehealth/in-person
272 system.

273 Similar to many healthcare facilities, our OBGYN-addiction clinic quickly transitioned care to a
274 telehealth platform at the beginning of the pandemic.²⁸ Provision of interdisciplinary virtual care
275 alongside reduced capacity in-person medical care (1) provided flexibility for individualized care
276 plans tailored to meet patients' needs and (2) helped ease anxiety about COVID-19 exposure, a
277 heightened concern among pregnant and parenting people.²⁰ However, the telehealth-based
278 system had some drawbacks. Patients were no longer able to combine interdisciplinary service
279 appointments into a single clinic visit. Instead, patients had to schedule multiple separate visits.
280 Given the many barriers to care patients face, including childcare responsibilities, lack of
281 transportation, and stigma,²⁹ removing the ability to combine appointments may have inhibited
282 some people from initiating or continuing interdisciplinary services (e.g., contraception,
283 behavioral health, social work support).

284 The COVID-19-driven telehealth platform was beneficial for clinical coordination within the
285 integrated OBGYN-addiction clinic as evidenced by more standardized intra-clinical
286 correspondence. Best practices for the care of pregnant and parenting people with SUD include
287 integrating perinatal care, mental health, and trauma-informed services with SUD treatment.³⁰
288 Within an integrated care model, maintaining intra-clinical communication between
289 interdisciplinary team members is key. Our OBGYN-addiction treatment program established
290 new modes of communication (i.e., weekly meetings) and information storage platforms using
291 virtual capabilities to help ensure that intra-clinical communication was maintained within the
292 hybrid telehealth/in-person model.

293 The novelty of the pandemic limits the availability of SUD treatment outcomes research,
294 particularly among pregnant and parenting people. Current study findings supplement the limited
295 existing literature, suggesting that offering virtual visits can increase the frequency of clinic
296 visits likely due to increased accessibility of care.²² Importantly, the study clinic did not cease in-
297 person medical visits to ensure the clinic continued to offer services suitable for all patients. It is
298 commendable that the OBGYN-addiction clinic continued treating pregnant people with SUD
299 and incorporating patient-centered approaches to support treatment retention as many SUD
300 treatment clinics do not employ tailored care approaches for pregnant people, and the number of
301 MOUD clinics accepting pregnant people decreased during the pandemic.³¹

302 Patient-level treatment engagement outcomes from our small cohort demonstrated that many
303 participants continued taking buprenorphine, their primary OUD treatment, during the COVID-
304 19 pandemic. Our buprenorphine continuation rate of over 70% for all three COVID-19 phases
305 is similar to or above the rate of other MOUD populations before COVID-19,³² including
306 postpartum patients.^{21,27} One COVID-19-driven strategy that supported participant

307 buprenorphine continuation was implementation of home buprenorphine induction, which has
308 been found to be safe and effective among pregnant people.³³

309 Medical provider visit attendance decreased over the three COVID-19 phases yet remained
310 relatively high; this is especially notable when considering the unique challenges pregnant and
311 parenting people with SUD face.^{14,34} We hypothesize that our expansion of patient-centered,
312 recovery-oriented strategies, like flexibility in visit type, contributed to the relatively high
313 treatment engagement across the COVID-19 phases. Notably, many participants were pregnant
314 in the first phase, but not in the third phase, which likely contributed to the decrease in medical
315 provider visits independent of COVID-19 because visit frequency typically decreases
316 postpartum.³⁵ Similar to previous work, within the primarily virtual behavioral health model,
317 attendance decreased dramatically and remained low.²³ Given that barriers to care for birthing
318 people increase after delivering an infant, a decrease in utilization of adjunctive services
319 (behavioral health) postpartum was somewhat expected among our cohort, as the percent of
320 pregnant participants decreased over time.³⁵ However, the drastic decrease in attendance may
321 have also been due to perceived loss of therapeutic rapport in a primarily virtual platform.^{11,36} In
322 response to these findings, the clinic has established a hybrid telehealth/in-person model for
323 behavioral health appointments.

324 **Clinical Practice Implications**

325 Findings underscore that a hybrid model, offering virtual and in-person options, may be a
326 preferable method of interdisciplinary care provision for this population.³⁷⁻³⁹ Moving forward,
327 integrating these COVID-19-driven changes into long-term practice may reduce patient and
328 provider burden as well as improve patient SUD outcomes. The study clinic site continues to use

329 a hybrid telehealth/in-person model and low-threshold, flexible buprenorphine prescribing
330 options. Improving clinical communication and workflow with virtual capabilities may help
331 improve wellbeing among healthcare workers, as burnout is a growing concern.^{34,40}

332 **Limitations**

333 This study assessed a unique OBGYN-addiction treatment clinic. Changes that worked within
334 this clinic may not work in other treatment settings. COVID-19-driven changes occurred rapidly,
335 and some changes may not have been captured in our review of clinical practices. The study site
336 is trainee-based; thus, some COVID-19-driven changes, especially for behavioral health services,
337 were largely dictated by institution-wide regulations limiting student attendance in clinic.

338 Additionally, the health system scheduling data used for the secondary aim may reflect a slightly
339 inflated count of attended appointments because virtual appointments were marked as “arrived”
340 at the beginning of the clinic shift; some ‘no show’ appointments may not have been coded
341 appropriately by overburdened clerical staff. Additionally, behavioral health appointments were
342 not captured in our clinic-wide scheduling database during the study timeframe. For patient-level
343 outcomes, participants were selected from those who consented to research registry participation,
344 introducing selection bias and limiting generalizability. The chart abstraction is subject to
345 information bias and offers constrained information, especially for psychosocial factors (e.g.,
346 child welfare involvement). Given the small sample size, these findings are preliminary and
347 intended to inform future research that can build upon this study by incorporating toxicology
348 reports and pregnancy outcomes among larger samples to better understand the impact of
349 COVID-19 changes on this vulnerable patient population. Despite these limitations, this study is
350 the first to describe COVID-19-driven clinical practice changes and SUD outcomes among
351 pregnant and parenting people in integrated outpatient OB/GYN-addiction treatment.

352

Conclusions

353

Our findings support ways healthcare accessibility can be achieved for vulnerable patient

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populations with SUD using a hybrid telehealth/in-person system that tailors care approaches to

355

individuals' needs. Clinics treating pregnant and parenting people with SUD may benefit from

356

incorporating similar clinical changes into permanent practice. Addiction researchers should

357

investigate how COVID-19-driven care adaptations can be cultivated to advance personalized

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approaches in addiction medicine.

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Acknowledgment

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Not applicable

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Figures

477 Figure 1. Total number of clinic-wide medical provider visits attended by month over three
478 COVID-19 phases in an OBGYN-Addiction clinic

479 Figure 2. Patient-level trends in treatment engagement outcomes by month across three COVID-
480 19 phases for study cohort receiving buprenorphine for opioid use disorder in the integrated
481 OBGYN-Addiction clinic

1 **Assessment of COVID-19-Driven Changes in an Integrated OBGYN-Addiction Treatment**
2 **Clinic and Future Implications**

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11 Conflicts of Interest: None

12 Source of Funding: This study was supported by the Jeanann Gray Dunlap Foundation and
13 partially by CTSA award No. UL1TR002649 from the National Center for
14 Advancing Translational Sciences. Parlier-Ahmad is supported by NIDA T32DA007027 (PI: W.
15 Dewey). Smarony was supported by the VCU Undergraduate Fellowship for Clinical and
16 Translational Research. Dr. Martin is supported by NIDA award No. K23 DA053507. For the
17 remaining authors none were declared.

18 Abstract: 250/250

19 Manuscript: 3496/3500

20 References: 40/40

21 Keywords: Integrated addiction treatment, women's health, SUD, COVID-19 outcomes

Abstract

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Objective: The COVID-19 pandemic prompted healthcare delivery changes, but the associated impacts on substance use disorder treatment outcomes among pregnant and parenting people are unknown. This study aims to 1) describe COVID-19-driven clinical practice changes, 2) evaluate clinic-level visit attendance patterns, and 3) compare patient-level treatment engagement outcomes across three COVID-19 pandemic phases in an OBGYN-addiction treatment clinic.

Methods: COVID-19 phases include: preCOVID-19 (August 2019-February 2020), earlyCOVID-19 (March 2020-December 2020), and COVID-19-vaccine (January 2021-~~June~~ July 2021). OBGYN-addiction treatment clinical practice changes were summarized. Clinic-level attended medical provider visits were analyzed. Patient-level treatment engagement outcomes (buprenorphine continuation, visit attendance, and virtual visits) were assessed in a cohort of pregnant and parenting people enrolled in a clinic research registry. Mixed-level effect logistic regression models determined the relationship between the COVID-19 phases and the patient-level outcomes.

Results: The study site made several COVID-19-driven clinical practice changes, including implementing a hybrid virtual/in-person system for medical visits. Clinic-level medical provider appointments increased between the first and second COVID-19 phases and remained high in the third phase. Among participants included in patient-level outcome analyses (N=27), there were no differences in the earlyCOVID-19 phase compared to preCOVID-19 phase in buprenorphine continuation, any visits, or medical visits. There was a decrease in all patient-level outcomes in the COVID-19-vaccine phase compared to preCOVID-19 ($p < .05$). Virtual visits increased between the first two phases and remained high during the third.

44 **Conclusion:** Within our OBGYN-addiction treatment clinic, implementation of tailored, patient-
45 centered treatment strategies supported clinic- and patient-level treatment engagement
46 throughout the pandemic.

47

Introduction

48 Within the United States, the COVID-19 pandemic has caused over one million deaths,
49 significantly decreasing the average life expectancy particularly among Black and Latinx
50 communities.^{1,2} Additionally, the pandemic has had substantial medical and social impacts,
51 including dramatic increases in substance use.³ Among people with substance use disorders
52 (SUD), COVID-19 incidence, COVID-19-related morbidity and mortality are high.^{4,5} People
53 with opioid use disorder (OUD) are particularly vulnerable to the negative impacts of COVID-19
54 given the pandemic emerged amid the opioid overdose epidemic. Between 2019-2020, the
55 United States recorded the highest number of overdose deaths in a 12-month period.⁶ Overdose
56 deaths have continued to increase rapidly each year during the COVID-19 pandemic⁷ due to both
57 the direct effects and psychosocial challenges of COVID-19.^{8,9} For this high-risk patient
58 population, accessible healthcare is crucial.

59 In order to prioritize patient and provider safety during the nationwide COVID-19 pandemic
60 lockdown, many healthcare systems transitioned to virtual modalities, offering patients remote
61 visits as alternatives to in-person visits. While the shift to a telehealth system ~~has~~ improved
62 access for some individuals, it has exacerbated challenges for others. Patient challenges include
63 lack of access to secure technologies, limited technology literacy, social isolation, and perceived
64 loss of therapeutic rapport.^{10,11} Evidence-based SUD treatments, including medication for opioid
65 use disorder (MOUD) and mental health treatment, reduce overdose risk and improve quality of
66 life.^{12,13} However, only 1 in 10 people with SUD receive specialized SUD treatment, even before
67 COVID-19.¹⁴ Although the conversion to telehealth coinciding with the COVID-19 pandemic
68 has ~~been encouraging for the healthcare system~~ encouraged continuity of care broadly, there is

69 concern that telehealth has made access to SUD treatment ~~even~~ more difficult for many
70 people.^{10,11,15}

71 Pregnant and parenting people, a high priority addiction treatment population, are exceptionally
72 vulnerable to the risks associated with both COVID-19 and the overdose epidemic. Overdoses,
73 largely by opioids, have become a leading cause of pregnancy-associated deaths, with the largest
74 proportion occurring in the 7-12 months after delivery and among birthing people not
75 consistently receiving MOUD.^{16,17} Barriers like lack of insurance coverage, lack of
76 transportation, conflict with wait/travel time, and childcare insecurity may place pregnant and
77 parenting people at risk of not accessing or having lapses in life-saving SUD treatment.^{18,19} In
78 addition, pregnant people are highly prone to pandemic-related stressors associated with feeling
79 unprepared for birth in the pandemic and fears of perinatal COVID-19 infection.²⁰ Given the
80 complexities that surround SUD, pregnancy/parenting, *and* the COVID-19 pandemic, it is vital
81 to maintain healthcare access and optimize recovery support for this vulnerable population.

82 Data describing the impact of COVID-19-driven healthcare delivery changes on SUD treatment
83 outcomes is limited. Among Medicaid beneficiaries with OUD in Wisconsin, patients in office-
84 based settings retained access to buprenorphine during COVID-19 at similar levels as
85 preCOVID-19 despite ~~the~~ decreases in on-site services like urine drug tests.²¹ Another study
86 analyzed COVID-19-driven shifts in a youth ~~n~~-outpatient addiction treatment program ~~for youth~~
87 and found that the visit attendance rates increased from approximately 60% to 70% after
88 converting to telehealth.²² To our knowledge, only one study ~~so far~~ has been conducted among
89 pregnant people with OUD. Authors found that with the shift to telehealth at the beginning of the
90 pandemic, group therapy attendance decreased and MOUD doses increased secondary to
91 cravings ~~in this small sample~~.²³

92 As telehealth moves into a more permanent place in our healthcare system, we need to consider
93 the impact of COVID-19-driven transitions in healthcare delivery on our most vulnerable
94 populations. To our knowledge, no study has evaluated how pandemic-driven changes in care,
95 including use of virtual modalities, have affected treatment outcomes among pregnant and
96 parenting people with SUD. This study aims to (1) describe COVID-19-driven changes in
97 clinical practices employed by an integrated, [intermulti](#)disciplinary OBGYN-addiction clinic, (2)
98 evaluate clinic-level [medical provider](#) visit attendance patterns across three defined phases of the
99 COVID-19 pandemic, and (3) compare patient-level SUD treatment [engagement](#) outcomes
100 among a cohort of pregnant and parenting people receiving buprenorphine for OUD across three
101 COVID-19 pandemic phases.

102 **Methods**

103 **Design**

104 This study describes COVID-19-driven clinical practice changes within an OBGYN-addiction
105 treatment clinic and assesses their impact on two levels: (1) clinic-level and (2) patient-level.
106 Both clinic-level and patient-level outcomes were assessed in three phases. The first phase is the
107 preCOVID-19 phase (August 2019-February 2020) ~~which coincides with- standardization of-The~~
108 ~~start of this phase was selected because the~~ clinic procedures and operations ~~became more~~
109 ~~standardized~~ due to onboarding of new nurse management. The next phase is the earlyCOVID-
110 19 phase (March 2020-December 2020) which is marked by the World Health Organization's
111 declaration of COVID-19 as a global pandemic in March 2020. The third phase is the COVID-
112 19-vaccine phase (January 2021-~~July~~une 2021) ~~which coincided .The start of this phase~~
113 ~~coincided~~ with [Phase 1c of the CDC's vaccine distribution plan allowing our patient population](#)

114 ~~the option to receive the first dose.~~²⁴ ~~the time during which COVID-19 vaccines were readily~~
115 ~~available for the clinic's patient population.~~ The independent variable for all three aims was the
116 COVID-19 phases.

117 **Setting**

118 The OBGYN-addiction outpatient treatment clinic is affiliated with a large academic medical
119 center in a Medicaid-expanded southern state. The medical center serves as a safety net for the
120 region and treats predominately low-income, racially and ethnically minoritized people. On-site
121 addiction medicine physicians are board-certified obstetrician-gynecologists, and nursing staff
122 are credentialed in both women's health and addiction. Most patients are referred from within the
123 academic medical center (e.g., inpatient consults, primary care physicians). At the initial clinic
124 visit, providers complete a comprehensive assessment. All patients diagnosed with OUD are
125 offered buprenorphine. ~~Throughout treatment at the clinic, a~~ comprehensive, recovery-oriented
126 care model is utilized ~~throughout treatment~~ in which patients have access to psychiatric, mental
127 health, case management, and social work services. The clinic prioritizes a low-threshold, harm
128 reduction approach, meaning that established patients with recurrence of substance use are not
129 excluded from treatment, but instead provided with increased wrap-around support. For patients
130 who initiate SUD treatment during pregnancy, there is no time limitation on how long patients
131 can continue SUD treatment with the clinic after delivery.

132 **Sample and Data Sources**

133 *Primary aim: Describe COVID-19-driven changes in clinical practices*

134 ~~Clinic-level management records were reviewed for~~ COVID-19-driven clinical practice methods
135 ~~were and~~ summarized across three phases by the research team using clinic-level management
136 records. Summarized COVID-19-driven clinical changes were reviewed and approved by a
137 group of representative stakeholders from the study site including physicians, nurses, and
138 behavioral health providers.

139 *Secondary aim: Evaluate clinic-level medical provider attendance patterns across the COVID-*
140 *19 pandemic*

141 The clinic provides outpatient addiction services for over 180 adults, serving approximately 63
142 patients per month, with nearly all patients being pregnant and/or parenting people with SUD.

143 All OBGYN-addiction clinic medical provider visits from August 2019 to July~~ne~~ 2021 were
144 included in the deidentified clinic-level dataset. Number of visits each month was pulled from
145 the health system appointment scheduling database. For this aim, protected health information
146 was not used which limited our access to clinic-level demographics across the COVID-19
147 phases. However, on average, 66% of the clinic patients identify as White and 34% as Black
148 with a mean age of 30.3 years. Most of the patients have at least one comorbid psychiatric
149 diagnosis, and 90% are receiving buprenorphine for OUD. Approximately 87% of the patients
150 are insured with Medicaid, 3% with private insurance, and 10% are uninsured.

151 *Tertiary aim: Compare patient-level SUD treatment engagement outcomes across the COVID-19*
152 *pandemic*

153 For patient-level outcomes, a secondary analysis of a cohort of participants from the OBGYN-
154 addiction treatment clinic research registry was conducted. All ~~elinic~~ patients are invited to
155 participate in the clinic-wide research registry (85% recruitment rate). For registry participants,

156 monthly (30-day) chart abstractions are conducted starting from their initial visit including basic
157 demographics, medical diagnosis, medication history, visit attendance, socioeconomic changes,
158 and comorbidities. The registry is approved by the university's Institutional Review Board.

159 For the current study analyses, registry participants were included if they initiated buprenorphine
160 treatment by January 2020 and had an OUD diagnosis. Analyses included data from the 30-day
161 periods within the study timeframe for N=27 pregnant and parenting people receiving
162 buprenorphine for OUD.

163 **Clinical Variables**

164 *Primary aim:*

165 The clinical practice methods were categorized by department: medical, behavioral health, and
166 care coordination (e.g., clinic management and procedures).

167 *Secondary aim:*

168 The dependent variable for the clinic-level data was the total number of medical provider visits
169 for the OBGYN-addiction treatment clinic per month, including both virtual and in-person visits.
170 All appointments coded as “arrived” were counted as attended and included in the number of
171 appointments.

172 *Tertiary aim:*

173 Demographic, psychosocial, and clinical variables were abstracted from the initial intake visit
174 and included race, age (~~in years~~), insurance type, employment status, living situation, number of
175 children in custody, comorbid SUD diagnosis, smoking tobacco (yes/no), psychiatric

176 comorbidity (yes/no) and psychotropic medication (yes/no). Duration of treatment episode was
177 calculated from the initial intake visit to the start of the study (August 2019) in months.
178 Pregnancy status was determined for individual participants for each of the three COVID-19
179 phases; if a participant was pregnant at any time during a phase, status was coded as pregnant.

180 Patient-level treatment engagement outcomes were buprenorphine continuation, total visit
181 attendance (behavioral health and medical provider visits), medical provider visits, behavioral
182 health visits, and proportion of total attended visits that were virtual for each of the 30-day
183 periods over the three study phases. Buprenorphine continuation (yes/no) was coded as “yes” if
184 the individual started or continued buprenorphine during that 30-day period. Any visit attendance
185 (yes/no) was coded as “yes” if the individual had at least one behavioral health or medical
186 provider visit during the 30-day period. Additionally, medical provider visits (yes/no) and
187 behavioral health provider visits (yes/no) were coded as two separate variables. For all 30-day
188 periods with at least one visit, the percent of medical provider and behavioral health ~~virtual~~-visits
189 attended virtually was calculated.

190 **Data Analysis**

191 *Primary aim:*

192 A qualitative description is provided for clinical practices and COVID-19-driven clinical
193 changes in each category for the ~~three COVID-19~~study phases.

194 *Secondary aim:*

195 The mean (and standard deviation) number of attended medical provider visits in each COVID-
196 19 phase was calculated. Interrupted time series design was used to analyze differences by

197 COVID-19 phases in the monthly counts of attended visits from August 2019 to July~~ne~~ 2021.
198 ITS design was chosen because we have a specific date of “intervention” (COVID-19), include a
199 repeated measure (visit count per month) that did not change in data collection practices over the
200 study period, and use a consistent interval between measurements (month’s duration). This
201 analysis method is similar to that used by other studies evaluating the impact of events that are
202 abrupt and temporary.²⁵

203 *Tertiary aim:*

204 Cohort characteristics at study enrollment are described. For the outcomes of buprenorphine
205 continuation, total visit attendance (including behavioral health and medical provider visits), and
206 percent of ~~virtual~~-visits attended virtually, mixed level logistic regression models with a person
207 level random intercept and random slopes for COVID-19 phases were used due to the
208 heterogeneity of the outcomes throughout COVID-19 phases in each individual. ~~Mixed-effect~~
209 ~~linear models with the same variables were used to assess the percent of virtual visits.~~ Similar
210 models have been used in work exploring longitudinal datasets and outcomes in questions
211 concerning COVID-19.²⁶ Models controlled for fixed effects of pregnancy and duration of
212 treatment episode.²⁷ Percent of visits attended virtually are described descriptively. All
213 analysesAnalysis for aims 2 and 3 were conducted using STATA 16C with statistical
214 significance set at 0.05.

215 **Results**

216 **Primary aim: Describe COVID-19-driven changes in clinical practices**

217 COVID-19-driven clinical practice changes in the OBGYN-addiction treatment clinic are
218 described in Table 1, with a few that supported continued patient engagement highlighted here.
219 During the earlyCOVID-19 and COVID-19-vaccine phases, ~~changes were made in care delivery~~
220 ~~method with both medical provider and behavioral health visits shifting to telehealth platforms.~~
221 mMedical providers continued to offer limited in-person appointments while behavioral health
222 primarily offered virtual options. Patient care policies were modified. In the preCOVID-19
223 phase, patients were required to attend at least one in-person medical provider visit and provide a
224 toxicology test every 30-days to receive MOUD and medication for alcohol use disorder
225 ~~(MAUD)~~ prescriptions. In the earlyCOVID-19 and COVID-19-vaccine phases, ~~this toxicology~~
226 ~~testing~~ was extended to every 90-days. The patient care policy was incorporated into a new
227 “Patient Care Agreement” and reviewed with patients by nursing staff during appointments.

228 During the earlyCOVID-19 and COVID-19-vaccine phases, virtual capabilities increased in
229 clinic management. Interdisciplinary plan of care meetings were held virtually which increased
230 attendance and interprofessional communication ~~among all departments working with clinic~~
231 ~~patients, and a~~ HIPAA compliant and synchronized cloud file hosting service was implemented
232 to store and share clinically relevant information.

233 **Secondary aim: Evaluate clinic-level medical provider attendance patterns across the**
234 **COVID-19 pandemic**

235 The ~~mean~~ number of medical provider visits attended in the OBGYN-addiction treatment clinic
236 per month over the three COVID-19 phases are shown in Figure 1. On average, the clinic had
237 69.7 (SD=11.2) attended appointments in the preCOVID-19 phase, 86.6 (SD=13.8) in the
238 earlyCOVID-19 phase, and 71.10 (SD=6.97.5) in the COVID-19-vaccine phase. No significant

239 changes in the number of visits each month were identified in the interrupted time series analysis
240 (Appendix 1).

241 **Tertiary aim: Compare patient-level SUD treatment engagement outcomes across the**
242 **COVID-19 pandemic**

243 Participants (N=27) identified as Black (48.2%) or White (51.9%) with a mean age of 31 years
244 (SD=4.0). Most participants had Medicaid insurance (81.5%), were unemployed (66.7%), and
245 living in their homes (81.5%; Table 2). Over 95% of the participants had a mental health
246 comorbidity, and about half were prescribed psychotropic medications (51.9%). Approximately
247 59% of participants were pregnant in the preCOVID-19 phase. Fewer participants were pregnant
248 in the latter two phases. Over half (51.8%) of participants were receiving treatment in the clinic
249 ~~prior to before the beginning of the study period started.~~

250 The number of participants for the ~~five~~ patient-level treatment engagement outcomes varied by
251 month as the inclusion criteria was initiation of care by the end of the first phase (~~Months~~
252 August-October 2019 ~~included n=16 participants~~, November 2019 ~~included n=20 participants~~,
253 December 2019 ~~included n=21 participants~~. ~~a~~All other months ~~included n=N=27 participants~~.

254 In both unadjusted and adjusted models, buprenorphine continuation in a 30-day period was
255 significantly lower in the COVID-19-vaccine phase (~~74.54.6%~~) compared to preCOVID-19
256 (~~96.5%~~), but not significantly different between early COVID-19 (~~91.92%~~) and preCOVID-19
257 phase (~~96.5%, 91.2%, 74.6 of 30-day periods in each phase respectively~~; Figure 2, Table 3).

258 In both unadjusted and adjusted models, any visit attendance in a 30-day period was significantly
259 lower in COVID-19-vaccine phase (64.41%) compared to the preCOVID-19 phase (89.57%
260 ~~79.9%, 64.1% of 30-day periods in each phase respectively~~; Figure 2, Table 3).

261 In both unadjusted and adjusted models, medical provider visit attendance was significantly
262 lower in the COVID-19-vaccine (63.96%) phase compared to preCOVID-19 (86.79.9%), but not
263 significantly different between earlyCOVID-19 (78.90%) and preCOVID-19 phase (86.79%
264 ~~78.0%, 63.6% of 30-day periods in each phase respectively~~; Figure 2, Table 3).

265 In both unadjusted and adjusted models, behavioral health visit attendance in a 30-day period
266 was significantly lower in both the early (18.29.4%) and COVID-19-vaccine (6.57.7%) phases
267 compared to the preCOVID-19 phase (32.21.7%; ~~19.4%, 7.7% of 30-day periods in each phase~~
268 ~~respectively~~; Figure 2, Table 3).

269 The average percentage of behavioral health visits attended virtually increased between the first
270 two phases and remained high during the third (2.7%, 91.5%, 91.1%). A similar trend was seen
271 for the average percentage of medical provider visits attended virtually (0.0%, 42.8%, 34.7%).
272 ~~Percentage of virtual visits increased significantly between the first two phases and remained~~
273 ~~high during the third (0.9%, 47.3%, 40.2%; Table 3).~~ Additional information for all full
274 regression analyses can be found in Appendices 2-34.

275 Discussion

276 This study describes COVID-19-driven clinical changes in an OBGYN-addiction treatment
277 clinic and summarizes patterns in clinic-level and patient-level outcomes throughout the
278 pandemic. During the unprecedented COVID-19 pandemic and nationwide shutdown, the study

279 site promptly adapted to a hybrid telehealth/in-person system to prioritize safety and patient
280 needs. With these changes, ~~number of~~ clinic-level visits remained consistent over three COVID-
281 19 phases. Although treatment engagement by participants in our small cohort of pregnant and
282 parenting people decreased over the study timeframe, engagement with medical providers~~it~~
283 remained relatively high, especially in the context of similar reported treatment retention rates
284 for this unique patient population.^{21,26} These clinic- and patient-level findings support that
285 healthcare accessibility can be achieved for this vulnerable population in a hybrid telehealth/in-
286 person system.

287 Similar to many healthcare facilities, our OBGYN-addiction clinic quickly transitioned care to a
288 telehealth platform at the beginning of the pandemic.²⁸ Provision of inter-~~multi~~disciplinary
289 virtual care alongside reduced capacity in-person medical care (1) provided flexibility for
290 individualized care plans tailored to meet patients' needs and (2) helped ease anxiety about
291 COVID-19 exposure, a heightened concern among pregnant and parenting people.²⁰ However,
292 the telehealth-based system had some drawbacks. ~~For instance, p~~Patients were no longer able to
293 combine multidisciplinary-interdisciplinary service appointments into a single clinic visit.
294 Instead, patients had to schedule multiple separate visits. Given the many barriers to care patients
295 face, including childcare responsibilities, lack of transportation, and stigma,²⁹ removing the
296 ability to combine appointments may have inhibited some people from initiating or continuing
297 multidisciplinary-interdisciplinary services (e.g., contraception, behavioral health, social work
298 support).

299 The COVID-19-driven telehealth platform was beneficial for clinical-~~care~~ coordination within
300 the integrated OBGYN-addiction clinic as evidenced by more standardized intra-clinical
301 correspondence. Best practices for the care of pregnant and parenting people with SUD include

302 integrating perinatal care, mental health, and trauma-informed services with SUD treatment.³⁰
303 Within an integrated care model, maintaining intra-clinical communication between
304 [multidisciplinary-interdisciplinary](#) team members is key. Our OBGYN-addiction treatment
305 program established new modes of communication ([i.e., weekly meetings](#)) and information
306 storage platforms using virtual capabilities to help ensure that intra-clinical communication was
307 maintained within the hybrid telehealth/in-person model.

308 The novelty of the pandemic limits the availability of SUD treatment outcomes research,
309 particularly among pregnant and parenting people. Current study findings supplement the limited
310 existing literature, suggesting that offering virtual visits can increase the frequency of clinic
311 visits likely due to increased accessibility of care.²² Importantly, the study clinic did not cease in-
312 person medical visits to ensure the clinic continued to offer services suitable for all patients. It is
313 commendable that the OBGYN-addiction clinic continued treating pregnant people with SUD
314 and incorporating patient-centered approaches to support treatment retention as many SUD
315 treatment clinics do not employ tailored care approaches for pregnant people, and the number of
316 MOUD clinics accepting pregnant people decreased during the pandemic.³¹

317 Patient-level [treatment engagement](#) outcomes from our small cohort demonstrated that many
318 participants continued taking buprenorphine, their primary OUD treatment, during the COVID-
319 19 pandemic. Our buprenorphine continuation rate of over 70% for all three COVID-19 phases
320 is similar to or above the rate of other MOUD populations before COVID-19,³² including
321 postpartum patients.^{21,27} One COVID-19-driven strategy that supported participant
322 buprenorphine continuation was implementation of home buprenorphine induction, which has
323 been found to be safe and effective among pregnant people.³³

324 ~~Similarly, m~~Medical provider visit attendance decreased over the three COVID-19 phases yet,
325 remained relatively high; this is especially notable when considering the unique challenges
326 pregnant and parenting people with SUD face.^{14,34} We hypothesize that our expansion of patient-
327 centered, recovery-oriented strategies, ~~such as like~~ flexibility in visit type, ~~likely~~ contributed to
328 the relatively high treatment engagement across the COVID-19 phases. Notably, many
329 participants were pregnant in the first phase, but not in the third phase, which likely contributed
330 to the decrease in medical provider visits independent of COVID-19 because visit frequency
331 typically decreases postpartum.³⁵ Similar to previous work, within the ~~primarily~~ virtual ~~only-~~
332 ~~option~~-behavioral health model, attendance decreased dramatically and remained low.²³ Given
333 that barriers to care for birthing people increase after delivering an infant, a decrease in
334 utilization of adjunctive services (behavioral health) postpartum was somewhat expected among
335 our cohort, as the percent of pregnant participants decreased over time.³⁵ However, the drastic
336 decrease in attendance may have also been due to perceived loss of therapeutic rapport in a
337 ~~primarily~~ virtual-~~only~~ platform.^{11,36} ~~Importantly, i~~In response to these findings, the clinic has
338 ~~now~~ established a hybrid telehealth/in-person model for behavioral health appointments.

339 **Clinical Practice Implications**

340 Findings underscore that a hybrid model, offering virtual and in-person options, may be a
341 preferable method of ~~multidisciplinary-interdisciplinary~~ care provision for this ~~complex and~~
342 ~~vulnerable SUD~~ population.³⁷⁻³⁹ ~~Additionally, findings suggest that flexible buprenorphine~~
343 ~~prescribing policies and lenient toxicology test timelines can support treatment engagement,~~
344 ~~especially for patients who have been on a stable recovery path.~~ Moving forward, integrating
345 these COVID-19-driven changes into long-term practice may reduce patient and provider burden
346 as well as improve patient SUD outcomes. The study clinic site continues to use a hybrid

347 telehealth/in-person model and low-threshold, flexible buprenorphine prescribing options.
348 Improving clinical communication and workflow with virtual capabilities may help improve
349 wellbeing among healthcare workers, as burnout is a growing concern.^{34,40}

350 **Limitations**

351 This study assessed a unique OBGYN-addiction treatment clinic. Changes that worked within
352 this clinic may not work in other treatment settings. COVID-19-driven changes occurred rapidly,
353 and some changes may not have been captured in our review of clinical practices. The study site
354 is trainee-based; thus, some COVID-19-driven changes, especially for behavioral health services,
355 were largely dictated by institution-wide regulations limiting student attendance in clinic.
356 Additionally, the health system scheduling data used for the secondary aim may reflect a slightly
357 inflated count of attended appointments because virtual appointments were marked as “arrived”
358 at the beginning of the clinic shift; some ‘no show’ appointments may not have been coded
359 appropriately by overburdened clerical staff. Additionally, behavioral health appointments were
360 not captured in our clinic-wide scheduling database during the study timeframe. For patient-level
361 outcomes, participants were selected from those who consented to research registry participation,
362 introducing selection bias and limiting generalizability. The chart abstraction is subject to
363 information bias and offers constrained information, especially for psychosocial factors (e.g.,
364 child welfare involvement)of this small sample size. Given the small sample size, these findings
365 are preliminary and intended to inform future research that can build upon this study by
366 incorporating toxicology reports and pregnancy outcomes among larger samples to better
367 understand the impact of COVID-19 changes on this vulnerable patient population. Despite these
368 limitations, this study is the first to describe COVID-19-driven clinical practice changes and

369 SUD outcomes among pregnant and parenting people in integrated outpatient OB/GYN-
370 addiction treatment.

371 **Conclusions**

372 ~~SUD treatment facilities and providers have demonstrated resiliency and creativity as they have~~
373 ~~cultivated new care provisions to meet patient needs during unprecedented circumstances.~~ Our
374 findings support ways healthcare accessibility can be achieved for vulnerable patient populations
375 with SUD using a hybrid telehealth/in-person system that tailors care approaches to individuals’
376 needs. Clinics treating pregnant and parenting people with SUD may benefit from incorporating
377 similar clinical changes into permanent practice., and ~~a~~Addiction researchers should investigate
378 how COVID-19-driven care adaptations can be cultivated to advance personalized approaches in
379 addiction medicine.

380 **Acknowledgment**

381 Not applicable

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Figures

498 Figure 1. Total number of clinic-wide medical provider visits attended by month over three
499 COVID-19 phases in an OBGYN-Addiction clinic

500 Figure 2. Patient-level trends in treatment engagement outcomes by month across three COVID-
501 19 phases for study cohort receiving buprenorphine for opioid use disorder in the integrated
502 OBGYN-Addiction clinic

Table 1. Description of changes in clinical practice methods across three COVID-19 phases in an interdisciplinary OBGYN-addiction treatment clinic

Type of care	Service	PreCOVID-19 Phase	Early COVID-19 Phase	COVID-19-Vaccine Phase
Medical	Visit modality	In-person	Both in-person and virtual (via Doximity & phone)	Both in-person and virtual (via Doximity & phone)
	Buprenorphine initiation modality	In-person at clinic visit	In-person at clinic visit or home induction of buprenorphine option without an initial in-person visit per provider discretion Patient provided handout with instructions	In-person at clinic visit or home induction of buprenorphine option without an initial in-person visit per provider discretion Patient provided handout with instructions
	Frequency of toxicology testing requirement for 30-day MOUD or MAUD prescription	In-person visit with toxicology every 30 days	In-person visit with toxicology every 90 days with virtual visits every 30 days in between	In-person visit with toxicology every 90 days with virtual visits every 30 days in between
	Patient care expectations	Patients verbally advised by provider on how often and for what reasons they would need to have clinic visit with their addiction provider.	Clinic expectations were not standardized nor routinely reviewed with patients	Team members collaboratively developed a “Patient Care Agreement” and reviewed expectations with all new and current patients
Behavioral Health (BH)	Individual visit modality (trainee-led appointments)	In-person appointments	Primarily virtual (via Zoom & phone) appointments	Primarily virtual (via Zoom & phone) appointments
	Group visit modality (Mom’s Recovery Group: registration-free, financially free,	In-person offered weekly	Virtual (via Zoom) offered weekly	Both in-person (with reduced capacity) and virtual (via Zoom) offered weekly

	baby/toddler welcome)			
	Scheduling system	By nurse coordinator and BH trainees on paper schedule	By nurse coordinator and BH trainees by phone or text and added to schedule in HIPAA compliant shared OneDrive	By nurse coordinator, BH trainees, or Patient Access Representative by phone, text, or via patient portal into electronic medical record
Care Coordination	Appointments with clinical team members from different disciplines	Coordinated appointments. Interdisciplinary providers rotate through the same medical exam room for all contacts with one patient.	Separate appointments. Interdisciplinary providers required to schedule appointments for specific service.	Separate appointments. Interdisciplinary providers required to schedule appointments for specific service.
	Provider meeting modality	Weekly interdisciplinary plan of care meeting held in-person at hospital for OB/GYN, Nursing, Research, and BH	Weekly interdisciplinary plan of care meeting held virtually via Zoom and expanded to additional disciplines (OB/GYN, Nursing, Research, BH, social work, pediatrics, and interpersonal violence advocates)	Weekly interdisciplinary plan of care meeting held virtually via Zoom and expanded to additional disciplines (OB/GYN, Nursing, Research, BH, social work, pediatrics, and interpersonal violence advocates)
	Information sharing	Pertinent information shared in person between team members present in clinic	Pertinent information shared between disciplines via virtual interdisciplinary plan of care meetings and in real time on	Pertinent information shared between disciplines via virtual interdisciplinary plan of care meetings and in real time on HIPAA compliant

			HIPAA compliant shared OneDrive during clinic	shared OneDrive during clinic
	Information storage	No centralized location for resources, schedules, and patient tracking information.	HIPAA compliant shared OneDrive folder created to house resources for patients, providers, and schedulers and was updated regularly.	HIPAA compliant shared OneDrive folder housed resources for patients, providers, and schedulers, and was updated regularly.
	Patient resource modality	Interdisciplinary care coordination and referrals (pediatric, nutrition, interpersonal violence advocates) given in-person, via nurse phone triage, and during clinic day or at interdisciplinary plan of care meeting	Interdisciplinary care coordination and referrals provided via impromptu phone calls or messages in the electronic medical record	Interdisciplinary care coordination and referrals provided via impromptu phone calls or messages in the electronic medical record

Abbreviations: MOUD, medication for opioid use disorder; MAUD, medication for alcohol use disorder; BH, behavioral health

Table 2. Patient-level demographic and psychosocial characteristics of study cohort receiving buprenorphine for opioid use disorder in the integrated OBGYN-Addiction clinic

Demographic and psychosocial characteristics	% (n) n=27
Race	
Black	48.2 (13)
White	51.9 (14)
Age (mean years \pm SD)	31.0 \pm 4.0
Insurance	
Medicaid	81.5 (22)
Private	11.1 (3)
Uninsured	7.4 (2)
Employment	
Employed	29.6 (8)
Unemployed	66.7 (18)
Not reported	3.7 (1)
Living situation	
Home	81.5 (22)
Residential treatment	11.1 (3)
Jail	7.4 (2)
Number of children in the individual's custody [median (range)] ^a	1 (0-8)
Co-morbid substance use disorder	
Cannabis	7.4 (2)
Stimulant	18.5 (5)
Alcohol	7.4 (2)
Smoking tobacco	63.0 (17)
Receipt of any psychotropic medication	51.9 (13)
Any comorbid psychiatric diagnosis	92.6 (25)
Pregnant	
PreCOVID-19	59.3 (16)
Early COVID-19	37.0 (10)
COVID-19-Vaccine	22.0 (6)
Duration of treatment episode [months; median (range)]	0 (0-16)

Table 3. Regression for patient-level treatment engagement outcomes across three COVID-19 phases for study cohort receiving buprenorphine for opioid use disorder in the integrated OBGYN-Addiction clinic

Outcome	Variable	Unadjusted model Odds ratio (95% CI)	Adjusted model^a Odds ratio (95% CI)
Buprenorphine continuation	PreCOVID-19 phase	Ref	Ref
	Early COVID-19 phase	.26 (.03, 2.46)	.37 (.04, 3.59)
	COVID-19 vaccine phase	.03* (.00, .30)	.05* (.005, .48)
Any visits	PreCOVID-19 phase	Ref	Ref
	Early COVID-19 phase	.29* (.07,.99)	.33 (.10, 1.10)
	COVID-19 vaccine phase	.11* (.03, .37)	.12* (.04,.41)
Medical provider visits	PreCOVID-19 phase	Ref	Ref
	Early COVID-19 phase	.38 (.13, 1.14)	.44 (.15,1.29)
	COVID-19 vaccine phase	.16* (.05, .48)	.18* (.06, .56)
Behavioral health visits	PreCOVID-19 phase	Ref	Ref
	Early COVID-19 phase	.16* (.03, .78)	.19* (.05, .70)
	COVID-19 vaccine phase	.02* (.00, .14)	.03* (.01, .16)

*significant at the p-value<.05; ^aadjusted for pregnancy during the observation month and duration of treatment episode (months).

Table 1. Description of changes in clinical practice methods across three COVID-19 phases in an interdisciplinary OBGYN-addiction treatment clinic

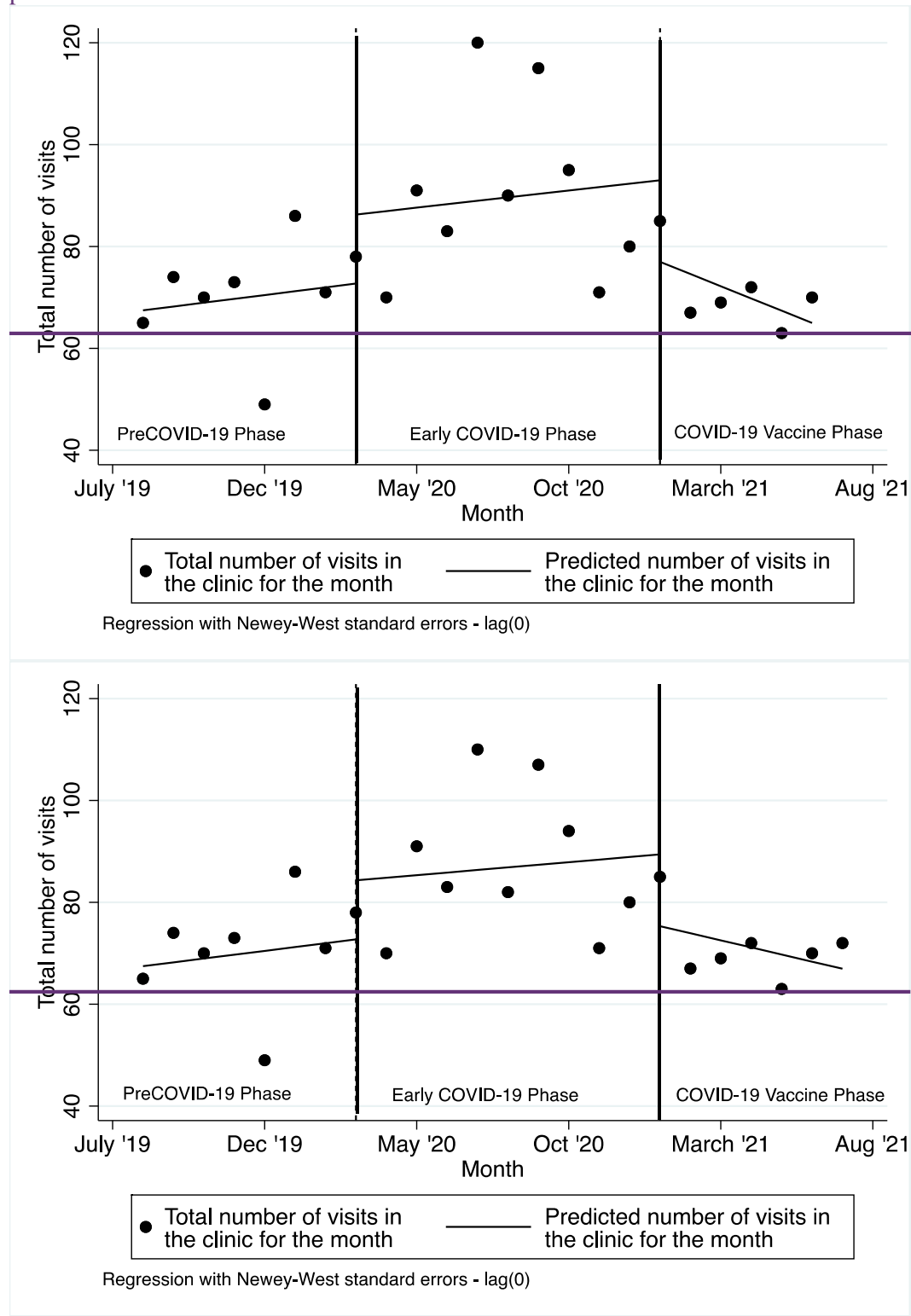
Type of care	Service	PreCOVID-19 Phase	Early COVID-19 Phase	COVID-19-Vaccine Phase
Medical	Visit modality	In-person	Both in-person and virtual (via Doximity & phone)	Both in-person and virtual (via Doximity & phone)
	Buprenorphine initiation modality	In-person at clinic visit	<u>In-person at clinic visit or hHome</u> induction of buprenorphine option without an initial in-person visit per provider discretion Patient provided handout with instructions	<u>In-person at clinic visit or hHome</u> induction of buprenorphine option without an initial in-person visit per provider discretion Patient provided handout with instructions
	Frequency of toxicology testing requirement (required for 30-day MOUD or MAUD prescription)	In-person <u>visit with toxicology</u> every 30 days	In-person <u>visit with toxicology</u> every 90 days with virtual visits every 30 days in between	In-person <u>visit with toxicology</u> every 90 days with <u>virtual visits every 30 days</u> in between
	Patient care expectations	Patients verbally advised by provider on how often and for what reasons they would need to have clinic visit with their addiction provider.	Clinic expectations were not standardized nor routinely reviewed with patients	Team members collaboratively developed a “Patient Care Agreement” and reviewed expectations with all new and current patients
	Behavioral Health (BH)	Individual visit modality (trainee-led appointments)	In-person appointments	<u>Primarily</u> virtual (via Zoom & phone) appointments
Group visit modality (Mom’s Recovery Group: registration-free, financially free, baby/toddler welcome)		In-person offered weekly	Virtual (via Zoom) offered weekly	Both in-person (with reduced capacity) and virtual (via Zoom) offered weekly
Scheduling system		By nurse coordinator and BH trainees on paper schedule	By nurse coordinator and BH trainees by phone or text and added to schedule in HIPAA compliant shared OneDrive	By nurse coordinator, BH trainees, or Patient Access Representative by phone, text, or via patient portal into

				electronic medical record
Care Coordination	Appointments with multidisciplinary clinical team members from different disciplines	Coordinated appointments. Multidisciplinary Interdisciplinary providers rotate through the same medical exam room for all contacts with one patient.	Separate appointments. Multidisciplinary Interdisciplinary providers required to schedule appointments for specific service.	Separate appointments. Multidisciplinary Interdisciplinary providers required to schedule appointments for specific service.
	Provider meeting modality	Weekly interdisciplinary plan of care meeting held in-person at hospital for OB/GYN, Nursing, Research, and BH	Weekly interdisciplinary plan of care meeting held virtually via Zoom and expanded to additional disciplines (OB/GYN, Nursing, Research, BH, social work, pediatrics, and interpersonal violence advocates)	Weekly interdisciplinary plan of care meeting held virtually via Zoom and expanded to additional disciplines (OB/GYN, Nursing, Research, BH, social work, pediatrics, and interpersonal violence advocates) Weekly interdisciplinary plan of care meeting held virtually via Zoom for all disciplines working with patients (OB/GYN, Nursing, Research, BH, social work, pediatrics and interpersonal violence advocates)
	Information sharing	Pertinent information shared in person between team members present in clinic	Pertinent information shared between disciplines via virtual interdisciplinary plan of care meetings and in real time on HIPAA compliant shared OneDrive during clinic	Pertinent information shared between disciplines via virtual interdisciplinary plan of care meetings and in real time on HIPAA compliant shared OneDrive during clinic
	Information storage	No centralized location for resources, schedules, and patient tracking information.	HIPAA compliant shared OneDrive folder created to house resources for patients, providers, and schedulers and	HIPAA compliant shared OneDrive folder housed resources for patients, providers, and schedulers, and

			was updated regularly.	was updated regularly.
	Patient resource modality	<u>Multidisciplinary</u> <u>Interdisciplinary</u> care coordination and referrals (pediatric, nutrition, interpersonal violence advocates) given in-person, via nurse phone triage, and during clinic day or at interdisciplinary plan of care meeting	<u>Inter</u> Multi disciplinary care coordination and referrals provided via impromptu phone calls or messages in the electronic medical record	Interdisciplinary care coordination and referrals provided via impromptu phone calls or messages in the electronic medical record

Abbreviations: MOUD, medication for opioid use disorder; MAUD, medication for alcohol use disorder; BH, behavioral health

Figure 1. Total number of clinic-wide medical provider visits attended by month over three COVID-19 phases in an OBGYN Addiction clinic^a

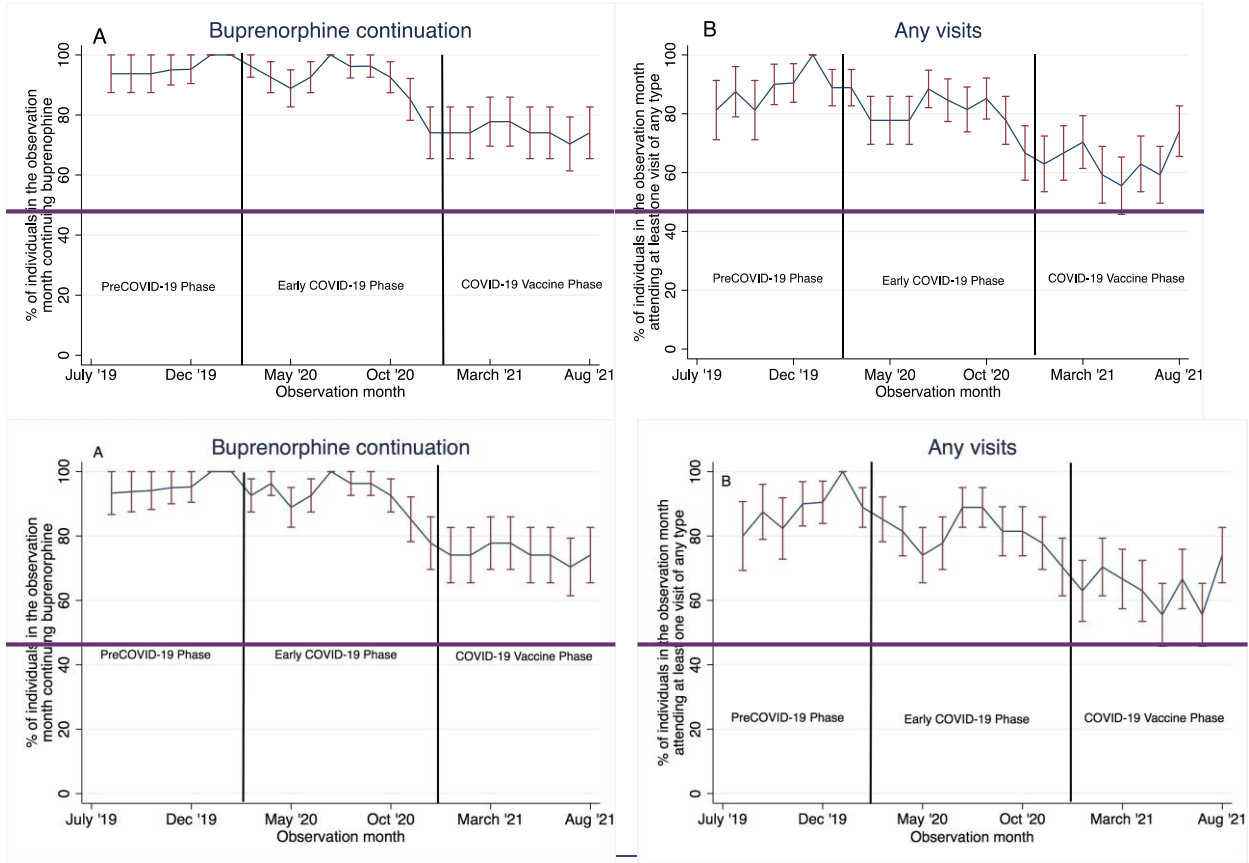


^aNo significant changes in the number of medical provider visits each month were identified in the interrupted time series analysis

Table 2. Patient-level demographic and psychosocial characteristics of study cohort receiving buprenorphine for opioid use disorder in the integrated OBGYN-Addiction clinic

Demographic and psychosocial characteristics	% (n) n=27
Race	
Black	48.2 (13)
White	51.9 (14)
Age (mean years \pm SD)	31.0 \pm 4.0
Insurance	
Medicaid	81.5 (22)
Private	11.1 (3)
Uninsured	7.4 (2)
Employment	
Employed	29.6 (8)
Unemployed	66.7 (18)
Not reported	3.7 (1)
Living situation	
Home	81.5 (22)
Residential treatment	11.1 (3)
Jail	7.4 (2)
Number of children in the individual's custody [median (range)] ^a	1 (0-8)
Co-morbid substance use disorder	
Cannabis	7.4 (2)
Stimulant	18.5 (5)
Alcohol	7.4 (2)
Smoking tobacco	63.0 (17)
Receipt of any psychotropic medication	51.9 (13)
Any comorbid psychiatric diagnosis	92.6 (25)
Pregnant	
PreCOVID-19	59.3 (16)
Early COVID-19	37.0 (10)
COVID-19-Vaccine	22.0 (6)
Duration of treatment episode [months; median (range)]	0 (0-16)

Figure 2. Patient level trends in treatment engagement outcomes by month across three COVID-19 phases for study cohort receiving buprenorphine for opioid use disorder in the integrated OBGYN Addiction clinic



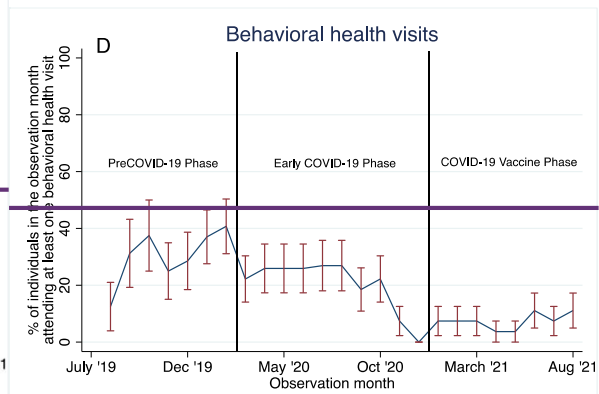
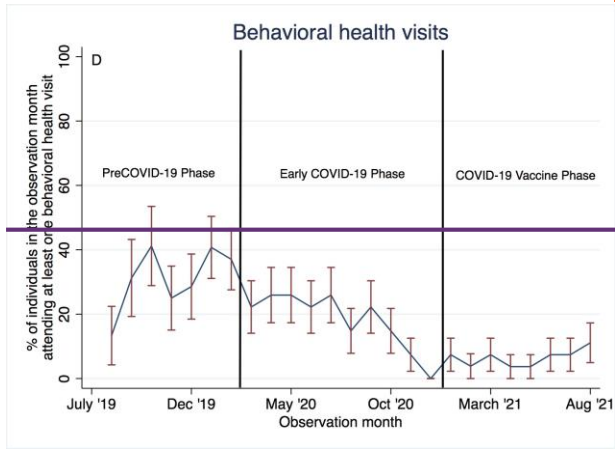
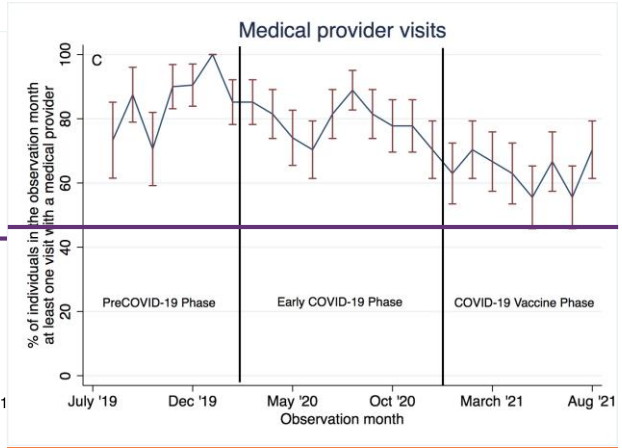
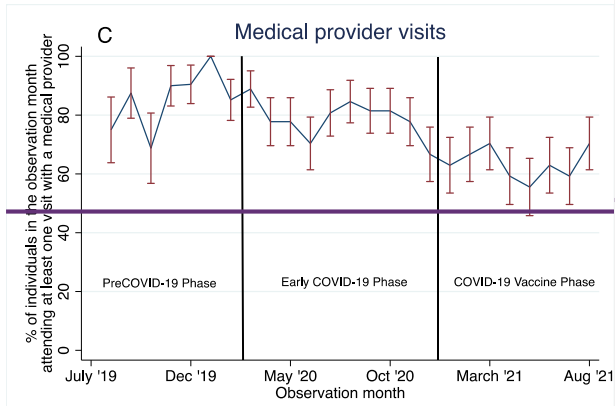
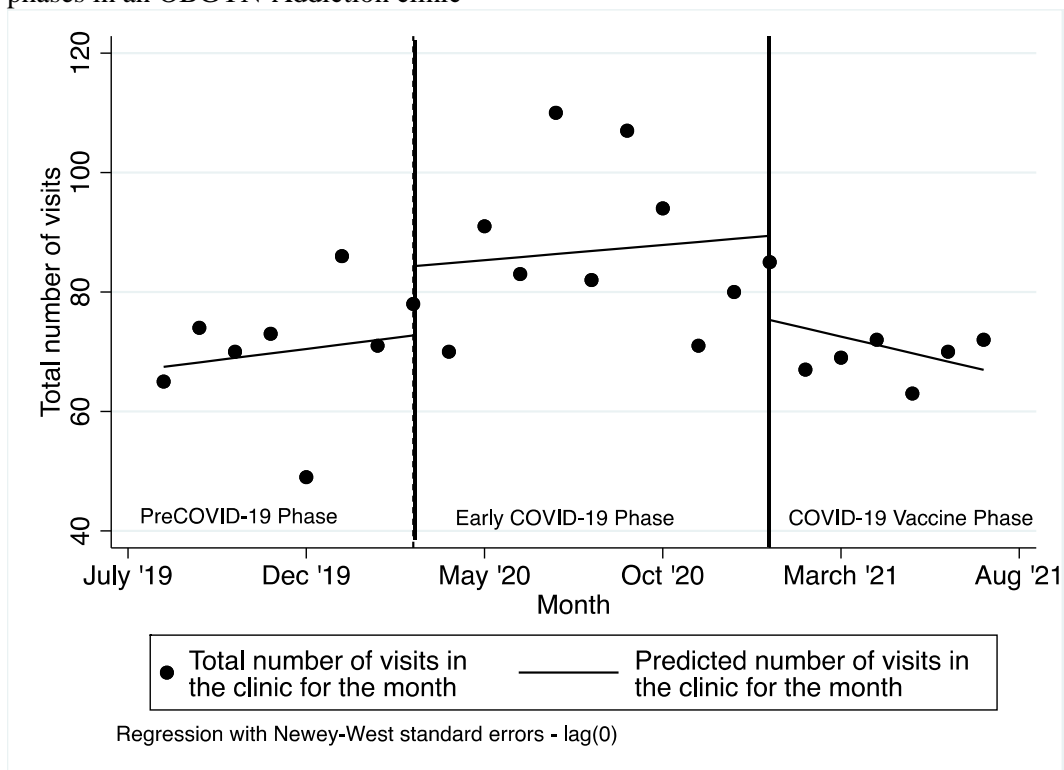


Table 3. Regression for patient-level regression-treatment engagement outcomes across three COVID-19 phases for study cohort receiving buprenorphine for opioid use disorder in the integrated OBGYN-Addiction clinic

Outcome	Variable	Unadjusted model Odds ratio (95% CI)	Adjusted model ^a Odds ratio (95% CI)
Buprenorphine continuation	PreCOVID-19 phase	Ref	Ref
	Early COVID-19 phase	.262 (.032, 2.461.89)	.3729 (.043, 3.592.80)
	COVID-19 vaccine phase	.033* (.00, .30)	.05* (.005, .4854)
Any visits	PreCOVID-19 phase	Ref	Ref
	Early COVID-19 phase	.298* (.078, .995)	.331 (.1009, 1.1002)
	COVID-19 vaccine phase	.110* (.03, .375)	.124* (.043, .4138)
Medical provider visits	PreCOVID-19 phase	Ref	Ref
	Early COVID-19 phase	.386 (.132, 1.1404)	.441 (.154, 1.249)
	COVID-19 vaccine phase	.165* (.05, .486)	.18* (.06, .563)
Behavioral health visits	PreCOVID-19 phase	Ref	Ref
	Early COVID-19 phase	.1620* (.035, .7887)	.1922* (.057, .705)
	COVID-19 vaccine phase	.023* (.004, .149)	.035* (.01, .169)
		Linear regression coefficients (95% CI)^a	
<u>% of medical provider and behavioral health visits that were conducted virtually</u>	<u>PreCOVID-19 phase</u>	<u>Ref</u>	<u>Ref</u>
	<u>Early COVID-19 phase</u>	<u>-.45* (-.33, .58)</u>	<u>-.44* (-.32, .57)</u>
	<u>COVID-19 vaccine phase</u>	<u>-.38* (-.26, .50)</u>	<u>-.38* (-.25, .50)</u>

*significant at the p-value<.05; ^aadjusted for pregnancy during the observation month and duration of treatment episode (months).

Figure 1. Total number of clinic-wide medical provider visits attended by month over three COVID-19 phases in an OBGYN-Addiction clinic^a



^aNo significant changes in the number of medical provider visits each month were identified in the interrupted time series analysis

Figure 2. Patient-level trends in treatment engagement outcomes by month across three COVID-19 phases for study cohort receiving buprenorphine for opioid use disorder in the integrated OBGYN-Addiction clinic

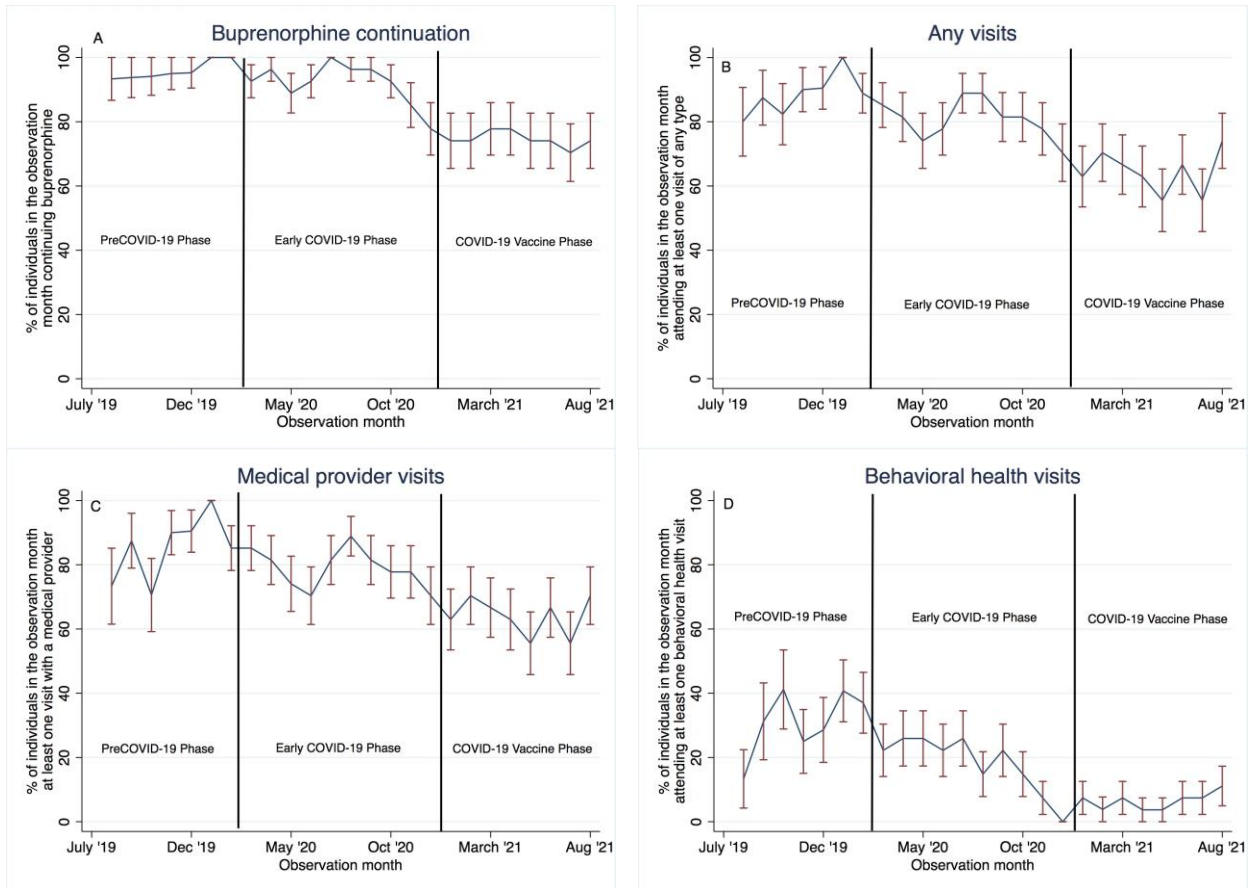
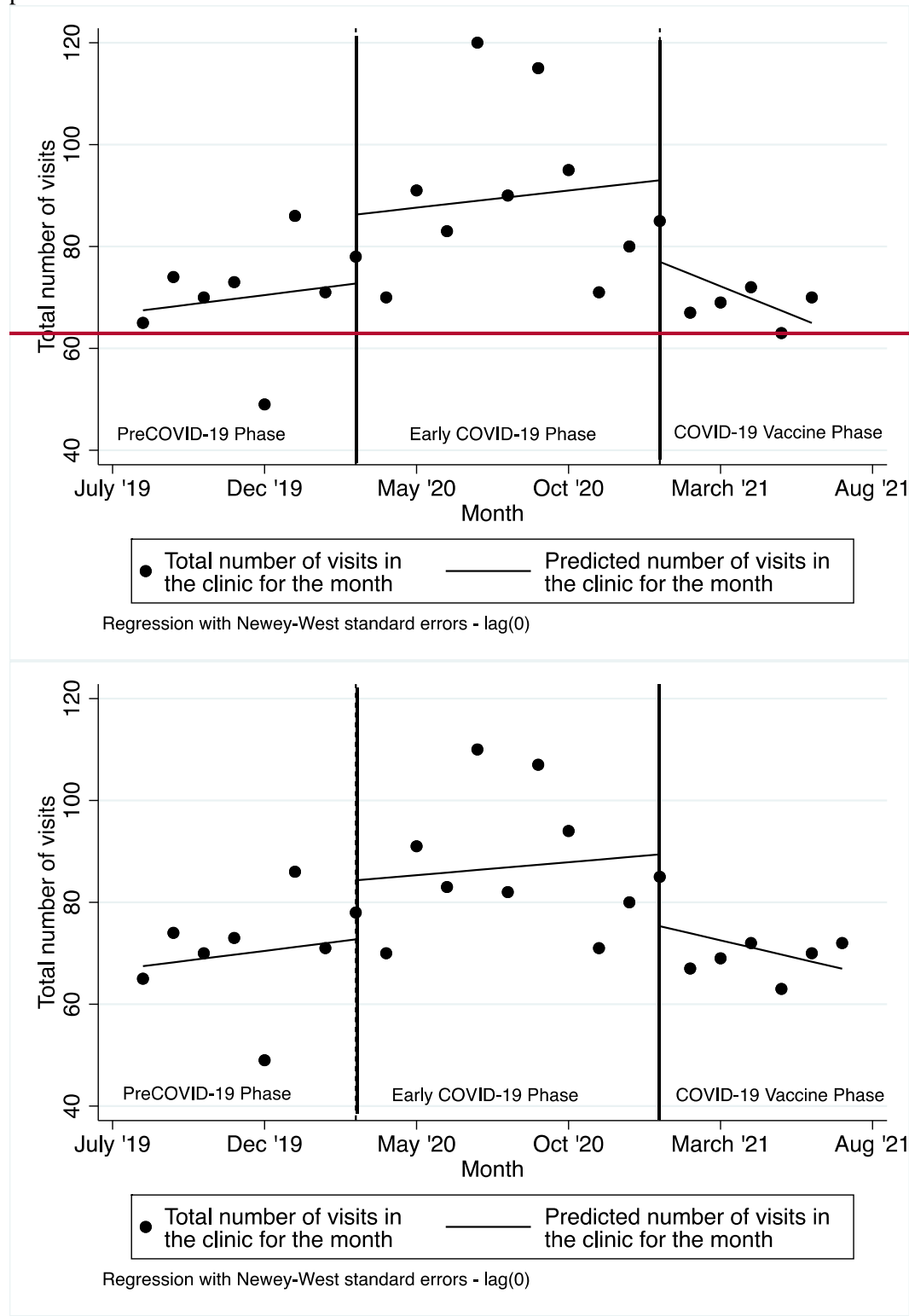
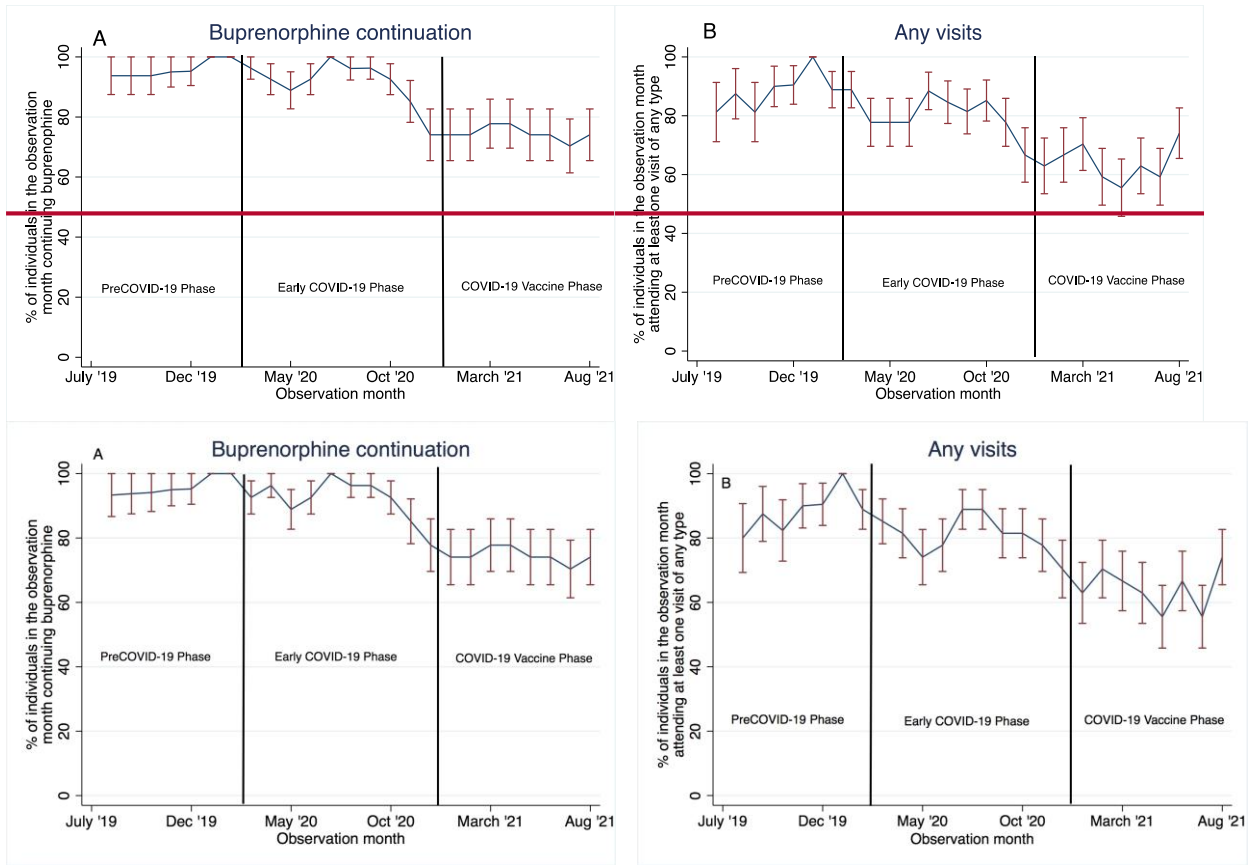


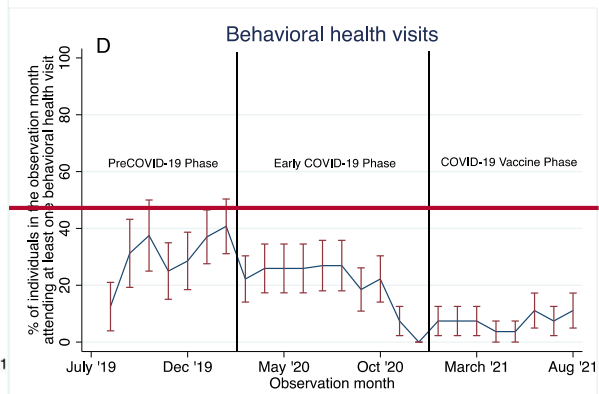
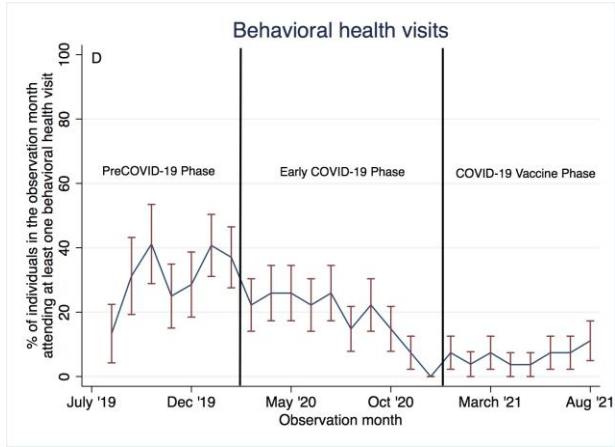
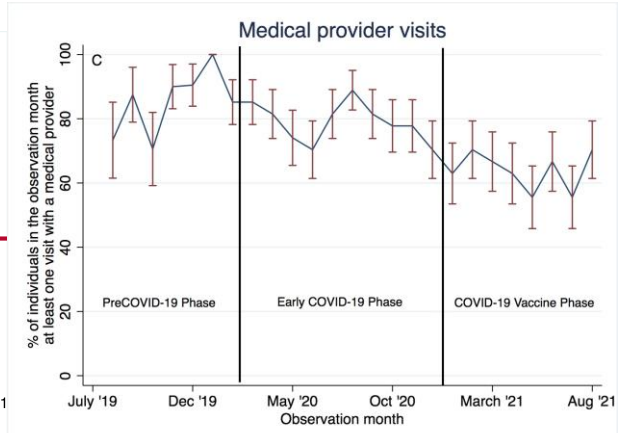
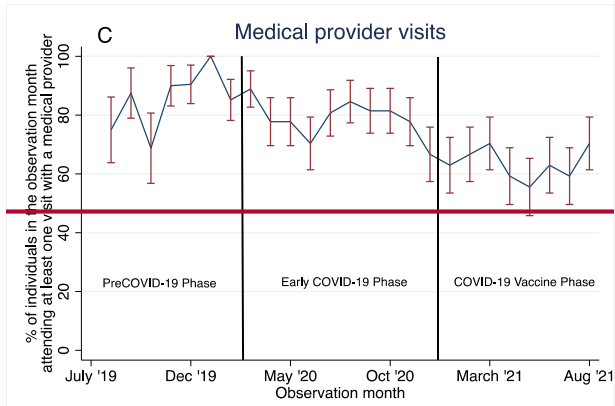
Figure 1. Total number of clinic-wide medical provider visits attended by month over three COVID-19 phases in an OBGYN-Addiction clinic^a

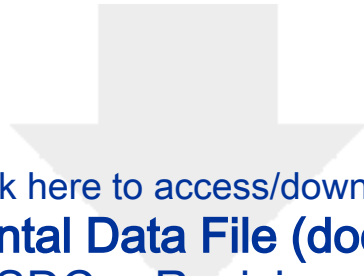


^aNo significant changes in the number of medical provider visits each month were identified in the interrupted time series analysis

Figure 2. Patient-level trends in **treatment engagement** outcomes by month across three COVID-19 phases for study cohort receiving buprenorphine for opioid use disorder in the integrated OBGYN-Addiction clinic







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