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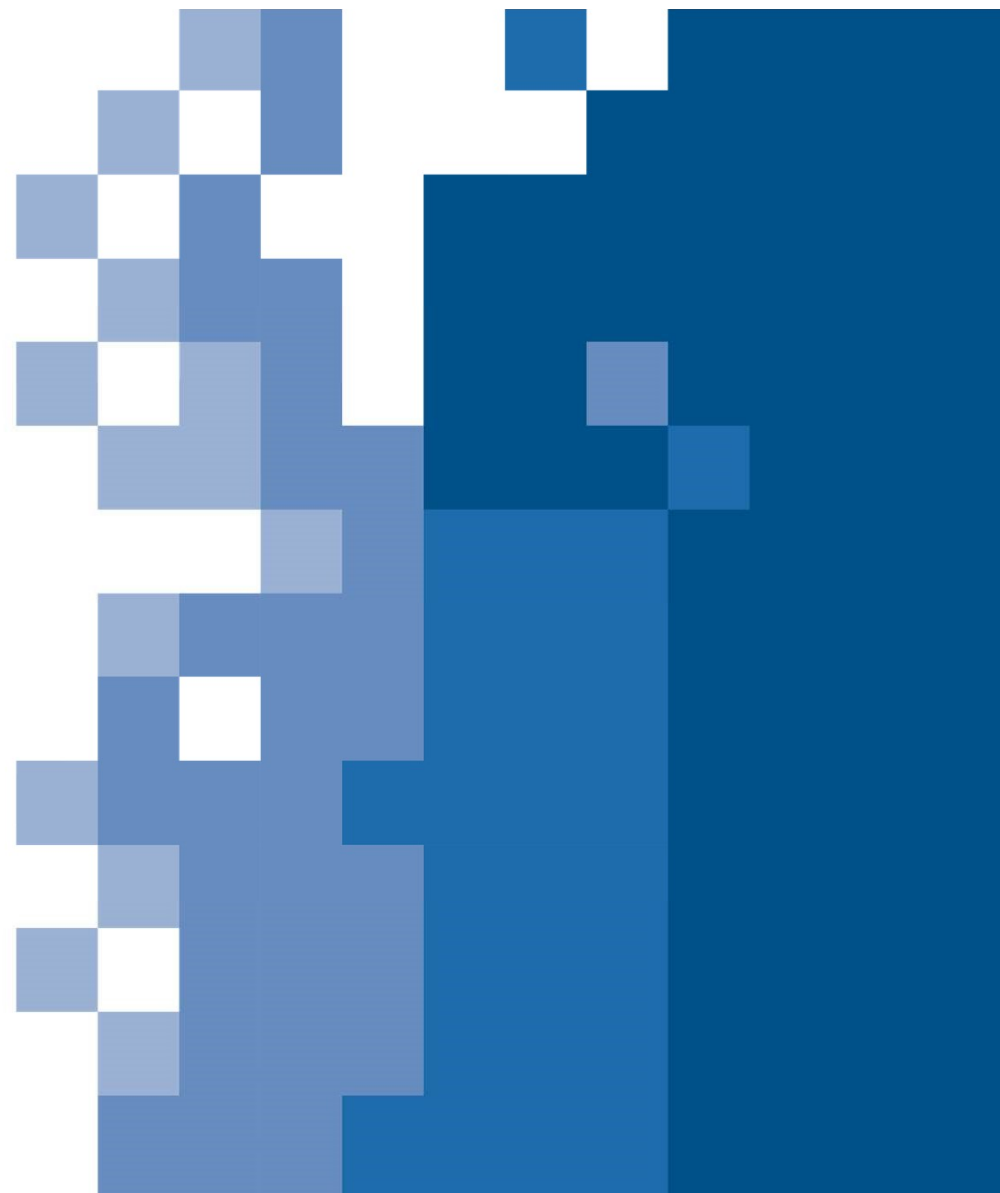
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Cost-effectiveness of in-person vs. virtual contingency management implementation strategies

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Project MIMIC's Conceptual Overview

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Project MIMIC (Maximizing Implementation of Motivational Incentives in Clinics): A cluster-randomized type 3 hybrid effectiveness-implementation trial

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Abstract
Background: Opioid-related overdoses and harms have been declared a public health emergency in the United States, highlighting an urgent need to implement evidence-based treatments. Contingency management (CM) is one of the most effective behavioral interventions when delivered in combination with medication for opioid use disorder, but its implementation in opioid treatment programs is woefully limited. Project MIMIC (Maximizing Implementation of Motivational Incentives in Clinics) was funded by the National Institute on Drug Abuse to identify effective strategies for helping opioid treatment programs improve CM implementation as an adjunct to medication. Specific aims will test the impact of two different strategies on implementation outcomes (primary aim) and patient outcomes (secondary aims), as well as test putative mediators of implementation effectiveness (exploratory aim).
Methods: A 3-cohort, cluster-randomized, type 3 hybrid design is used with the opioid treatment programs as the unit of randomization. Thirty programs are randomized to one of two conditions: The control condition is the Addiction Technology Transfer Center (ATTC) Network Implementation strategy, which consists of three core approaches: didactic training, performance feedback, and on-going consultation. The experimental condition is an enhanced ATTC strategy, with the same core ATTC elements plus two additional theory-driven elements. The two additional elements are Pay-for-Performance, which aims to increase implementing staff's extrinsic motivations, and Implementation & Sustainment Facilitation, which targets staff's intrinsic motivations. Data will be collected using a novel, CM Tracker tool to document CM session delivery, session audio recordings, provider surveys, and patient surveys. Implementation outcomes include CM Exposure (number of CM sessions delivered per patient), CM Skill (ratings of CM fidelity), and CM Sustainment (number of patients receiving CM after removal of support). Patient outcomes include self-reported opioid abstinence and opioid-related problems (both assessed at 3- and 6-months post-baseline).
Discussion: There is urgent public health need to improve the implementation of CM as an adjunct to medication for opioid use disorder. Consistent with its hybrid type 3 design, Project MIMIC is advancing implementation science by comparing impacts of these two multifaceted strategies on both implementation and patient outcomes, and by examining the extent to which the impacts of those strategies can be explained by putative mediators.

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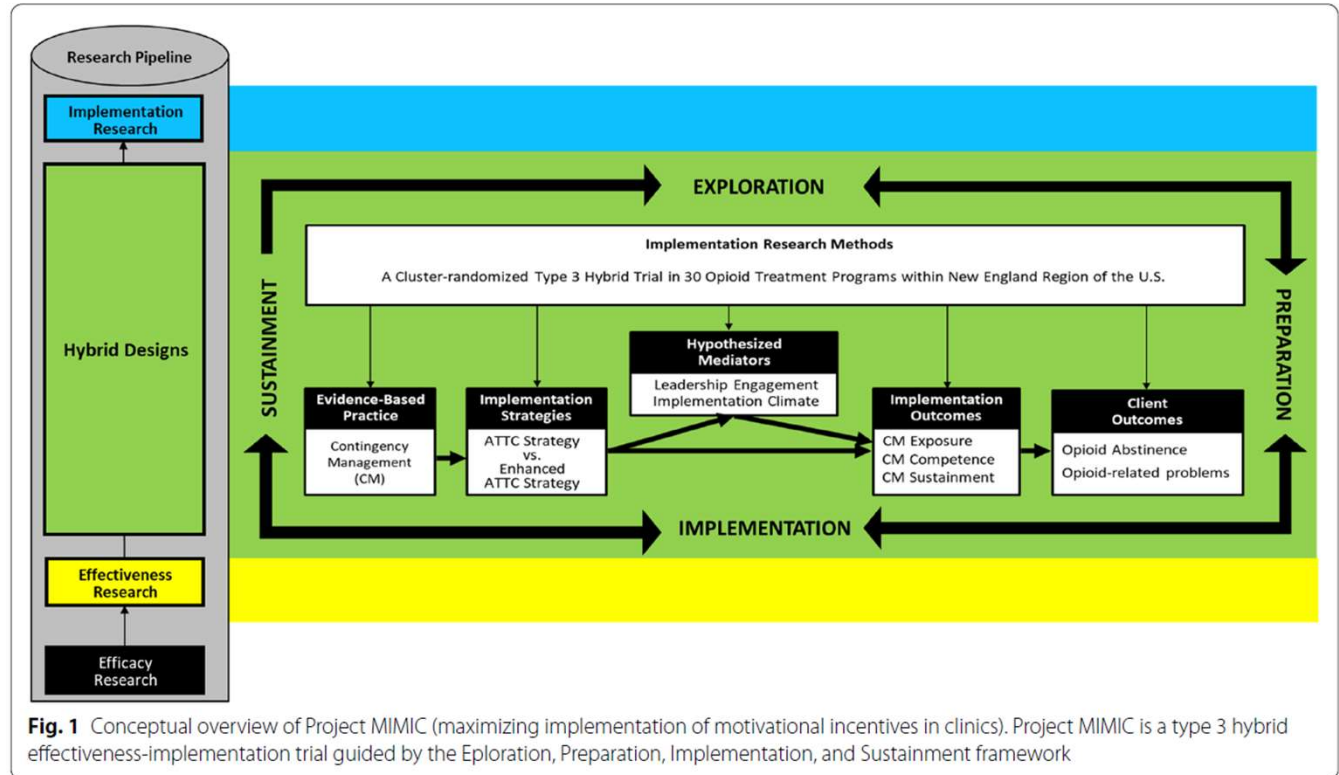


Fig. 1 Conceptual overview of Project MIMIC (maximizing implementation of motivational incentives in clinics). Project MIMIC is a type 3 hybrid effectiveness-implementation trial guided by the Exploration, Preparation, Implementation, and Sustainment framework

Project MIMIC's Phases

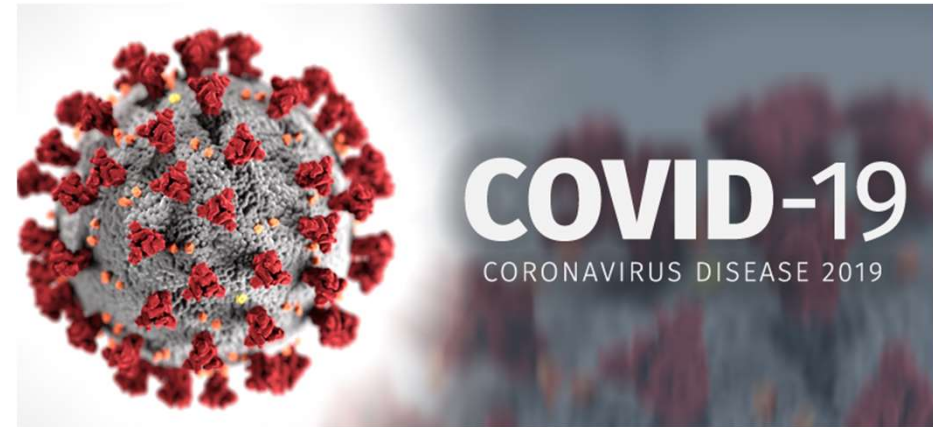
Study Phase According to the Exploration, Preparation, Implementation, and Sustainment Model

Timepoint from launch of each cohort (month)	Preparation (5 months)					Implementation (9 months)									Sustainment (6 months)					
	1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16	17	18	19	20
ENROLLMENT																				
Opioid Treatment Programs	X																			
Providers (Leaders and counselors)		X	X																	
Patients						X	X	X	X	X	X									
Randomization of OTPs		X																		
IMPLEMENTATION STRATEGIES																				
ATTC: CM Didactic Training				X																
ATTC: CM Consultation Calls (Monthly)						X	X	X	X	X	X	X	X	X						
ATTC: CM Performance Feedback (Role Play and then Monthly)					X	X	X	X	X	X	X	X	X	X						
Enhanced-ATTC: Implementation Sustainment & Facilitation Strategy Meetings (Monthly)			X	X	X	X	X	X	X	X	X	X	X	X						
Enhanced-ATTC: Pay-for-Performance Incentives (Per Recording and Per Patient)						X	X	X	X	X	X	X	X	X						

Project MIMIC's Contingency Management Training

In-person workshop training

Timing	June, 2019
Location	University event center
Training staff	Trainer: Carla Rash Support: Project Staff
Duration	8.5 h, single-day event
Learning objective	Training to skills-based criterion*
Learning structure	Synchronous
Educational strategies	Didactic instruction Small group discussion Trainer demonstration/modeling Behavioral rehearsal
Educational activities	Introduction to CM principles Implementation planning Trainer modeling of CM delivery Application of fidelity ratings Dyadic role-play with peer Orientation to parent trial
Remuneration	6.0 continuing education units



Project MIMIC's Contingency Management Trainings

	In-person workshop training	Virtual workshop training
Timing	June, 2019	August, 2020
Location	University event center	Zoom-facilitated webinars
Training staff	Trainer: Carla Rash Support: Project Staff	Trainer: Carla Rash Support: Project Staff
Duration	8.5 h, single-day event	5 h, segmented over multiple days
Learning objective	Training to skills-based criterion*	Training to skills-based criterion*
Learning structure	Synchronous	Mix of synchronous/asynchronous
Educational strategies	Didactic instruction Small group discussion Trainer demonstration/modeling Behavioral rehearsal	Didactic instruction Small group discussion Trainer demonstration/modeling Behavioral rehearsal
Educational activities	Introduction to CM principles Implementation planning Trainer modeling of CM delivery Application of fidelity ratings Dyadic role-play with peer Orientation to parent trial	Introduction to CM principles Implementation planning Trainer modeling of CM delivery Application of fidelity ratings Dyadic role-play with peer Orientation to parent trial
Remuneration	6.0 continuing education units	5.0 continuing education units

Project MIMIC's Contingency Management Trainings

	In-person workshop training	Virtual workshop training
Timing	June, 2019	August, 2020
Location	University event center	Zoom-facilitated webinars
Training staff	Trainer: Carla Rash Support: Project Staff	Trainer: Carla Rash Support: Project Staff
Duration		Multiple days
Learning objective		Criterion*
Learning structure		Synchronous
Educational strategies		Modeling
Educational activities	Introduction to CM principles Implementation planning Trainer modeling of CM delivery Application of fidelity ratings Dyadic role-play with peer Orientation to parent trial	Introduction to CM principles Implementation planning Trainer modeling of CM delivery Application of fidelity ratings Dyadic role-play with peer Orientation to parent trial
Remuneration	6.0 continuing education units	5.0 continuing education units

How did these two trainings differ in terms of effectiveness, cost, and cost-effectiveness?

Participants

Table 2 Demographic and background characteristics of opioid treatment program staff

	In-person workshop training cohort	Virtual workshop training cohort
<i>N</i>	26	31
Age in years (Standard deviation)	37.48 (10.95)	36.65 (10.90)
Clinical experience in years (Standard deviation)	9.01 (7.53)	6.28 (6.65)
Workplace tenure in years (standard deviation)	3.70 (4.86)	2.40 (2.54)
Educational attainment*		
Less than a bachelor's degree	8%	10%
Bachelor's degree	46%	10%
Master's degree	46%	80%
Demography		
Female	81%	87%
Hispanic	8%	6%
Non-Hispanic White	81%	87%

The initial cohort, drawn from 8 recruited opioid treatment programs, attended an in-person training workshop in June, 2019; the latter cohort, drawn from 10 recruited opioid treatment programs, attended a virtual training workshop in August, 2020

* indicates between-cohort difference at $p < 0.05$, based on χ^2 test

Post-Training Assessment

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Psychometric properties of the Contingency Management Competence Scale[☆]

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ABSTRACT

Contingency management (CM) is an evidence-based treatment, and clinicians are beginning to implement this intervention in practice. However, little research exists on methods for assuring appropriate implementation of CM. This study describes the development and psychometric properties of the 12-item CM Competence Scale (CMCS). Thirty-five therapists from nine community-based clinics participated; following a training period, a randomized trial evaluated the efficacy of CM in cocaine addiction. Analyses of the CMCS are based on ratings from 1613 audiotapes of therapist interactions with 78 patients enrolled in the training phase and 103 patients in the randomized phase. Inter-rater reliability from 11 raters and internal consistency of items on the CMCS was good to excellent. Items loaded onto two factors: one contained items specific to discussions of the outcomes of urine testing and reinforcement, and the other contained general items related to use of praise, communication of confidence, empathy, skillfulness, and maintaining session structure, as well as discussions of self-reports of drug use when they occurred. During the training phase in CM delivery, scores on the CMCS rose significantly between earlier and later training sessions, and during the randomized phase, CM sessions were rated more highly than non-CM sessions. Scores on the subscale assessing general items were significantly correlated with indices of the therapeutic alliance and predictive of durations of cocaine abstinence achieved. These data suggest that the CMCS is reliable and valid in assessing delivery of CM and that competence in CM delivery is associated with improved patient outcomes.

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1. Introduction

Contingency management (CM) is an empirically based intervention for treating substance use disorders. In a recent meta-analysis and review of the literature, Dutra et al. (2008) concluded that CM was the psychosocial intervention with the greatest evidence of efficacy for substance abusing patients. Theoretically, CM is based on basic operant principles—a behavior that is reinforced will increase in frequency. The central tenants of CM are to: frequently monitor the behavior targeted for change, reinforce the behavior tangibly each time it occurs, and withhold reinforcement each time the behavior does not occur. Typically, in CM treatment of substance use disorders, drug abstinence is the behavior targeted for change. Urine sample monitoring occurs 2–3 times weekly, and patients earn reinforcers consisting of vouchers worth escalating monetary values or chances to win prizes ranging from \$1 to \$100 in value each time abstinence is detected (Higgins et al., 2000; Petry, 2000).

In the recent National Institute on Drug Abuse's Clinical Trials Network (CTN) studies of CM in the United States (Peirce et al., 2006; Petry et al., 2005a), over 800 stimulant abusing patients from 14 community clinics were randomized to standard care plus frequent urine testing or that same treatment plus the chance to win prizes contingent upon abstinence. The longest duration of abstinence achieved increased significantly in patients assigned to the CM condition relative to those assigned to the standard care condition. Meta-analyses likewise point to the efficacy of CM in treating substance abusers (Lussier et al., 2006; Prendergast et al., 2006).

With the completion of the CTN studies in CM, the National Institute on Drug Abuse and the Substance Abuse and Mental Health Services Administration in the United States created dissemination materials entitled Promoting Awareness of Motivational Incentives. Clinics in the United States and in other countries are beginning to implement CM in clinical settings (Cameron and Ritter, 2007; Garcia-Rodriguez et al., 2009; Lott and Jencius, 2009; Kellogg et al., 2005; Squires et al., 2008). As interest in CM grows, more effort needs to be directed toward training resources in CM delivery. In the only known study systematically evaluating adherence to CM implementation, Andrzejewski et al. (2001) noted that without regular feedback from CM experts, clinicians' administration of CM was often suboptimal, with clinicians failing to monitor and reinforce behaviors according to pre-specified criteria. As

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- Recordings were rated using the Contingency Management Competence Scale (CMCS)
 - Assesses six CM specific skills and three general therapy skills on a 7-point scale (1 = very poor to 7 = excellent)
- Trainees submitted an audio-recording of a standardized role play within 30 days of workshop completion
- Trainees received a written feedback report detailing their performance
- Mean score of 4.0 for Basic Proficiency
- Mean score of 5.8 for Advanced Proficiency



Training Effectiveness (Unadjusted)



- Cohort 1: In-person Training
 - 26 counselors from 8 OTPs
 - 85% achieved Basic Proficiency
 - 31% achieved Advanced Proficiency



- Cohort 2: Virtual Training
 - 31 counselors from 10 OTPs
 - 97% achieved Basic Proficiency
 - 45% achieved Advanced Proficiency

No statistically significant differences

Total Costs



- Cohort 1: In-person Training
 - \$24,547



- Cohort 2: Virtual Training
 - \$13,725

**\$10,822 (44%) less than
in-person training**

Average Cost Per Trainee



- Cohort 1: In-person Training
 - \$792



- Cohort 2: Virtual Training
 - \$393

**\$399 (50%) less than
in-person training**

Average Cost Per Trainee

Table 3 Actual expenses for in-person and virtual workshop training

	In-person workshop training	Virtual workshop training
Workshop training	\$719	\$322
Labor costs		
Counselors	\$260	\$151
Training Staff	\$130	\$65
Travel costs		
Counselors	\$112	–
Training Staff	\$44	–
Space and Meal Costs	\$163	\$44
Materials Costs	\$10	\$62
Submitted role plays	\$73	\$71
Labor costs		
Counselors	\$4	\$2
Training staff	\$28	\$29
Materials costs	\$41	\$40
Total costs	\$792	\$393

All costs are actual per-counselor costs, based on the recruited cohorts of opioid treatment programs' staff for in-person workshop training ($n = 26$) and virtual workshop training ($n = 31$)

Cost-effectiveness

Table 4 Cost-effectiveness metrics for achievement of proficiency benchmarks

	Adjusted cost estimates	Adjusted rate for staff achievement of the beginning proficiency benchmark	Beginning proficiency ICER	Adjusted rate for staff achievement of the advanced proficiency benchmark	Advanced proficiency ICER
In-person workshop training	\$811	0.86		0.36	
Virtual workshop training	\$388	0.96		0.41	
Incremental difference	\$423*	-0.10	Dominant	-0.05	Dominant

The adjusted cost and proficiency estimates in this table reflect estimates controlling for the effects of educational attainment, and therefore may not match the actual costs of training. Incremental Cost-Effectiveness Ratios (ICERs) were calculated to specify the ratio of between-cohort costs to the ratio of between-cohort proficiency estimates. The ICERs were derived from the contingency management competency data. The ICER for the virtual training was -0.05, indicating that the virtual training was more effective and less costly than the in-person training. The ICER for the in-person training was 0.36, indicating that the in-person training was more costly and less effective than the virtual training. The ICER for the incremental difference was -0.05, indicating that the virtual training was more effective and less costly than the in-person training.

* $p < 0.05$

The virtual training was the dominant strategy because it was both (a) more effective and (b) less costly

Cost-effectiveness acceptability curves

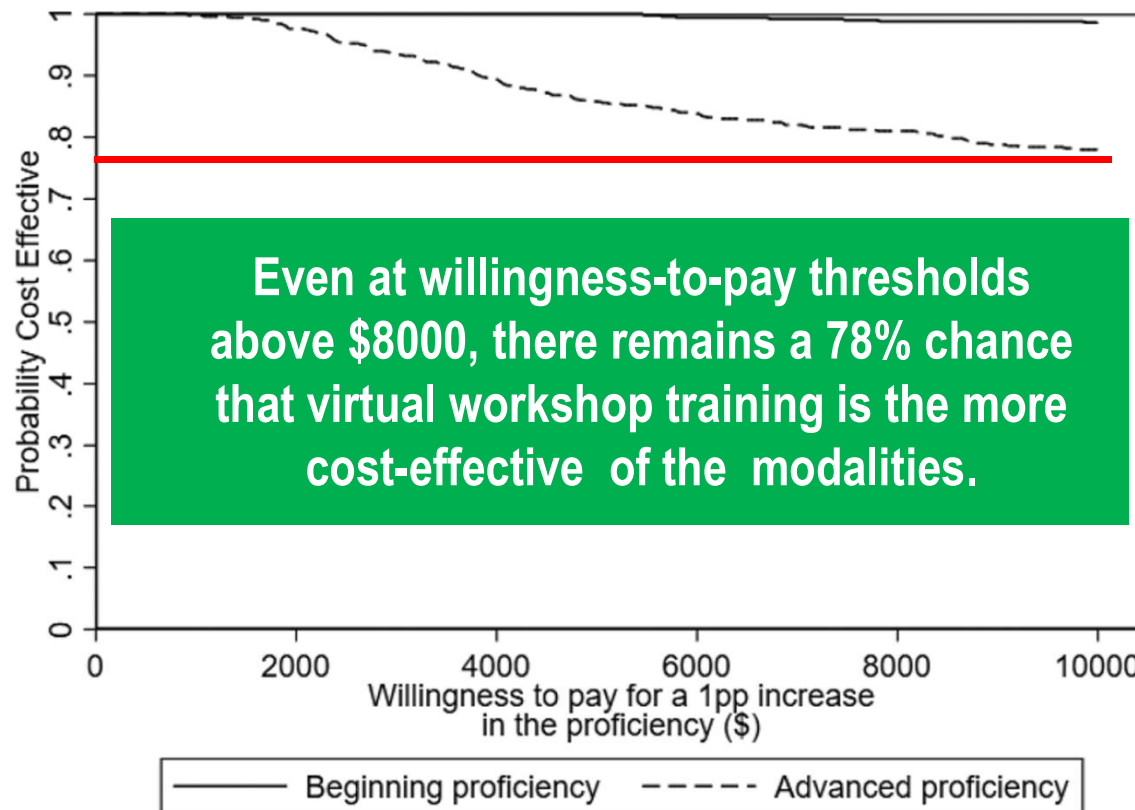


Fig. 1 Cost effectiveness acceptability curve

Discussion

- In response to COVID-19, the research team was able to successfully translate the project's in-person training into a virtual training format
- The virtual training resulted in higher rates of training effectiveness during the project's preparation phase, which was observed for both basic proficiency and advanced proficiency
 - Notable limitations are that: (a) it is possible that these differences were due to the training team improving over time and (b) these differences were limited to the preparation phase.
- Due to the elimination of travel costs, and due to reduce space and meal costs, the virtual training cost was 50% less per trainee
- Due to being both more effective (although not statistically significant) and less costly, the virtual training “dominated” the in-person training for our project's preparation phase
- Future research will be examining differences during the implementation phase.

Publication



Hartzler B, Hinde J, Lang S, Correia N, Yermash J, Yap K, Murphy CM, Ruwala R, Rash CJ, Becker SJ, Garner BR. Virtual Training Is More Cost-Effective Than In-Person Training for Preparing Staff to Implement Contingency Management. *Journal of Technology in Behavioral Science*. 2022 Oct 12:1-0.

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THANK YOU!

- Bryan R. Garner, PhD, Professor
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