



Evaluation of a Buprenorphine Boot Camp training program for healthcare providers in Minnesota

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Executive summary

Medications for opioid use disorder, like buprenorphine, are an important tool for treating opioid addiction. Buprenorphine can be prescribed in primary care settings and has the potential to greatly expand the availability of this life-saving treatment. However, only a small percentage of primary care providers in Minnesota have the necessary training and administrative supports to offer buprenorphine in their clinics.

Minnesota's state government is investing in multiple efforts to expand capacity for treating opioid use disorder, including a program called Buprenorphine Boot Camp, a 1.5-day in-person training for healthcare providers to learn how to set up a successful buprenorphine program. Boot Camp was developed in response to interest from the provider community and designed for care teams (prescribers, nurses, and clinic administrators) to develop the full range of supports needed to operate a buprenorphine program.

The goals of Boot Camp were to increase a) the number of prescribers with the required federal waiver to prescribe buprenorphine, and b) the number of patients receiving buprenorphine for opioid use disorder. The purpose of this study was to learn whether these goals were met, compared to what would have happened in the absence of Boot Camp, referred to business-as-usual.

This study used Medicaid claims data to compare, over the course of 18 months, providers who attended Boot Camp (N = 125) and like providers who did not attend Boot Camp (N = 250). The results show that attending Boot Camp led to statistically and practically significant increases in waivers and buprenorphine prescribing. We find:

- Attending Boot Camp resulted in a 37%-point increase in waivers over 15 months compared to providers who did not attend.
- Eighteen months after Boot Camp, attendees increased their buprenorphine prescribing to patients with a history of opioid use disorder by 6.8% points.
- In an exploratory analysis, both Boot Camp and ECHO (a separate "hub-and-spoke" program that offers weekly virtual sessions on opioid-related topics) had separate effects on waivers and buprenorphine prescribing, suggesting that both are beneficial, and the two programs complement each other.

The positive impacts on waivers and buprenorphine provide strong evidence that a brief, focused training like Boot Camp is an effective way to train primary care providers in prescribing buprenorphine in the community. This kind of training program, implemented within a robust continuum of care, could be expanded to further curb the harmful effects of the opioid epidemic.

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Minnesota Management & Budget (MMB)

Impact Evaluation Unit

685 Cedar Street

St. Paul, MN 55155

ResultsFirstMN@state.mn.us

<https://mn.gov/mmb/impact-evaluation/>

Background

Over the past two decades, thousands of Minnesota families have suffered from the opioid epidemic. Since 2000, 5,475 Minnesotans have died from opioid-involved overdoses, and there were more than 12,000 visits to the emergency room for nonfatal overdoses involving opioids between 2016 and 2020 (Minnesota Department of Health, 2021). Communities of color have been disproportionately affected, with American Indians seven times as likely to die from an overdose and African Americans twice as likely to die from an overdose as whites. The state has invested in a variety of initiatives to create a robust continuum of care, prevention, early intervention, treatment, and recovery services, to mitigate the devastating effects of opioid misuse and addiction.

A critical component of treatment for opioid use disorder (OUD) is access to medications for opioid use disorder (MOUD). MOUD are highly effective for relieving cravings, reducing the risk of overdose, decreasing illicit opioid use, and improving patient survival (SAMHSA, 2021). Three medications are approved for treating OUD: methadone, naltrexone, and buprenorphine. Methadone can only be dispensed in certified opioid treatment programs. Both naltrexone and buprenorphine can be prescribed in primary care settings.

Research shows individuals with OUD who receive methadone or buprenorphine are 59% and 38% less likely to have a fatal overdose in a 12-month period than those who do not receive an MOUD (Larochelle et al., 2018). Because it is effective and relatively simple to administer, buprenorphine is often the preferred treatment; however, providers are required to obtain a Drug Abuse Treatment Act waiver (DATA-waiver) from the federal government to prescribe it. To treat more than 30 buprenorphine patients, they must also complete additional training. In 2020, only 4.6% (1,094) of Minnesota's eligible providers had the required waiver; in 31 counties there were no waived providers. Moreover, not all waived providers actually prescribe buprenorphine, because of barriers like lack of training, stigma, concerns about diversion, and low reimbursement rates (Huhn & Dunn, 2017; Molfenter et al., 2019). This likely means there are eligible individuals with OUD who would benefit from MOUD but are unable to access this proven-effective treatment.

One initiative the state invested in to expand provider capacity and improve the quality of MOUD is Project ECHO.¹ Two of the ECHO hubs in Minnesota, Hennepin Healthcare and CHI-St. Gabriel's, focused on expanding MOUD through regular videoconferences for didactic and case-based learning for primary care clinics (Solmeyer et al., 2021). Providers who attended these virtual ECHO sessions indicated a need for in-person training and more information on the logistics of operating a buprenorphine program. In response, Hennepin Healthcare and CHI-St. Gabriel's created a program called Buprenorphine Boot Camp.

Buprenorphine Boot Camp is a 1.5 day in-person training designed to teach primary care clinic teams how to successfully prescribe buprenorphine in their clinics. It includes training for providers to become DATA-waivered if they were not already; education on intakes, inductions, and pragmatic advice for prescribing buprenorphine; information on the logistics of billing and financing; and sessions on coordinating with other community

¹ ECHO programs consist of a "hub" where specialists work in an interdisciplinary team and "spokes" (typically providers in rural or underserved areas, or primary care providers who do not have specialized training in treating a particular illness) who connect to the hub through regular videoconferences.

agencies and resources. Each participating clinic is required to send at least two prescribers, a nurse, and a clinic administrator. This helps to create a robust care team that could provide the full range of supports needed to operate a buprenorphine program.

Boot Camp, which was developed locally as a pragmatic response to identified needs, has not yet been formally evaluated. A literature search did not find any published evaluations of similar programs; however, other organizations have identified the need for similar trainings. For example, a recent paper summarized lessons learned by five grantees in different states that worked to expand MOUD in primary care practices in rural communities (Cole et al., 2021). Their recommendations include training the entire clinic staff (not just prescribers), providing both virtual and in-person training options at varying intensities, and including a broad range of topics that are important for delivering MOUD (beyond prescribing), like clinic workflow and psychosocial supports. All these elements are part of Boot Camp and shared a goal of increasing buprenorphine prescribing to people with OUD.

One program that included a Boot Camp-like element was the Veterans Health Administration's Stepped Care for Opioid Use Disorder Train the Trainer initiative. It aimed to expand MOUD access in primary care, mental health, and pain clinics. The approach was comprehensive and provided ongoing support, including a two-day, in-person conference (Gordon et al., 2020). The conference included sessions to complete the DATA-waiver and training on diagnosing OUD, medical management of OUD, essential counseling skills for medical management, and MOUD implementation challenges. There was, however, no systematic evaluation that examined whether attending the conference impacted participants' behaviors. This leaves a gap in our knowledge this evaluation aims to fill.

This evaluation addresses the following research question: Among primary care providers who are eligible to obtain a DATA-waiver to write buprenorphine prescriptions, does attending Buprenorphine Boot Camp change the likelihood that the provider obtains a DATA-waiver and/or prescribes buprenorphine up to 18 months after attending Boot Camp, compared to well-matched providers who do not attend Boot Camp?

Data and methods

To address this question, we compared the outcomes of providers who attended Boot Camp (we call them the "Boot Camp group") to providers who did not attend Boot Camp (we call them the "comparison group"; sometimes referred to as the "business-as-usual" group), but who were similar to Boot Camp attendees. Providers were matched on traits prior to study enrollment, like demographics, patient panel characteristics, whether they had a DATA-waiver at the beginning of the study, their buprenorphine prescribing practices, and whether they had attended any ECHO sessions, or belonged to a provider group with members who had attended ECHO, prior to Boot Camp (see Appendix – Study Design for more details). All providers in this study treat Medicaid patients, are primary care providers, and have a credential that makes them eligible to obtain a DATA-waiver (i.e., physician, physician assistant, nurse practitioner, or certified nurse specialist). Outcome measures and data sources are described in Table 1.

Table 1. Primary outcome measures

Outcome measure	Coding values	Analytic sample	Data source
DATA-waiver status	1 = provider has a DATA-waiver 0 = provider does not have a DATA-waiver	All providers	CSA Registry database ²
Active use of DATA-waiver	1 = provider wrote at least 1 buprenorphine prescription to a patient with OUD 0 = provider did not write any buprenorphine prescriptions to patients with OUD	All providers	MMIS ³
Buprenorphine prescribing	% of OUD patients per month for whom the provider wrote a buprenorphine prescription	Providers with at least 1 OUD patient	MMIS

Abbreviations: CSA, Controlled Substances Act; DATA, Drug Abuse Treatment Act of 2000; OUD, opioid use disorder

Results

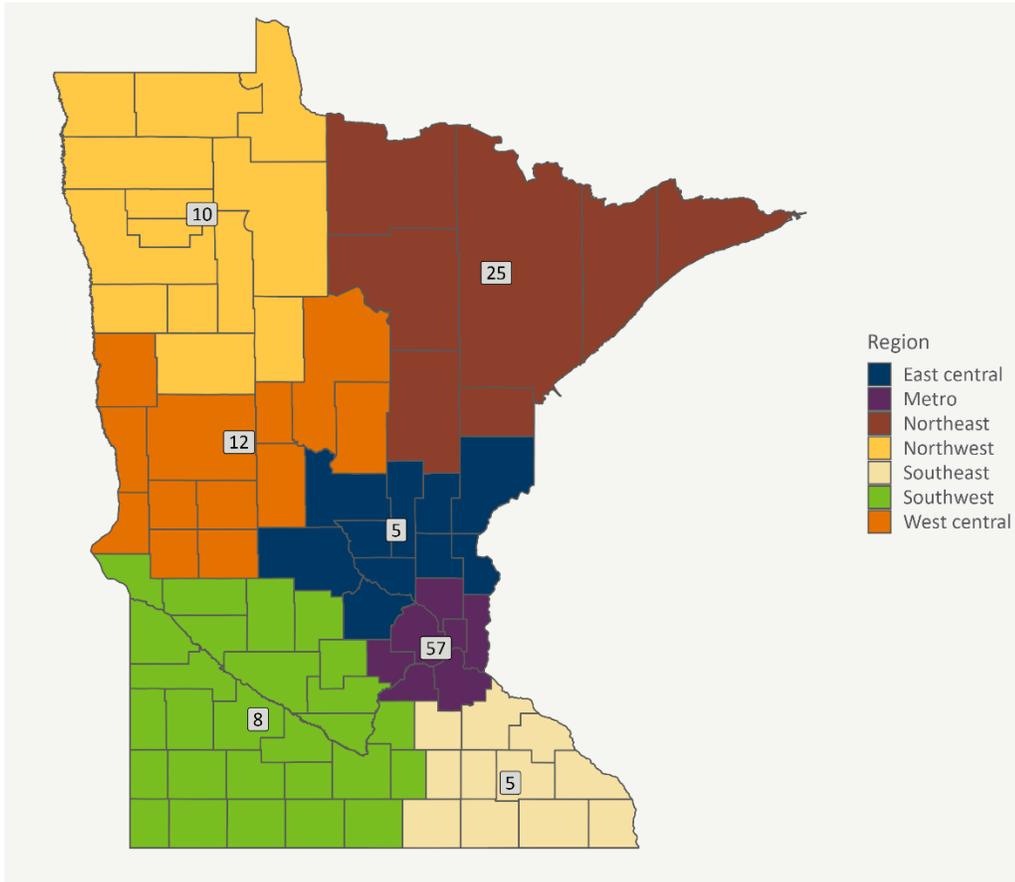
Participants

The final sample included 375 providers (125 in the Boot Camp group and 250 in the comparison group). Figure 1 shows the distribution of Boot Camp providers in the final sample across the state. Follow-up data was available at 18 months for 67 Boot camp (54%) and 142 comparison (57%) providers. There were no statistically significant differences on observable baseline characteristics between matched Boot Camp and comparison providers, including buprenorphine prescribing history across four quarters preceding study enrollment, having attended ECHO prior to Boot Camp, or demographics (see Table 3, Appendix). This suggests that the two groups were similar on all measured characteristics at baseline. This is an important consideration when trying to understand whether any changes in outcomes are a result of Boot Camp or some other factor.

² Controlled Substances Act Registry, maintained by the U.S. Drug Enforcement Agency. Administrative records on which providers have obtained a DATA-waiver and when it was obtained.

³ Minnesota’s Medicaid Management Information system, which houses Medicaid claims data.

Figure 1. Number of Boot Camp providers in the final sample, by Prevention Region



Outcomes

The results show that Boot Camp led to both statistically and practically significant increases in DATA-waivering and buprenorphine prescribing. This program can be an important part of the continuum of care for treating individuals with opioid use disorder.

In the baseline period,⁴ 22% of Boot Camp participants and 19% of comparison providers were identified in the DATA-waiver database (see Table 4, Appendix). In the latest available data (Quarter 1, 2020), five quarters after the first Boot Camp, 67% of Boot Camp participants and 27% of comparison participants had attained DATA-waivers. We estimate that Boot Camp attendance was associated with a 37%-point increase in DATA-waiver attainment over five quarters versus the comparison group (see Figure 2A and Table 2).

⁴ We had access to a limited set of quarterly DATA-waiver data. The baseline for February 2019 Boot Camp attendees and comparison providers was Quarter 1, 2018 (we did not have access to Quarters 2-4, 2018). The baseline for December 2019 Boot Camp attendees and comparison providers was Quarter 3, 2019.

Active use of the DATA-waivers, indicated by prescribing buprenorphine to at least one patient with OUD, also increased more among Boot Camp participants than comparison participants. In the quarter preceding study enrollment, 23% of Boot Camp participants and 21% of comparison participants wrote a buprenorphine prescription, demonstrating the two groups were similar at baseline. At 18 months follow-up, 55% of Boot Camp and 20% of comparison providers prescribed buprenorphine, a 33%-point greater increase among Boot Camp providers (see Figure 2B, Table 2, and Table 4 – Appendix).

Boot Camp participants also prescribed buprenorphine to a greater proportion of their OUD patients than comparison providers. Buprenorphine prescribing increased from 6.6% of monthly patients with a history of OUD in the baseline period to 14.6% 18 months later, among Boot Camp participants. Over the same period, buprenorphine prescribing among comparison participants increased from 5.5% of monthly OUD patients to 6.7%. Relative to the change in the comparison population, over 18 months of follow-up Boot Camp participants increased buprenorphine by 6.8% points of their monthly OUD patients (see Figure 2C, Table 2, and Table 4 – Appendix).

Table 2. Estimated effect of Boot Camp training at each time point

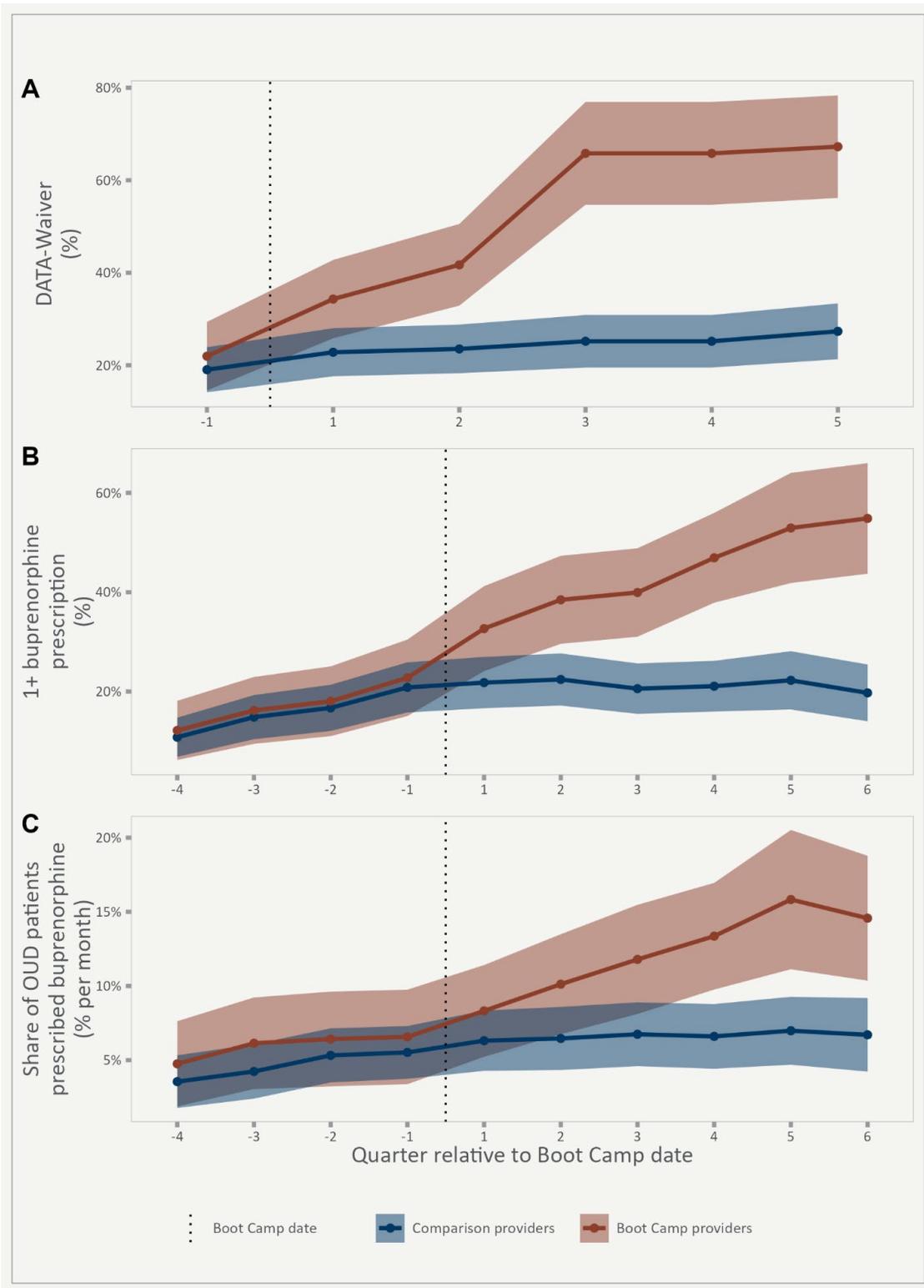
Outcome	Difference-In-Difference Estimate (95% confidence interval)							P-value (overall)
	Baseline	3 months	6 months	9 months	12 months	15 months	18 months	
DATA-waiver (% points)	(ref)	8.6* (1.9, 15.2)	15.3*** (7.4, 23.1)	37.7*** (26.0, 49.4)	37.7*** (26.0, 49.4)	37.0*** (25.1, 48.9)	<i>No data</i>	<.001
1+ buprenorphine prescription per quarter (% points)	(ref)	8.9** (2.2, 15.7)	14.1*** (6.5, 21.7)	17.4*** (9.6, 25.3)	23.9*** (15.2, 32.6)	28.7*** (17.1, 40.4)	33.2*** (21.5, 44.8)	<.001
% of OUD patients prescribed buprenorphine (% points per month)	(ref)	0.97 (-0.75, 2.7)	2.6 (-0.52, 5.7)	4.0* (0.92, 7.1)	5.7*** (2.8, 8.6)	7.8*** (3.6, 12.0)	6.8*** (3.1, 10.6)	.005

* $p < .05$, ** $p < .01$, *** $p < .001$

The COVID-19 pandemic began in March 2020, which overlapped with the study period. Many healthcare operations and services were interrupted, potentially leading to unrelated changes in the outcomes of interest for this study. We therefore conducted a sensitivity analysis comparing the outcomes before and during COVID-19 and did not find any evidence that our findings were affected by the pandemic.

To better understand some the complex ways in which Boot Camp might impact or interact with programs or outcomes beyond the scope of our specific study, we conducted three supplemental analyses that are described in the Appendix – Supplemental Analyses. They were: 1) examining Boot Camp’s impact on *any* MOUD prescription (buprenorphine, naltrexone, or methadone); 2) exploring whether increases in buprenorphine prescribing were driven by new prescribers vs. experienced prescribers increasing the percentage of patients for whom they prescribed buprenorphine; and 3) examining the interaction between Boot Camp and Project ECHO.

Figure 2. Boot Camp and comparison provider outcomes over 15 months (for DATA-waivers) and 18 months (for buprenorphine prescribing)



Discussion and conclusion

Expanding access to buprenorphine is a critical component of curtailing the devastating effects of the opioid epidemic (Huhn & Dunn, 2017). Innovative, local practitioners created Buprenorphine Boot Camp to do just that, by training primary care providers to use the evidence-based, life-saving medication to treat OUD within their communities. This study compared providers who attended Boot Camp to similar providers who did not and tracked their outcomes over the course of 18 months.

The results indicate that Boot Camp increased providers' likelihood of a) becoming waived to prescribe buprenorphine, b) prescribing buprenorphine to at least one patient diagnosed with OUD, and c) prescribing buprenorphine to a greater percentage of their Medicaid patients diagnosed with OUD. Results were consistent both before and during the COVID-19 pandemic's interruptions to the delivery of medical care.

Importantly, Boot Camp occurred within a context of multiple, overlapping efforts to address the opioid epidemic, including Project ECHO. In our supplemental analysis (see Appendix – Supplemental Analyses), we found that Boot Camp increased DATA-waiver attainment and buprenorphine prescribing among both providers who did and did not attend ECHO prior to Boot Camp. This suggests that the two programs complement each other, both are effective, and both can be part of the state's efforts to increase access to MOUD and may help to expand waivers beyond the current 5% of eligible primary care providers who have them (Solmeyer et al., 2021).

This study was observational, as randomization was not practical. As with all observational studies, our results are limited by the quality and availability of data used to establish comparison groups, measure outcomes, and identify causal relationships. Provider and clinic characteristics of interest were drawn from the MMIS data system; therefore, the measured effects may be most reliable for providers who treat patients enrolled in the state's Medical Assistance program. Further, providers in our sample (both the Boot Camp and comparison groups) treated more patients with OUD than the average Medicaid provider, making the findings most generalizable to providers with similar patient rosters. It is possible that difference between providers or clinics not captured by the MMIS data system, like provider motivation or support of peer providers at their clinic, could lead to variations in observed outcomes from those reported here.

Nonetheless, the findings provide strong evidence that a brief, focused training like Boot Camp is an effective way to train primary care providers in prescribing buprenorphine in the community. This kind of training program, implemented within a robust continuum of care, could be expanded to further curb the harmful effects of the opioid epidemic.

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Appendix: Data, methods, and results

Study design

This is an observational cohort study. Boot Camp has been offered multiple times in Minnesota and our analysis examined attendees at the first two offerings, one in February and one in December of 2019. We pooled providers who attended either one or both⁵ of these Boot Camps into a single group. The analysis compares outcomes of providers who attended Boot Camp to providers who did not attend Boot Camp, but who were otherwise similar to Boot Camp attendees on relevant characteristics.⁶ Comparison providers were identified through propensity score matching. We also weighted the observations to further adjust any existing baseline differences between the treatment and comparison groups (Solmeyer et al., 2021)

The study enrollment date for Boot Camp providers was the date of their first Boot Camp training. The study enrollment date for comparison providers were determined by randomly selecting a single date from the two Boot Camp dates. Baseline data was collected for the 12-month period before study enrollment and outcomes were measured quarterly for up to 18 months after study enrollment.

Data sources and measures

The Boot Camp trainers provided us with identifying information about the people who attended Boot Camp. Administrative records from the Drug Enforcement Agency's Controlled Substances Act (CSA) Registry database were used to determine whether each provider had a DATA-waiver to prescribe, dispense, or administer buprenorphine; and the quarters when the waiver was active. We had access to DATA-waiver data for the following years/quarters: 2018/Q1, 2019/Q1-Q4, and 2020/Q1. Information about provider characteristics and buprenorphine prescriptions came from claims entered in Minnesota's Medicaid Management Information System (MMIS).

Data analysis

Outcomes were aggregated into three-month quarterly periods before and after study enrollment by identifying if the outcome ever occurred in the quarter (binary outcomes) or averaging across the quarter (continuous outcomes). We used difference-in-differences analysis to estimate the effect of Boot Camp participation in the follow-up periods.

⁵ Four providers attended both the February and December Boot Camp trainings; we set their study enrollment date as February 2019.

⁶ Matching variables included: Provider type (MD, PA, NP, CNS), study enrollment date, geographic region, age (5 levels), attendance at ECHO prior to Boot Camp (by the provider and/or others in provider's practice group), and, for each of four quarters preceding study enrollment, number of Medicaid patients per month (4 levels), number of patients with OUD per month (4 levels), and buprenorphine prescribing (3 levels).

Results tables

Table 3. Unweighted baseline characteristics for Boot Camp and comparison providers

Characteristic	Study group, Mean (SD) or No. (%)		P value ^a
	Boot Camp providers (n = 125)	Comparison providers (n = 250)	
Age (years)	43.1 (10.5)	43.2 (10.5)	0.92
Follow-up time (months)	18.4 (5.0)	17.9 (5.9)	0.50
Provider type (N [%])			
Physician	72 (57.6)	126 (50.4)	0.52
Nurse Practitioner	38 (30.4)	86 (34.4)	0.52
Clinical Nurse Specialist	1 (0.8)	1 (0.4)	0.52
Physician Assistant	14 (11.2)	37 (14.8)	0.52
Region (N [%])			
Minneapolis-Saint Paul metro region	62 (49.6)	129 (51.6)	0.79
Greater Minnesota	57 (45.6)	106 (42.4)	0.79
Outside Minnesota	6 (4.8)	15 (6.0)	0.79
Attended ECHO prior to Boot Camp	29 (23.2)	46 (18.4)	0.27
Member of provider group attended ECHO prior to Boot Camp ^b	112 (89.6)	220 (88.0)	0.65
Unique Medicaid patients per month (count)	67.1 (56.8)	61.7 (54.9)	0.38
Unique Medicaid patients per month with OUD diagnosis history (count)	10.6 (15.0)	9.8 (15.2)	0.61
DATA-Waiver (N [%])	28 (22.4)	47 (18.8)	0.41
1+ buprenorphine prescription in previous 12 months (N [%])	30 (24.0)	56 (22.4)	0.73

→Abbreviations: ECHO, Extension for Community Health Outcomes; OUD, opioid use disorder; SD, standard deviation

^a P-values for count and continuous variables from 2-sided t-test. P-values for binary and categorical variables from Chi-square test.

^b Information about provider groups was available in MMIS, which includes a field indicating providers who work at the same practice or clinic.

Table 4. Estimated means at each quarter for primary outcomes

Outcome	Estimated means (95% confidence interval)						
	Baseline	3 months	6 months	9 months	12 months	15 months	18 months
DATA-waiver (%)							
Boot Camp providers	22.0 (14.6, 29.4)	34.3 (25.8, 42.8)	41.7 (32.9, 50.6)	65.8 (54.7, 76.9)	65.8 (54.7, 76.9)	67.3 (56.2, 78.4)	<i>No data</i>
Comparison providers	19.0 (14.2, 23.9)	22.8 (17.6, 28.0)	23.5 (18.3, 28.8)	25.2 (19.5, 30.9)	25.2 (19.5, 30.9)	27.3 (21.3, 33.4)	<i>No data</i>
1+ buprenorphine prescription (% per quarter)							
Boot Camp providers	22.8 (15.1, 30.5)	32.7 (24.1, 41.2)	38.5 (29.6, 47.3)	39.9 (31.0, 48.8)	46.9 (37.9, 56.0)	52.9 (41.9, 64.0)	54.9 (43.7, 66.0)
Comparison providers	20.8 (15.8, 25.9)	21.8 (16.6, 27.0)	22.4 (17.2, 27.7)	20.6 (15.5, 25.7)	21.1 (16.0, 26.2)	22.3 (16.4, 28.1)	19.7 (14.0, 25.5)
% of OUD patients prescribed buprenorphine (% per month)							
Boot Camp providers	6.6 (3.4, 9.8)	8.3 (5.2, 11.4)	10.1 (6.7, 13.5)	11.8 (8.1, 15.5)	13.4 (9.8, 17.0)	15.8 (11.1, 20.5)	14.6 (10.4, 18.8)
Comparison providers	5.5 (3.7, 7.3)	6.3 (4.3, 8.3)	6.5 (4.3, 8.6)	6.7 (4.6, 8.9)	6.6 (4.4, 8.8)	7.0 (4.7, 9.3)	6.7 (4.2, 9.2)

Supplemental analyses

To probe the impact of Boot Camp within the complex landscape of OUD treatment, we conducted three supplemental analyses. These were designed to unpack whether increases in buprenorphine prescribing offset other MOUD prescribing (i.e., naltrexone and methadone); whether certain types of providers were driving the increase in prescribing; and how Boot Camp and ECHO complement each other. For additional details, email ResultsFirstMN@state.mn.us.

Secondary outcome: Any MOUD

The primary focus of Buprenorphine Boot Camp was to train providers in treating OUD with buprenorphine; however, there are circumstances when treatment with naltrexone or methadone is more appropriate. It is therefore important to know if Boot Camp leads to an increase in overall MOUD because of increased buprenorphine prescribing, or if providers are using buprenorphine in place of one of these other treatments. To do so, we examined the percentage, per provider, of patients with an OUD diagnosis for whom the provider wrote a prescription for any MOUD (buprenorphine, naltrexone, or methadone) each month.

As with buprenorphine prescribing alone, MOUD prescribing was similar at baseline for Boot Camp (6.9% of OUD patients per month [95% Confidence Interval 3.7%, 10.1%]) and comparison providers (5.9% of OUD patients per month [4.1%, 7.7%]). At 18 months of follow up, Boot Camp providers prescribed MOUD to 14.7% of OUD patients per month (10.5%, 18.9%), versus 7.1% of OUD patients of comparison providers (4.6%, 9.6%). We estimate that, at 18 months, Boot Camp attendance increased MOUD prescribing to OUD patients by 6.6% points (2.8% points, 10.4% points). This estimate is consistent with the estimated effect of Boot Camp attendance on buprenorphine prescribing, suggesting that providers who attended Boot Camp increased the total number of OUD patients to whom they offered MOUD rather than switching current patients from naltrexone to buprenorphine, for example.

Subgroup analysis: New and experienced prescribers

To better understand how Boot Camp was changing prescriber behavior, we also investigated if the observed increase in buprenorphine prescriptions was due primarily to first-time prescribers beginning to prescribe buprenorphine after attending Boot Camp, or if providers who were already prescribing buprenorphine before Boot Camp increased buprenorphine prescribing after Boot Camp. We estimated the difference in the effect of Boot Camp on the percent of monthly patients with a history of OUD among providers who prescribed buprenorphine in the baseline period (24% of Boot Camp providers) compared with those who had not previously prescribed buprenorphine (76% of Boot Camp providers).

Over 18 months of follow-up, we did not observe a significant difference in buprenorphine prescribing for Boot Camp providers who were already prescribing buprenorphine, versus similar comparison providers (1.4%-point increase [-6.9% points, 9.8% points]). We observed a substantial increase in buprenorphine prescribing for Boot Camp providers who were not prescribing buprenorphine, versus comparison providers (8.7%-point increase [4.6% points, 12.8% points]). The overall difference in effect by buprenorphine prescribing history did not achieve statistical significance ($P = 0.34$; this could be due to limited power to detect a three-way interaction).

While we did not have a definitive answer to the question, the increase in prescribing seems to be driven primarily by new prescribers with a smaller, not-statistically-significant increase among experienced providers. Both seemed to be contributing to the observed Boot Camp impacts.

Subgroup analysis: ECHO participants and non-ECHO participants

As discussed, Boot Camp was originally developed as a supplement to weekly virtual project ECHO sessions that were running in Minnesota; in this way, Boot Camp and ECHO were linked and cross-promoted. We have previously found that ECHO participation increases DATA-waiver attainment and buprenorphine prescribing (Solmeyer et al., 2021). We were therefore interested in separating the unique effects of Boot Camp, as many providers attended it in concert with ECHO.

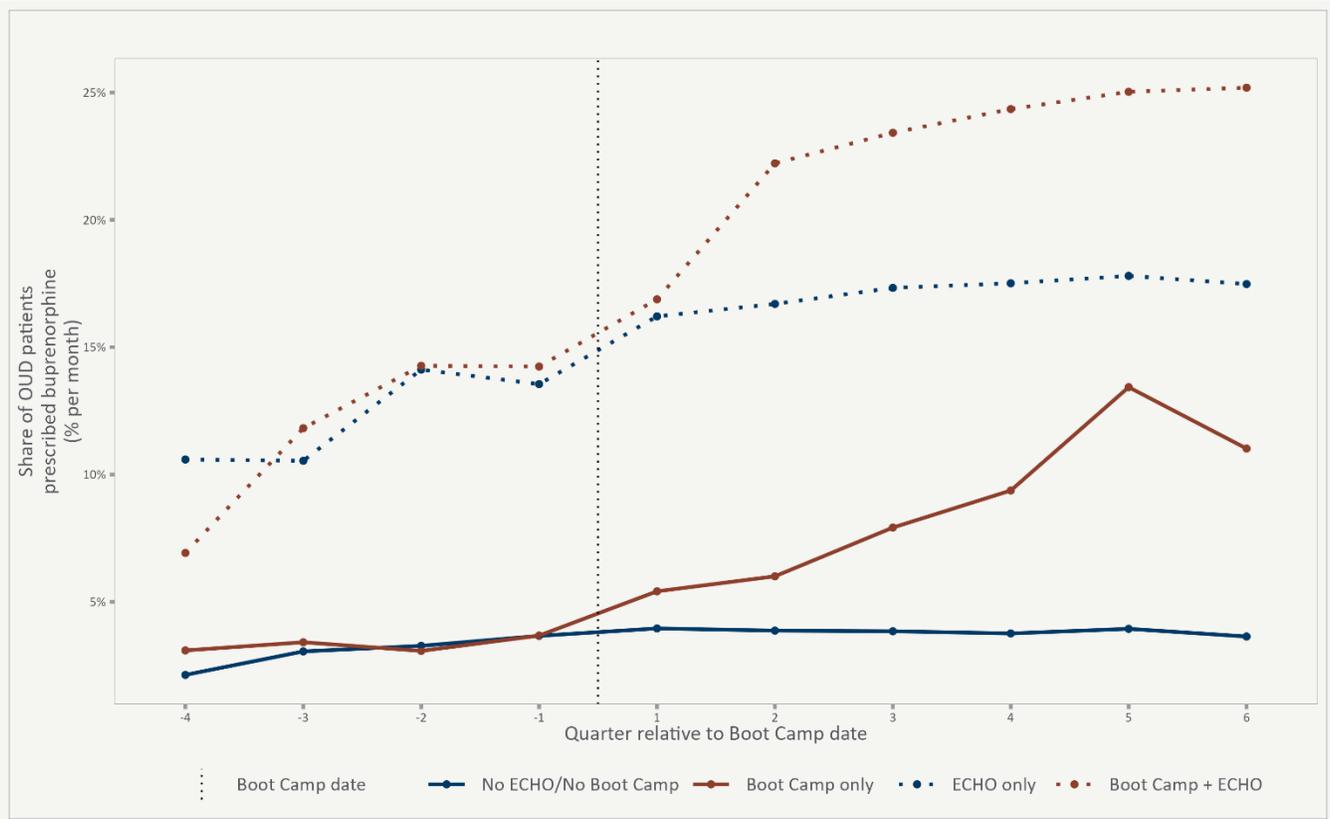
To isolate the impact of Boot Camp, we split our study population into those who attended one or more ECHO sessions during their baseline period (21% of Boot Camp attendees, 20% of comparison providers), and those who did not. For each of these groups, we then collected follow-up data after their study enrollment date. If a non-ECHO attending provider later went on to attend ECHO, we excluded any follow-up data from *after* their initial ECHO attendance (thus censoring providers in follow-up after they attended ECHO). This led to four distinct groups: no ECHO/no Boot Camp; ECHO/no Boot Camp; no ECHO/Boot Camp; and ECHO/Boot Camp. This allowed us to estimate whether the impacts of Boot Camp depend on prior ECHO attendance and also allowed us to isolate the effects of Boot Camp from those of ECHO, if ECHO is begun during the follow-up period.

Notably, providers who attended one or more ECHO sessions before enrollment in this study were more likely to have attained a DATA-waiver ($P = 0.03$), prescribed buprenorphine ($P = 0.01$), and prescribed buprenorphine to a greater share of OUD patients ($P = 0.003$) than providers who had not attended ECHO (see Figure 3, showing only the percentage of OUD patients prescribed buprenorphine). This effect is plainly visible when comparing the dotted lines to the solid lines in Figure 3. This effect represents a difference in the *level* of the outcome – overall, providers who attended ECHO (regardless of whether they later attended Boot Camp) showed higher levels of buprenorphine prescribing than those who did not.

The critical question for this study is about *change* in the outcomes – does the growth in outcomes for providers who attend Boot Camp differ from the growth in outcomes for providers who did not, and does that change depend on whether providers attended ECHO? The results suggest that the *change* in outcomes was not affected by ECHO attendance – there were no significant differences by baseline ECHO attendance in the estimated effect of Boot Camp on DATA-waiver attainment ($P = 0.46$), any buprenorphine prescribing ($P = 0.25$), or buprenorphine prescriptions per OUD patient ($P = 0.34$). In general, both ECHO-attending providers and non-ECHO-attending providers experienced similar increases in all three outcomes after Boot Camp (see Figure 3, comparing the solid and dotted red lines). Our prior study of Project ECHO provides evidence that at least part of this difference is due to the causal effect of the ECHO training itself (Solmeyer et al., 2021). However, this supplemental analysis supports an effect of Boot Camp that is independent from any prior ECHO training.

These findings suggest that Boot Camp and ECHO complement each other. They each provide unique modes of delivery at varying intensities, offering multiple options for providers who want training on MOUDs. The primary takeaway is that either form of training is beneficial and that designing a program that providers will attend, whether it is ECHO, Boot Camp, or both, is likely to have a positive impact.

Figure 3. Supplemental analysis of the effects of Boot Camp and ECHO on buprenorphine prescribing



Note: In red are providers who attended Boot Camp. The dotted lines indicate providers who attended ECHO. The red dotted line indicates providers who attended both.