Supplementary Online Content

Solmeyer AR, Berger AT, Barton SL, et al. Association of Project ECHO training with buprenorphine prescribing by primary care clinicians in Minnesota for treating opioid use disorder. *JAMA Health Forum*. 2022;3(11):e224149. doi:10.1001/jamahealthforum.2022.4149

eAppendix. Supplemental Methods

eReference

eTable 1. National Drug Codes for Buprenorphine

eTable 2. Diagnosis Codes Used to Identify Opioid Use Disorder

eTable 3. Original and Alternative Specification for DATA-Waiver Attainment Among ECHO-Trained and Comparison Clinicians in a Propensity Score–Matched Cohort

eTable 4. Intracluster Correlation Coefficients for Primary Mixed-Effects Models

eFigure. Clinician Selection Flow Diagram

This supplementary material has been provided by the authors to give readers additional information about their work.
eAppendix. Supplemental Methods

Clinician types and taxonomy codes
Clinicians were included if their NPI number was associated with clinician types 20 (physician), 65 (nurse practitioner), 68 (clinical nurse specialist), or 69 (physician assistant), and the first four characters of their primary clinician taxonomy codes included 207Q (family medicine), 207R (internal medicine), 207V (obstetrics and gynecology), 2080 (pediatrics), 2083 (preventive medicine), 2084 (psychology and neurology), 208D (general practice), 383A (physician assistant), 363L (nurse practitioner), or 364S (clinical nurse specialist).

Matching procedure

Initial screen
After collecting baseline characteristics of ECHO-trained clinicians and potential comparison clinicians, we screened out comparison clinicians whose baseline age or practice characteristics fell well outside the range observed for ECHO clinicians of the same clinician type. The screen was applied to ensure no comparison clinicians who were completely outside the values of the ECHO-trained clinicians. Age was bounded exactly (e.g., comparison physicians aged less than 29 or greater than 79 were excluded). Comparison clinicians were also excluded if their maximum or minimum value in any quarter of certain characteristics was outside of a buffered range of corresponding values among ECHO-trained clinicians of the same clinician type. The characteristics were: the count of unique patients per month, unique patients with prior substance use disorder diagnosis per month, unique patients with opioid use disorder (OUD) diagnosis per month, buprenorphine prescriptions per OUD patient per month, and opioid analgesic prescribing as morphine milligram equivalent (MME) per month per unique patient. The buffer was set as the floor or ceiling of the second significant digit of the minimum or maximum value for ECHO-trained clinicians. As an example, the maximum value of unique MHCP patients per month among ECHO-trained nurse practitioners (NPs) was 252; we screened out comparison NPs who treated more than 260 unique patients per month in any one quarter.

Propensity score matching
We fitted a propensity score model as a logistic regression including both time invariant covariates and time-varying patient panel and clinical practice variables. The time-varying covariates included measures of the outcomes of interest, included to reduce bias from pre-exposure deviations from parallel trends.1

Time invariant covariates included:
- Clinician type (physician, NP, PA, CNS)
- Index date (continuous)
- Age at index date (quintile)
- Geographic region (seven Minnesota regions, Wisconsin, North Dakota, South Dakota)
- Prior enrollment in a complementary training (“Buprenorphine Boot Camp,” binary)
- Prior attainment of DATA-waiver (binary)

Time-varying covariates were measured in each of the four quarters preceding the index date. They included:
- Unique MHCP patients per month (none, up to 50th percentile, up to 75th percentile, > 75th percentile)
- Unique patients with OUD per month (none, up to 50th percentile, up to 75th percentile, > 75th percentile)
- Buprenorphine prescribing per OUD-diagnosed patient per month (none, up to 50th percentile of those who prescribed, > 50th percentile of those who prescribed)
- Opioid analgesic prescribing per MHCP patient per month (none, up to 50th percentile, up to 75th percentile, up to 90th percentile, up to 99th percentile, > 99th percentile)
- Any high-dose opioid analgesic prescribing >= 90 MME per day (binary)
Sensitivity analyses

COVID-19 time period

The COVID-19 pandemic spanned the final quarter of our follow-up period (March –June 2020), which represented 10 percent of the full study period. During this time, there were substantial shifts in health care, such as most appointments moving from in-person to virtual, that could potentially change the patterns of ECHO attendance and the outcomes. To examine this possibility, we conducted a set of sensitivity checks.

ECHO sessions were offered with the usual frequency in March – June 2020. We examined the index dates for ECHO clinicians across quarters and found no difference between the number of clinicians whose first ECHO session date was between March and June 2020 and the number of clinicians whose first ECHO session date was during earlier quarters. This suggests that clinicians were starting ECHO at a similar rate before and during COVID.

We conducted a sensitivity analysis, presented in the legislative report (Appendix F), in which we removed data that was collected after March 1, 2020, and re-estimated the primary outcome models. Essentially, this tested what would have happened if the study period had ended on March 1, 2020 (before COVID-19) instead of June 11, 2020. Then, we visually compared plots of the estimated means over time and their 95% confidence intervals, for models with and without the COVID time period. None of the outcomes showed different patterns depending on whether the COVID time period was included or excluded.

Based on these results, we concluded that it was unlikely that including the one quarter of data during the beginning of the COVID-19 pandemic unduly influenced our findings.

Alternative specification of DATA-waiver status

Due to gaps in the availability of Controlled Substances Act Registry data, we tested an alternative specification for DATA-waiver. In this sensitivity analysis we defined DATA-waiver as either (1) confirmation in the Controlled Substances Act Registry or (2) having prescribed buprenorphine to any patient with OUD up to and including the quarter in question. The main analysis, which likely under-counts DATA-waivers, and the sensitivity analysis, which likely over-counts DATA-waivers, can be seen as bounding the true association between ECHO training and DATA-waiver attainment.

The association between ECHO training and change in DATA-waiver attainment in the alternate specification was consistent with the observed association in the original analysis (eTable 4). All difference-in-differences estimates in the sensitivity analysis fell within the 95% CI of the original analysis and vice versa.

eReference

1. Ryan AM. Well-Balanced or too Matchy–Matchy? The Controversy over Matching in Difference-in-Differences. Health Services Research. 2018;53(6):4106-4110. doi:10.1111/1475-6773.13015
### eTable 1. National Drug Codes for Buprenorphine

| National Drug Code | Generic Product Name                                      |
|--------------------|----------------------------------------------------------|
| 00054017613        | buprenorphine 2 mg sublingual tablet                     |
| 00054017713        | buprenorphine 8 mg sublingual tablet                     |
| 00054018813        | buprenorphine-naloxone 2 mg-0.5 mg sublingual tablet     |
| 00054018913        | buprenorphine-naloxone 8 mg-2 mg sublingual tablet       |
| 00093215533        | Buprenorphine 16 MG / Naloxone 4 MG Oral Strip           |
| 00093537856        | buprenorphine 2 mg sublingual tablet                     |
| 00093537956        | buprenorphine 8 mg sublingual tablet                     |
| 00093572156        | buprenorphine-naloxone 8 mg-2 mg sublingual tablet       |
| 00228315303        | buprenorphine 8 mg sublingual tablet                     |
| 00228315309        | Buprenorphine 8 MG Sublingual Tablet                     |
| 00228315373        | Buprenorphine 8 MG Sublingual Tablet                     |
| 00228315403        | buprenorphine-naloxone 2 mg-0.5 mg sublingual tablet     |
| 00228315409        | buprenorphine-naloxone 2 mg-0.5 mg sublingual tablet     |
| 00228315473        | buprenorphine-naloxone 2 mg-0.5 mg sublingual tablet     |
| 00228315503        | buprenorphine-naloxone 8 mg-2 mg sublingual tablet       |
| 00228315509        | buprenorphine-naloxone 8 mg-2 mg sublingual tablet       |
| 00228315567        | Buprenorphine 8 MG / Naloxone 2 MG Sublingual Tablet     |
| 00228315573        | buprenorphine-naloxone 8 mg-2 mg sublingual tablet       |
| 00228315603        | buprenorphine 2 mg sublingual tablet                     |
| 00228315609        | Buprenorphine 2 MG Sublingual Tablet                     |
| 00228315673        | Buprenorphine 2 MG Sublingual Tablet                     |
| 00247148701        | 1 ML Buprenorphine 0.3 MG/ML Injection                   |
| 00378092393        | buprenorphine 2 mg sublingual tablet                     |
| 00378092493        | buprenorphine 8 mg sublingual tablet                     |
| 00378876716        | Buprenorphine 8 MG / Naloxone 2 MG Oral Strip            |
| 00378876793        | Buprenorphine 8 MG / Naloxone 2 MG Oral Strip            |
| 00378876816        | Buprenorphine 12 MG / Naloxone 3 MG Oral Strip           |
| 00378876893        | Buprenorphine 12 MG / Naloxone 3 MG Oral Strip           |
| 00406192303        | Buprenorphine 2 MG / Naloxone 0.5 MG Sublingual Tabl     |
| 00406192309        | Buprenorphine 2 MG / Naloxone 0.5 MG Sublingual Tabl     |
| 00406192403        | Buprenorphine 8 MG / Naloxone 2 MG Sublingual Tablet     |
| 00406192409        | Buprenorphine 8 MG / Naloxone 2 MG Sublingual Tablet     |
| 00406800503        | Buprenorphine 2 MG / Naloxone 0.5 MG Sublingual Tabl     |
| 00406802003        | buprenorphine-naloxone 8 mg-2 mg sublingual tablet       |
| 00409201203        | 1 ML Buprenorphine 0.3 MG/ML Cartridge                  |
| 00409201232        | 1 ML Buprenorphine 0.3 MG/ML Cartridge                  |
| 00517072501        | 1 ML Buprenorphine 0.3 MG/ML Injection                   |
| 00517072505        | 1 ML Buprenorphine 0.3 MG/ML Injection                   |
| 00781721606        | Buprenorphine 2 MG / Naloxone 0.5 MG Oral Strip          |
| National Drug Code | Generic Product Name |
|--------------------|---------------------|
| 00781721664        | Buprenorphine 2 MG / Naloxone 0.5 MG Oral Strip |
| 00781722706        | Buprenorphine 4 MG / Naloxone 1 MG Oral Strip |
| 00781722764        | Buprenorphine 4 MG / Naloxone 1 MG Oral Strip |
| 00781723806        | Buprenorphine 8 MG / Naloxone 2 MG Oral Strip |
| 00781723864        | Buprenorphine 8 MG / Naloxone 2 MG Oral Strip |
| 00781724906        | Buprenorphine 12 MG / Naloxone 3 MG Oral Strip |
| 00781724964        | Buprenorphine 12 MG / Naloxone 3 MG Oral Strip |
| 12496010001        | buprenorphine 100 mg/0.5 mL subcutaneous solution, e |
| 12496010002        | 0.5 ML Buprenorphine 200 MG/ML Prefilled Syringe |
| 12496010005        | 0.5 ML Buprenorphine 200 MG/ML Prefilled Syringe |
| 12496030001        | buprenorphine 300 mg/1.5 mL subcutaneous solution, e |
| 12496030002        | 1.5 ML Buprenorphine 200 MG/ML Prefilled Syringe |
| 12496030005        | 1.5 ML Buprenorphine 200 MG/ML Prefilled Syringe |
| 12496075701        | 1 ML Buprenorphine 0.3 MG/ML Injection |
| 12496075705        | 1 ML Buprenorphine 0.3 MG/ML Injection |
| 12496120201        | buprenorphine-naloxone 2 mg-0.5 mg sublingual film |
| 12496120203        | buprenorphine-naloxone 2 mg-0.5 mg sublingual film |
| 12496120401        | buprenorphine-naloxone 4 mg-1 mg sublingual film |
| 12496120403        | buprenorphine-naloxone 4 mg-1 mg sublingual film |
| 12496120801        | buprenorphine-naloxone 8 mg-2 mg sublingual film |
| 12496120803        | buprenorphine-naloxone 8 mg-2 mg sublingual film |
| 12496121201        | buprenorphine-naloxone 12 mg-3 mg sublingual film |
| 12496121203        | buprenorphine-naloxone 12 mg-3 mg sublingual film |
| 21695051510        | 1 ML Buprenorphine 0.3 MG/ML Cartridge |
| 35356000407        | Buprenorphine 8 MG / Naloxone 2 MG Sublingual Tablet |
| 35356000430        | Buprenorphine 8 MG / Naloxone 2 MG Sublingual Tablet |
| 35356055530        | Buprenorphine 2 MG Sublingual Tablet |
| 35356055630        | Buprenorphine 8 MG Sublingual Tablet |
| 40042001001        | 1 ML Buprenorphine 0.3 MG/ML Injection |
| 42023017901        | 1 ML Buprenorphine 0.3 MG/ML Injection |
| 42023017905        | 1 ML Buprenorphine 0.3 MG/ML Injection |
| 42023017910        | 1 ML Buprenorphine 0.3 MG/ML Injection |
| 42291017430        | buprenorphine-naloxone 2 mg-0.5 mg sublingual tablet |
| 42291017530        | buprenorphine-naloxone 8 mg-2 mg sublingual tablet |
| 42858050103        | buprenorphine 2 mg sublingual tablet |
| 42858050203        | buprenorphine 8 mg sublingual tablet |
| 43063018407        | Buprenorphine 8 MG / Naloxone 2 MG Sublingual Tablet |
| 43063018430        | Buprenorphine 8 MG / Naloxone 2 MG Sublingual Tablet |
| 43063066706        | buprenorphine 8 mg sublingual tablet |
| 43063075306        | buprenorphine 8 mg sublingual tablet |
| 43598057901        | Buprenorphine 2 MG / Naloxone 0.5 MG Oral Strip |
| 43598057930        | Buprenorphine 2 MG / Naloxone 0.5 MG Oral Strip |
| National Drug Code | Generic Product Name |
|--------------------|----------------------|
| 43598058001        | Buprenorphine 4 MG / Naloxone 1 MG Oral Strip |
| 43598058030        | Buprenorphine 4 MG / Naloxone 1 MG Oral Strip |
| 43598058101        | Buprenorphine 12 MG / Naloxone 3 MG Oral Strip |
| 43598058130        | Buprenorphine 12 MG / Naloxone 3 MG Oral Strip |
| 43598058201        | Buprenorphine 8 MG / Naloxone 2 MG Oral Strip |
| 43598058230        | buprenorphine-naloxone 8 mg-2 mg sublingual film |
| 47781035503        | Buprenorphine 2 MG / Naloxone 0.5 MG Oral Strip |
| 47781035511        | Buprenorphine 2 MG / Naloxone 0.5 MG Oral Strip |
| 47781035603        | Buprenorphine 4 MG / Naloxone 1 MG Oral Strip |
| 47781035611        | Buprenorphine 4 MG / Naloxone 1 MG Oral Strip |
| 47781035703        | Buprenorphine 8 MG / Naloxone 2 MG Oral Strip |
| 47781035711        | Buprenorphine 8 MG / Naloxone 2 MG Oral Strip |
| 47781035803        | Buprenorphine 12 MG / Naloxone 3 MG Oral Strip |
| 47781035811        | Buprenorphine 12 MG / Naloxone 3 MG Oral Strip |
| 47781071203        | Buprenorphine 12 MG / Naloxone 3 MG Oral Strip |
| 47781071211        | Buprenorphine 12 MG / Naloxone 3 MG Oral Strip |
| 49349055402        | Buprenorphine 2 MG Sublingual Tablet |
| 50090157100        | Buprenorphine 8 MG Sublingual Tablet |
| 50090292400        | Buprenorphine 8 MG Sublingual Tablet |
| 50268014411        | Buprenorphine 2 MG / Naloxone 0.5 MG Sublingual Tabl |
| 50268014415        | buprenorphine-naloxone 2 mg-0.5 mg sublingual tablet |
| 50268014511        | Buprenorphine 8 MG / Naloxone 2 MG Sublingual Tablet |
| 50268014515        | buprenorphine-naloxone 8 mg-2 mg sublingual tablet |
| 50268014550        | Buprenorphine 8 MG / Naloxone 2 MG Sublingual Tablet |
| 50383028733        | Buprenorphine 8 MG / Naloxone 2 MG Sublingual Tablet |
| 50383028793        | buprenorphine-naloxone 8 mg-2 mg sublingual tablet |
| 50383029433        | Buprenorphine 2 MG / Naloxone 0.5 MG Sublingual Tabl |
| 50383029493        | buprenorphine-naloxone 2 mg-0.5 mg sublingual tablet |
| 50383092493        | buprenorphine 2 mg sublingual tablet |
| 50383093093        | buprenorphine 8 mg sublingual tablet |
| 52125067802        | Buprenorphine 2 MG Sublingual Tablet |
| 52427069203        | Buprenorphine 2 MG / Naloxone 0.5 MG Oral Strip |
| 52427069211        | Buprenorphine 2 MG / Naloxone 0.5 MG Oral Strip |
| 52427069403        | Buprenorphine 4 MG / Naloxone 1 MG Oral Strip |
| 52427069411        | Buprenorphine 4 MG / Naloxone 1 MG Oral Strip |
| 52427069803        | Buprenorphine 8 MG / Naloxone 2 MG Oral Strip |
| 52427069811        | Buprenorphine 8 MG / Naloxone 2 MG Oral Strip |
| 52427071203        | Buprenorphine 12 MG / Naloxone 3 MG Oral Strip |
| 52427071211        | Buprenorphine 12 MG / Naloxone 3 MG Oral Strip |
| 52440010014        | Buprenorphine 74.2 MG Drug Implant |
| 53217013830        | Buprenorphine 8 MG / Naloxone 2 MG Sublingual Tablet |
| 53217024630        | Buprenorphine 8 MG Sublingual Tablet |
| National Drug Code | Generic Product Name |
|--------------------|----------------------|
| 53217032801        | Buprenorphine 8 MG / Naloxone 2 MG Oral Strip |
| 54123011430        | buprenorphine-naloxone 11.4 mg-2.9 mg sublingual tab |
| 54123090730        | buprenorphine-naloxone 0.7 mg-0.18 mg sublingual tab |
| 54123091430        | buprenorphine-naloxone 1.4 mg-0.36 mg sublingual tab |
| 54123092930        | buprenorphine-naloxone 2.9 mg-0.71 mg sublingual tab |
| 54123095730        | buprenorphine-naloxone 5.7 mg-1.4 mg sublingual tab |
| 54123098630        | buprenorphine-naloxone 8.6 mg-2.1 mg sublingual tab |
| 54569639900        | Buprenorphine 8 MG / Naloxone 2 MG Oral Strip |
| 54569640800        | Buprenorphine 8 MG / Naloxone 2 MG Sublingual Tablet |
| 54569657800        | Buprenorphine 8 MG Sublingual Tablet |
| 54868570700        | Buprenorphine 8 MG / Naloxone 2 MG Sublingual Tablet |
| 54868570701        | Buprenorphine 8 MG / Naloxone 2 MG Sublingual Tablet |
| 54868570702        | Buprenorphine 8 MG / Naloxone 2 MG Sublingual Tablet |
| 54868570703        | Buprenorphine 8 MG / Naloxone 2 MG Sublingual Tablet |
| 54868570704        | Buprenorphine 8 MG / Naloxone 2 MG Sublingual Tablet |
| 54868575000        | Buprenorphine 2 MG / Naloxone 0.5 MG Sublingual Tabl |
| 55154496200        | Buprenorphine 2 MG Sublingual Tablet |
| 55154496204        | Buprenorphine 2 MG Sublingual Tablet |
| 55154496206        | Buprenorphine 2 MG Sublingual Tablet |
| 55390010010        | 1 ML Buprenorphine 0.3 MG/ML Injection |
| 55700014730        | Buprenorphine 8 MG / Naloxone 2 MG Oral Strip |
| 55700018430        | Buprenorphine 2 MG / Naloxone 0.5 MG Sublingual Tabl |
| 55700030230        | Buprenorphine 8 MG Sublingual Tablet |
| 55700030330        | Buprenorphine 8 MG Sublingual Tablet |
| 58118017608        | Buprenorphine 2 MG Sublingual Tablet |
| 58118017708        | Buprenorphine 8 MG Sublingual Tablet |
| 58118315608        | Buprenorphine 2 MG Sublingual Tablet |
| 58284010014        | buprenorphine 74.2 mg subcutaneous implant |
| 59385001201        | buprenorphine-naloxone 2.1 mg-0.3 mg buccal film |
| 59385001230        | buprenorphine-naloxone 2.1 mg-0.3 mg buccal film |
| 59385001401        | buprenorphine-naloxone 4.2 mg-0.7 mg buccal film |
| 59385001430        | buprenorphine-naloxone 4.2 mg-0.7 mg buccal film |
| 59385001601        | buprenorphine-naloxone 6.3 mg-1 mg buccal film |
| 59385001630        | buprenorphine-naloxone 6.3 mg-1 mg buccal film |
| 60429058611        | Buprenorphine 2 MG / Naloxone 0.5 MG Sublingual Tabl |
| 60429058630        | buprenorphine-naloxone 2 mg-0.5 mg sublingual tablet |
| 60429058633        | Buprenorphine 2 MG / Naloxone 0.5 MG Sublingual Tabl |
| 60429058711        | Buprenorphine 8 MG / Naloxone 2 MG Sublingual Tablet |
| 60429058730        | buprenorphine-naloxone 8 mg-2 mg sublingual tablet |
| 60429058733        | Buprenorphine 8 MG / Naloxone 2 MG Sublingual Tablet |
| 60846097003        | Buprenorphine 2 MG / Naloxone 0.5 MG Sublingual Tabl |
| 60846097103        | Buprenorphine 8 MG / Naloxone 2 MG Sublingual Tablet |
| National Drug Code | Generic Product Name                                      |
|-------------------|----------------------------------------------------------|
| 61786067802       | Buprenorphine 2 MG Sublingual Tablet                     |
| 61786091102       | Buprenorphine 2 MG Sublingual Tablet                     |
| 61786091202       | Buprenorphine 8 MG Sublingual Tablet                     |
| 62175045232       | Buprenorphine 2 MG / Naloxone 0.5 MG Sublingual Tablet  |
| 62175045832       | Buprenorphine 8 MG / Naloxone 2 MG Sublingual Tablet    |
| 62756045964       | Buprenorphine 2 MG Sublingual Tablet                     |
| 62756045983       | buprenorphine 2 mg sublingual tablet                     |
| 62756046064       | Buprenorphine 8 MG Sublingual Tablet                     |
| 62756046083       | buprenorphine 8 mg sublingual tablet                     |
| 62756096964       | Buprenorphine 2 MG / Naloxone 0.5 MG Sublingual Tablet  |
| 62756096983       | buprenorphine-naloxone 2 mg-0.5 mg sublingual tablet    |
| 62756097064       | Buprenorphine 8 MG / Naloxone 2 MG Sublingual Tablet    |
| 62756097083       | buprenorphine-naloxone 8 mg-2 mg sublingual tablet      |
| 63629402801       | Buprenorphine 2 MG / Naloxone 0.5 MG Sublingual Tablet  |
| 63629402802       | Buprenorphine 2 MG / Naloxone 0.5 MG Sublingual Tablet  |
| 63629403401       | Buprenorphine 8 MG / Naloxone 2 MG Sublingual Tablet    |
| 63629403402       | Buprenorphine 8 MG / Naloxone 2 MG Sublingual Tablet    |
| 63629403403       | Buprenorphine 8 MG / Naloxone 2 MG Sublingual Tablet    |
| 63629403404       | Buprenorphine 8 MG / Naloxone 2 MG Sublingual Tablet    |
| 63629409202       | Buprenorphine 8 MG Sublingual Tablet                     |
| 63629507401       | Buprenorphine 8 MG / Naloxone 2 MG Sublingual Tablet    |
| 63629712501       | Buprenorphine 2 MG Sublingual Tablet                     |
| 63629712502       | Buprenorphine 2 MG Sublingual Tablet                     |
| 63629712503       | Buprenorphine 2 MG Sublingual Tablet                     |
| 63629712504       | Buprenorphine 2 MG Sublingual Tablet                     |
| 63629712505       | Buprenorphine 2 MG Sublingual Tablet                     |
| 63629712506       | Buprenorphine 2 MG Sublingual Tablet                     |
| 63629712507       | Buprenorphine 2 MG Sublingual Tablet                     |
| 63629712601       | Buprenorphine 8 MG Sublingual Tablet                     |
| 63629712602       | Buprenorphine 8 MG Sublingual Tablet                     |
| 63629712603       | Buprenorphine 8 MG Sublingual Tablet                     |
| 63629712604       | Buprenorphine 8 MG Sublingual Tablet                     |
| 63629712605       | Buprenorphine 8 MG Sublingual Tablet                     |
| 63629712606       | Buprenorphine 8 MG Sublingual Tablet                     |
| 63629712607       | Buprenorphine 8 MG Sublingual Tablet                     |
| 63629712608       | Buprenorphine 8 MG Sublingual Tablet                     |
| 63629712609       | Buprenorphine 8 MG Sublingual Tablet                     |
| 63629727001       | Buprenorphine 2 MG / Naloxone 0.5 MG Sublingual Tablet  |
| 63629727002       | Buprenorphine 2 MG / Naloxone 0.5 MG Sublingual Tablet  |
| 64725093003       | Buprenorphine 8 MG Sublingual Tablet                     |
| 64725093004       | Buprenorphine 8 MG Sublingual Tablet                     |
| 64725192403       | Buprenorphine 2 MG Sublingual Tablet                     |

© Solmeyer AR et al. JAMA Health Forum.
| National Drug Code | Generic Product Name                                      |
|-------------------|----------------------------------------------------------|
| 64725192404       | Buprenorphine 2 MG Sublingual Tablet                     |
| 65162041503       | buprenorphine-naloxone 8 mg-2 mg sublingual tablet       |
| 65162041509       | Buprenorphine 8 MG / Naloxone 2 MG Sublingual Tablet     |
| 65162041603       | buprenorphine-naloxone 2 mg-0.5 mg sublingual tablet     |
| 65162041609       | Buprenorphine 2 MG / Naloxone 0.5 MG Sublingual Tablet   |
| 67046099030       | Buprenorphine 2 MG Sublingual Tablet                     |
| 67046099130       | Buprenorphine 8 MG Sublingual Tablet                     |
| 67046099230       | Buprenorphine 2 MG Sublingual Tablet                     |
| 67046099330       | Buprenorphine 8 MG Sublingual Tablet                     |
| 67046099430       | Buprenorphine 2 MG Sublingual Tablet                     |
| 67046099530       | Buprenorphine 8 MG Sublingual Tablet                     |
| 67046099630       | Buprenorphine 2 MG Sublingual Tablet                     |
| 67046099730       | Buprenorphine 8 MG Sublingual Tablet                     |
| 67046099830       | Buprenorphine 2 MG Sublingual Tablet                     |
| 67046099930       | Buprenorphine 8 MG Sublingual Tablet                     |
| 69189059101       | Buprenorphine 2 MG / Naloxone 0.5 MG Sublingual Tablet   |
| 70022000110       | 1 ML Buprenorphine 0.3 MG/ML Injection                   |
| 70518044200       | Buprenorphine 8 MG Sublingual Tablet                     |
| 70518065200       | Buprenorphine 2 MG Sublingual Tablet                     |
| 70518065201       | Buprenorphine 2 MG Sublingual Tablet                     |
| 70518065202       | Buprenorphine 2 MG Sublingual Tablet                     |
| 70518071100       | Buprenorphine 2 MG Sublingual Tablet                     |
| 70518071101       | Buprenorphine 2 MG Sublingual Tablet                     |
| 70518041000       | Buprenorphine 2 MG / Naloxone 0.5 MG Sublingual Tablet   |
| 705180515700      | Buprenorphine 2 MG Sublingual Tablet                     |
| 7051812500        | Buprenorphine 8 MG Sublingual Tablet                     |
| 705181684400      | Buprenorphine 8 MG / Naloxone 2 MG Sublingual Tablet     |
| 70518201400       | Buprenorphine 8 MG Sublingual Tablet                     |
| 70518221600       | Buprenorphine 2 MG Sublingual Tablet                     |
| 70518221700       | Buprenorphine 2 MG Sublingual Tablet                     |
| 70518221800       | Buprenorphine 8 MG Sublingual Tablet                     |
| 70518222600       | Buprenorphine 2 MG Sublingual Tablet                     |
| 71335035301       | Buprenorphine 2 MG Sublingual Tablet                     |
| 71335035302       | Buprenorphine 2 MG Sublingual Tablet                     |
| 71335035303       | Buprenorphine 2 MG Sublingual Tablet                     |
| 71335035304       | Buprenorphine 2 MG Sublingual Tablet                     |
| 71335035305       | Buprenorphine 2 MG Sublingual Tablet                     |
| 71335035306       | Buprenorphine 2 MG Sublingual Tablet                     |
| 71335035307       | Buprenorphine 2 MG Sublingual Tablet                     |
| 71335095001       | Buprenorphine 2 MG Sublingual Tablet                     |
| 71335095002       | Buprenorphine 2 MG Sublingual Tablet                     |
| 71335095003       | Buprenorphine 2 MG Sublingual Tablet                     |
| National Drug Code | Generic Product Name                        |
|-------------------|--------------------------------------------|
| 71335095004       | Buprenorphine 2 MG Sublingual Tablet       |
| 71335095005       | Buprenorphine 2 MG Sublingual Tablet       |
| 71335095006       | Buprenorphine 2 MG Sublingual Tablet       |
| 71335095007       | Buprenorphine 2 MG Sublingual Tablet       |
| 71335115401       | Buprenorphine 8 MG Sublingual Tablet       |
| 71335115402       | Buprenorphine 8 MG Sublingual Tablet       |
| 71335115403       | Buprenorphine 8 MG Sublingual Tablet       |
| 71335115404       | Buprenorphine 8 MG Sublingual Tablet       |
| 71335115405       | Buprenorphine 8 MG Sublingual Tablet       |
| 71335115406       | Buprenorphine 8 MG Sublingual Tablet       |
| 71335115407       | Buprenorphine 8 MG Sublingual Tablet       |
| 71335115408       | Buprenorphine 8 MG Sublingual Tablet       |
| 71335115409       | Buprenorphine 8 MG Sublingual Tablet       |
| 71335116301       | Buprenorphine 8 MG Sublingual Tablet       |
| 71335116302       | Buprenorphine 8 MG Sublingual Tablet       |
| 71335116303       | Buprenorphine 8 MG Sublingual Tablet       |
| 71335116304       | Buprenorphine 8 MG Sublingual Tablet       |
| 71335116305       | Buprenorphine 8 MG Sublingual Tablet       |
| 71335116306       | Buprenorphine 8 MG Sublingual Tablet       |
| 71335116307       | Buprenorphine 8 MG Sublingual Tablet       |
| 71335116308       | Buprenorphine 8 MG Sublingual Tablet       |
| 71335116309       | Buprenorphine 8 MG Sublingual Tablet       |
| 76519117000       | Buprenorphine 8 MG Sublingual Tablet       |
| 76519117001       | Buprenorphine 8 MG Sublingual Tablet       |
| 76519117002       | Buprenorphine 8 MG Sublingual Tablet       |
| 76519117003       | Buprenorphine 8 MG Sublingual Tablet       |
| 76519117004       | Buprenorphine 8 MG Sublingual Tablet       |
| 76519117005       | Buprenorphine 8 MG Sublingual Tablet       |
**eTable 2. Diagnosis Codes Used to Identify Opioid Use Disorder**

| ICD-10 Diagnosis Code | Description                                                      |
|-----------------------|-------------------------------------------------------------------|
| F11.1                 | Opioid abuse                                                      |
| F11.10                | Opioid abuse, uncomplicated                                       |
| F11.11                | Opioid abuse, in remission                                        |
| F11.12                | Opioid abuse with intoxication                                   |
| F11.120               | Opioid abuse with intoxication, uncomplicated                     |
| F11.121               | Opioid abuse with intoxication delirium                           |
| F11.122               | Opioid abuse with intoxication with perceptual disturbance        |
| F11.129               | Opioid abuse with intoxication, unspecified                      |
| F11.13                | Opioid abuse with withdrawal                                     |
| F11.14                | Opioid abuse with opioid-induced mood disorder                    |
| F11.15                | Opioid abuse with opioid-induced psychotic disorder               |
| F11.150               | Opioid abuse with opioid-induced psychotic disorder with delusions|
| F11.151               | Opioid abuse with opioid-induced psychotic disorder with hallucinations|
| F11.159               | Opioid abuse with opioid-induced psychotic disorder, unspecified  |
| F11.18                | Opioid abuse with other opioid-induced disorder                   |
| F11.181               | Opioid abuse with opioid-induced sexual dysfunction               |
| F11.182               | Opioid abuse with opioid-induced sleep disorder                   |
| F11.188               | Opioid abuse with other opioid-induced disorder                   |
| F11.19                | Opioid abuse with unspecified opioid-induced disorder             |
| F11.2                 | Opioid dependence                                                 |
| F11.20                | Opioid dependence, uncomplicated                                  |
| F11.21                | Opioid dependence, in remission                                  |
| F11.22                | Opioid dependence with intoxication                              |
| F11.220               | Opioid dependence with intoxication, uncomplicated                |
| F11.221               | Opioid dependence with intoxication delirium                      |
| F11.222               | Opioid dependence with intoxication with perceptual disturbance   |
| F11.229               | Opioid dependence with intoxication, unspecified                  |
| F11.23                | Opioid dependence with withdrawal                                 |
| F11.24                | Opioid dependence with opioid-induced mood disorder               |
| F11.25                | Opioid dependence with opioid-induced psychotic disorder          |
| F11.250               | Opioid dependence with opioid-induced psychotic disorder with delusions |
| F11.251               | Opioid dependence with opioid-induced psychotic disorder with hallucinations |
| F11.259               | Opioid dependence with opioid-induced psychotic disorder, unspecified |
| F11.28                | Opioid dependence with other opioid-induced disorder              |
| F11.281               | Opioid dependence with opioid-induced sexual dysfunction          |
| F11.282               | Opioid dependence with opioid-induced sleep disorder              |
| F11.288               | Opioid dependence with other opioid-induced disorder              |
| F11.29                | Opioid dependence with unspecified opioid-induced disorder}
| ICD-10 Diagnosis Code | Description                                                                 |
|----------------------|------------------------------------------------------------------------------|
| F11.9                | Opioid use, unspecified                                                      |
| F11.90               | Opioid use, unspecified, uncomplicated                                      |
| F11.92               | Opioid use, unspecified with intoxication                                   |
| F11.920              | Opioid use, unspecified with intoxication, uncomplicated                    |
| F11.921              | Opioid use, unspecified with intoxication delirium                          |
| F11.922              | Opioid use, unspecified with intoxication with perceptual disturbance       |
| F11.929              | Opioid use, unspecified with intoxication, unspecified                     |
| F11.93               | Opioid use, unspecified with withdrawal                                     |
| F11.94               | Opioid use, unspecified with opioid-induced mood disorder                   |
| F11.95               | Opioid use, unspecified with opioid-induced psychotic disorder              |
| F11.950              | Opioid use, unspecified with opioid-induced psychotic disorder with delusions|
| F11.951              | Opioid use, unspecified with opioid-induced psychotic disorder with hallucinations|
| F11.959              | Opioid use, unspecified with opioid-induced psychotic disorder, unspecified|
| F11.98               | Opioid use, unspecified with other specified opioid-induced disorder        |
| F11.981              | Opioid use, unspecified with opioid-induced sexual dysfunction              |
| F11.982              | Opioid use, unspecified with opioid-induced sleep disorder                  |
| F11.988              | Opioid use, unspecified with other opioid-induced disorder                  |
| F11.99               | Opioid use, unspecified with unspecified opioid-induced disorder           |
Table 3. Original and Alternative Specification for DATA-Waiver Attainment Among ECHO-Trained and Comparison Clinicians in a Propensity Score–Matched Cohort

| Relative Quarter | -4 | -3 | -2 | -1 | 1 | 2 | 3 | 4 | 5 | 6 | P value<sup>c</sup> |
|------------------|----|----|----|----|---|---|---|---|---|---|----------------|
| **Baseline period** |    |    |    |    |   |   |   |   |   |   |               |
| ECHO-trained clinicians | 16.3 (12.2, 20.5) | 22.0 (17.1, 26.8) | 23.7 (18.7, 28.8) | 26.4 (21.1, 31.8) | 30.6 (24.8, 36.4) | 38.9 (32.0, 45.7) | 42.0 (34.4, 49.7) |    |    |    |    |
| Comparison clinicians | 15.9 (13.0, 18.7) | 17.1 (14.1, 20.1) | 17.0 (14.0, 19.9) | 17.6 (14.5, 20.7) | 17.9 (14.8, 21.0) | 18.1 (15.0, 21.2) | 18.8 (15.5, 22.2) |    |    |    |    |
| Difference-in-differences | 4.4 (1.3, 7.5) | 6.3 (2.8, 9.8) | 8.4 (4.2, 12.5) | 12.2 (7.4, 17.1) | 20.3 (14.1, 26.5) | 22.7 (15.5, 29.9) | <.001 |    |    |    |    |
| **Follow-up period** |    |    |    |    |   |   |   |   |   |   |               |
| ECHO-trained clinicians | 19.6 (15.2, 24.1) | 25.2 (20.2, 30.3) | 28.3 (22.9, 33.6) | 32.6 (26.8, 38.4) | 36.4 (30.2, 42.5) | 40.3 (33.7, 47.0) | 41.9 (34.7, 49.0) |    |    |    |    |
| Comparison clinicians | 17.8 (14.8, 20.8) | 18.5 (15.4, 21.5) | 19.6 (16.4, 22.7) | 19.9 (16.7, 23.1) | 20.5 (17.2, 23.8) | 20.4 (17.1, 23.7) | 21.0 (17.5, 24.4) |    |    |    |    |
| Difference-in-differences | 5.0 (2.0, 8.0) | 6.9 (3.1, 10.7) | 11.0 (6.3, 15.6) | 14.0 (8.9, 19.2) | 18.2 (12.2, 24.1) | 19.1 (12.5, 25.7) | <.001 |    |    |    |    |

Abbreviations: DATA, Drug Abuse Treatment Act of 2000; ECHO, Extension for Community Health Outcomes

<sup>a</sup>Means and differences-in-differences estimated with linear mixed-effects models (continuous outcomes) and generalized linear mixed-effects models (dichotomous outcomes) with clinician-level random intercepts.

<sup>b</sup>Only one baseline DATA-waiver measure computed due to intermittent data availability prior to 2019. Alternate specification includes DATA-waiver record or history of any buprenorphine prescribing to patients with OUD.

<sup>c</sup>Type 3 P value for exposure * time interaction.
### eTable 4. Intracluster Correlation Coefficients for Primary Mixed-Effects Models\(^1\)

| Outcome                                                      | Intracluster correlation coefficient |
|--------------------------------------------------------------|-------------------------------------|
| DATA-waiver (%)                                              | .569                                |
| 1+ buprenorphine prescription (%)                            | .276                                |
| Percent of monthly OUD patients prescribed buprenorphine     | .847                                |
| Count of unique OUD patients per month                      | .877                                |

Abbreviations: DATA, Drug Abuse Treatment Act of 2000; OUD, opioid use disorder.

\(^1\) See Table 2 in the main article for estimated means and 95% confidence intervals.
eFigure. Clinician Selection Flow Diagram

Unique ECHO participants N = 1,070

Link to MMIS N = 711

Active primary care clinicians N = 321

Propensity score matched N = 306

Follow-up analysis
Quarter 1 = 271
Quarter 2 = 252
Quarter 3 = 240
Quarter 4 = 218
Quarter 5 = 211
Quarter 6 = 167

Non-ECHO primary care clinicians N = 29,769

Active non-ECHO primary care clinicians N = 19,978

Screened to core parameters of ECHO clinicians N = 19,202

Propensity score matched N = 612

Follow-up analysis
Quarter 1 = 538
Quarter 2 = 512
Quarter 3 = 487
Quarter 4 = 435
Quarter 5 = 419
Quarter 6 = 330

• 359 not linked
• 138 less than 12 months enrollment
• 171 saw no patients
• 81 ineligible clinician type or taxonomy

• 4,437 less than 12 months enrollment
• 4,726 saw no patients
• 597 outside geography
• 31 consolidated from two clinician types

• 776 outside core parameters for ECHO clinicians

• 18,586 not matched

Abbreviation: ECHO, Extension for Community Health Outcomes