

# Text Message Reminders and Their Impact on Attendance at Healthy Marriage and Relationship Education Workshops



February 2022



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## **Text Message Reminders and Their Impact on Attendance at Healthy Marriage and Relationship Education Workshops**

February 2022

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## Overview

### Introduction

The ability of healthy marriage and relationship education (HMRE) programs to have a meaningful impact hinges on participants' attendance and engagement. Most HMRE programs for adults include group-based workshop sessions that participants attend individually or as a couple. For these services to have their intended effect, clients must have substantial exposure to them.

Limited participation can be a common challenge in voluntary, family-based programs. Even among couples who initially participate in workshops, regular attendance can be a challenge. Further, participants who are in most need of services might face significant hurdles to consistently attending. In light of these participation challenges, there is a need for effective outreach strategies to help HMRE programs reach their target population, boost initial participation, and support regular attendance.

One potential way to support attendance at HMRE group workshops is through “nudges” sent to participants. A nudge is a small, easy, and inexpensive change to an environment or to the way choices are presented. The aim is to influence recipients' behavior and decision making. Nudges can take many forms, from a simple reminder that can address memory failure to more targeted content that addresses other factors such as procrastination or low motivation.

In this study, we examined the effectiveness of sending nudges through text message reminders to boost couples' attendance at an HMRE program called ELEVATE. In 2015, the University of Florida (UF) received a five-year grant from the Office of Family Assistance (OFA) within the Administration for Children and Families (ACF) to deliver ELEVATE through the university's county-based Cooperative Extension Service. Program staff delivered ELEVATE through a series of five weekly workshop sessions for couples. For this study, we used a random assignment evaluation design to measure the impacts of text message reminders on two aspects of couples' workshop attendance: (1) continuing attendance among couples that attended the first workshop session and (2) initial attendance at the first workshop session among couples that registered for the program. We also compared the effectiveness of different types of text message reminders by varying the content of the reminders.

### Research questions

This report addresses the following primary research questions:

- Can text message reminders have an impact on couples' *continued attendance* at HMRE group workshop sessions? If so, which types of reminders are most effective?
- Can text message reminders have an impact on couples' *initial attendance* at HMRE group workshop sessions? If so, which types of reminders are most effective?

### Purpose

This report describes the impacts of text message reminders on couples' continuing attendance and initial attendance at UF's ELEVATE group workshop sessions. These impacts were estimated by comparing the attendance outcomes of more than 1,700 couples that enrolled in the study as part of the ELEVATE program. To estimate impacts, we randomly assigned each couple to receive a different type of text message reminder or to a control group that did not receive reminders. In addition to describing these impacts, the report also summarizes earlier evidence on the effectiveness of text message reminders, describes the process we used to develop different text message reminders, and documents the study

design and methods. An earlier report provided more detailed information on the design and implementation of the ELEVATE program during the first two years of the impact study. Mathematica and Public Strategies conducted this study as part of the Strengthening Relationship Education and Marriage Services (STREAMS) evaluation for ACF.

### **What we learned**

- We found no evidence to suggest that any one of the text message reminders was more effective than others (or sending no reminders) in increasing continued session attendance. Among couples who attended the first workshop session, attendance rates were high for the rest of the workshop sessions after the first one and were similar across all research groups. Most couples attended three additional sessions after the first one and missed no more than one session over the course of the workshop.
- We found that simple text message reminders that provided only the date and time of the first session increased couples' initial session attendance by about seven percent points. Among couples who registered for a workshop, many did not attend the first workshop session. Only 58 percent of couples who did not receive reminders attended the first session. However, the attendance rate at the first session was higher (65 percent) for couples who received simple reminders. The simple reminders also outperformed two enhanced reminders we had designed for this study that included motivational messages, graphics, and peer testimonials.

### **Methods**

Study enrollment occurred over a three-year period from January 2017 to February 2020. For the first two years of the study, couples were enrolled at the first ELEVATE workshop session and randomly assigned to either a control group that received no reminders or one of several study groups that each received a different type of text message reminder. We compared couples' attendance outcomes across groups to estimate impacts on couples' continuing session attendance. For the last year of the study, the timing of study enrollment changed to happen when couples first registered for the workshop. We used attendance data from this period of the study to estimate the impacts of different text message reminders on couples' initial session attendance.

Throughout the study, both members of the couple had to provide consent to the STREAMS evaluation and provide valid phone numbers to receive text messages, and neither member could have previously attended an HMRE workshop offered by UF. To estimate impacts more efficiently than would be possible with a traditional randomization procedure, we used a Bayesian adaptive design to randomly assign couples to research groups. This design involved conducting interim analyses of the study outcome data to make mid-course changes to the random assignment procedures and inform how future study participants were randomly assigned.

### **Considerations for HMRE programs and research**

Our results suggest that text message reminders can be effective in increasing attendance at HMRE group workshop sessions but that providers must pinpoint the source of the leak in the attendance pipeline and then target reminders accordingly. As this study unfolded, we learned that (1) among couples that attended the first session, continued attendance was high at remaining sessions and (2) text message reminders did not further increase attendance. When we interviewed program staff and participants to assess why some couples missed a session after the first one, we found that the reason usually involved something outside the scope of a text message reminder. We also learned that the largest drop in

attendance occurred between workshop registration and the first session. In response, we shifted the study's focus to improving initial attendance among workshop registrants and found that simple text message reminders increased the initial attendance rate. Our experience highlights the importance of looking at attendance patterns to identify the source of couples' difficulties with initial or regular attendance and then directing the reminder messages accordingly.

The findings from this study also suggest that simple reminders may work better for HMRE program participants as compared to messages with enhanced content such as motivational messages, graphics, or peer testimonials. This study does not allow us to conclude why the simple reminder was most effective at increasing initial attendance, but we can suggest a few possibilities. Given the personal nature of romantic relationships, it might be difficult to design enhanced content that captures couples' many possible motivations for attending HMRE group workshop sessions. Capturing motivations might be particularly tough for programs that serve diverse populations, as ELEVATE did. It is possible that some HMRE providers know their clients well enough or serve a narrow enough population that they could craft carefully worded text message reminders that resonate with everyone. For most HMRE programs, however, our findings from ELEVATE suggest that it may be advisable to keep the content simple.

Future research should explore whether and how these findings generalize to other populations, programs, and methods for sending text message reminders. ELEVATE offered five workshop sessions to a demographically diverse mix of couples from six counties in different parts of Florida. Although a five-session workshop is about average in length for recent HMRE grantees, some programs offer much longer workshops or additional content and services. In addition, as compared to clients served by other federally funded HMRE programs, the ELEVATE participants had higher education levels, lower levels of economic insecurity, and one fewer child, on average. These factors could limit the generalizability of our study findings to other programs and contexts. We sent the text messages using an automated software system. Although the system was easy to use and efficient, it did not allow for interactive dialogue, which might have led some couples to perceive the messages as impersonal. Future research should seek to build rigorous evidence on the impacts and cost-effectiveness of more personalized approaches for sending text message reminders.

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## Introduction

The ability of healthy marriage and relationship education (HMRE) programs to have a meaningful impact hinges on participants' attendance and engagement. Most HMRE programs for adults include group-based workshop sessions that participants attend individually or as a couple. Across the cohort of HMRE grantees funded by the Office of Family Assistance (OFA) within the Administration for Children and Families (ACF) of the U.S. Department of Health and Human Services in 2015, programs for adults offered group-based workshops with an average of five sessions and an average of 13 workshop hours (Avellar et al. 2021a). For these services to have their intended effect, clients must have substantial exposure to them (Nation et al. 2003). Despite limited evidence on the exact number of sessions required for programs to have their intended benefits, a few studies have shown that greater participation and dosage are associated with better outcomes (Hawkins et al. 2012; Cobb and Sullivan 2015; Bradford et al. 2017; Arnold and Beelmann 2019).

Limited participation can be a common challenge in voluntary, family-based programs (Eisner and Meidert 2011; Fabiano 2007; Nock and Photos 2006). A recent study of HMRE grantees found that about one in five adult couples who enrolled in the programs never attended a workshop session (Avellar et al. 2021a). Even among adult couples who initially participate in workshops, regular attendance can be a challenge. Earlier evaluations of federally funded HMRE programs for couples show that programs vary in their degree of success in getting couples to participate in workshops and regularly attend sessions (Dion et al. 2010; Miller et al. 2012; Zaveri and Baumgartner 2016). For example, among programs in the Building Strong Families evaluation that enrolled low-income unmarried couples who were expecting or had recently had a child, only 55 percent of couples attended a workshop session and participating couples attended for a little over half the workshop hours offered (Dion et al. 2010). In contrast, among programs in the Supporting Healthy Marriage evaluation that served low-income married couples, 83 percent of couples attended a workshop session, and participating couples attended for 71 percent of the workshop hours offered (Miller et al. 2012). Further, participants who are in most need of services might face significant hurdles to consistently attending (Erickson and Egeland 2011). In light of these participation challenges, there is a need for effective outreach strategies to help HMRE programs reach their target population, boost initial participation, and support regular attendance.

One potential way to support attendance at HMRE group workshop sessions is through “nudges” sent to participants. A nudge is a small, easy, and inexpensive change to an environment or to the way choices are presented. The aim is to influence recipients' behavior and decision making (Thaler and Sunstein 2008). Nudges can take many forms, from a simple reminder that can address memory failure to more targeted content that addresses other factors such as procrastination or low motivation. Reminders may be especially effective for families with low incomes; in such families, the cognitive and emotional demands of daily financial stressors can pull their attention from other intended actions (Mani et al. 2013; Haushofer and Fehr 2014; Gennetian et al. 2016). Similarly, for couples with children, reminders might help capture parents' attention and energy, which can be limited by the competing demands of parenting and daily life (Mullainathan and Shafir 2013).

In this study, we examined the effectiveness of sending nudges through text message reminders to boost couples' attendance at a five-session HMRE group workshop. Although nudges can be sent in various forms such as postcards, emails, or phone calls, this study focused on text message reminders because they can provide information in a practical, timely, and inexpensive manner. We used a random assignment evaluation design to measure the impacts of text message reminders on two aspects of

couples' workshop attendance: (1) continuing attendance among couples that attended the first workshop session and (2) initial attendance at the first workshop session among couples that registered for the program. We also compared the effectiveness of different types of text message reminders by varying the content of the reminders. Therefore, in this report, we provide evidence on the following research questions:

- Can text message reminders have an impact on couples' *continued attendance* at HMRE group workshop sessions? If so, which types of reminders are most effective?
- Can text message reminders have an impact on couples' *initial attendance* at HMRE group workshop sessions? If so, which types of reminders are most effective?

To answer these questions, we compared the attendance outcomes of more than 1,700 couples that enrolled in the study as part of a statewide HMRE program in Florida called ELEVATE. In 2015, the University of Florida (UF) received a five-year grant from OFA to deliver a five-session HMRE workshop, ELEVATE, through the university's county-based Cooperative Extension Service. To assess the impacts of text message reminders on couples' attendance at HMRE group workshop sessions, the study team partnered with UF staff to assign couples in the ELEVATE program randomly to either a control group that received no reminders or one of several study groups that each received a different type of text message reminder. The study was part of the broader Strengthening Relationship Education and Marriage Services (STREAMS) evaluation conducted by Mathematica and Public Strategies for ACF's Office of Planning, Research and Evaluation, with funding from OFA.

In this report, we present findings from the impact study of text message reminders on couples' HMRE group workshop attendance. We also summarize earlier evidence on the effectiveness of text message reminders, describe UF's ELEVATE program, and document the study design and methods. An earlier report provided more detailed information on the design and implementation of UF's ELEVATE program during the first two years of the impact study (Alamillo et al. 2020).

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### About the STREAMS evaluation

Since the early 2000s, the Administration for Children and Families (ACF) in the U.S. Department of Health and Human Services has led a sustained effort to expand the available evidence on healthy marriage and relationship education (HMRE) programs. In 2015, ACF contracted with Mathematica and its partner, Public Strategies, to conduct the Strengthening Relationship Education and Marriage Services (STREAMS) evaluation to help identify strategies for improving the delivery and effectiveness of HMRE programs. The evaluation has a particular emphasis on understudied populations and program approaches not covered in ACF's prior federal evaluations. STREAMS includes in-depth process studies, random assignment impact studies, a rapid-cycle evaluation of text message reminders to improve attendance at HMRE group workshops, a formative evaluation of a facilitation training curriculum for HMRE programs for high school students, and predictive analytic modeling of attendance at HMRE group workshops. Learn more about the evaluation at <https://www.acf.hhs.gov/opre/research/project/strengthening-relationship-education-and-marriage-services-streams>.▲

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## Prior research on the impacts of text message reminders on attendance

Text message reminders have the potential to address several challenges (for example, inattention, procrastination, memory failure, and competing demands on time) that can keep people from completing their intended actions. For example, to address inattention or memory failure, well-timed text messages can remind recipients of their intended actions at the right moment. Other challenges can be addressed through the content of the reminders by, for instance, providing information that can simplify decision making, build trust, or correct misperceptions.

Substantial evidence from health care and education settings indicates that text message reminders can increase attendance at scheduled appointments and events. For example, health care studies show that sending text message reminders can increase attendance at doctors' and dentists' appointments by 5 to 10 percentage points (Boksmati et al. 2016; Free et al. 2013; Gurol-Urganci et al. 2013; Lin and Wu 2014; Mayer and Fontelo 2017; Guy et al. 2012). Research further suggests that sending several reminders or various types of reminders can help reduce missed appointments and boost attendance. For example, a systematic review of 33 studies of hospital appointment reminders found a 34 percent decline in missed appointments among patients who received both telephone and text message reminders (Hasvold and Wootton 2011). According to a meta-analysis of digital notifications on clinic attendance, notifications increased the likelihood of patients attending clinics by 23 percent (Robotham et al. 2016). Further, compared to sending only one notification, sending two or more notifications increased attendance by as much as 19 percent. In education research, two recent studies found that text messaging campaigns can reduce absenteeism among students (Heppen et al. 2020; Bergman and Chan 2019).

There is less evidence on the effectiveness of text message reminders in increasing attendance at voluntary community-based programs for couples and families. One study of a parent training program found that a simple text message reminder with the date and time of the next parenting class increased program completion rates (Murray et al. 2015). The present study is the first to examine the impacts of text message reminders on couples' attendance at HMRE group workshop sessions.

A small but growing body of research suggests that the design and content of messages can also be factors in determining message effectiveness. For example, one recent study compared the effectiveness of 19 nudges sent via text message to increase flu vaccination rates (Milkman et al. 2021). The study found that the nudges increased vaccination rates by an average of 5 percent overall but that the most effective messages were those communicating that a flu shot was "waiting" or "reserved" for the recipient. Similarly, a study in the United Kingdom investigating attendance rates at doctors' appointments found that, compared to patients who received a simple text message reminder, patients had higher attendance rates when their reminder indicated the cost to the public of missing their appointment (Hallsworth et al. 2015). One study in New York city examined the effectiveness of postcards and text messages to increase the number of participants who attended an informational meeting about an earnings supplement for which they might be eligible (Dechausay et al. 2015). The study found that the reminders were most effective in increasing attendance when the content presented simplified choices, displayed deadlines prominently, and included implementation prompts.

## The ELEVATE program

We conducted the present study in coordination with UF's statewide ELEVATE program. Starting in 2017, staff from the UF's Cooperative Extension Service delivered a five-session HMRE workshop for adult couples in six Florida counties. The program was based on the *ELEVATE* curriculum, which was

originally developed as part of the Alabama Healthy Marriage and Relationship Education Initiative for delivery through Extension programs and other organizations (Futris et al. 2014). ELEVATE has two primary goals: (1) to teach couples practical strategies and tools to maintain a healthy relationship and (2) to develop mindfulness practices that help couples regulate their physiological responses to conflict and stress. The curriculum includes eight, one-hour modules that cover topics such as understanding how relationships affect physical and mental health, managing conflict and stress, and intimacy. An earlier report concluded that the program was generally implemented as intended (Alamillo et al. 2020).

In Florida, program staff delivered ELEVATE through a series of five weekly workshop sessions for couples. Each weekly session lasted about 2.5 hours. Notably, ELEVATE's number of sessions and duration of ELEVATE was close to the average among OFA's recent HMRE grantees (Avellar et al. 2021a). The sessions were held at a variety of community-based locations, including Extension offices, community centers, libraries, and on the UF campus. In most counties, UF started new ELEVATE workshops on a regular basis, typically the week after the previous workshop ended, thereby minimizing the time that interested couples had to wait between registering for and starting the workshop. This approach enabled program staff to start a new five-week workshop cycle up to nine times a year. In advance of each workshop cycle, program staff recruited couples through Internet advertisements; word-of-mouth referrals; advertisements in local newspapers, magazines, and on the radio; and program flyers distributed at community events and through local partner organizations. To enroll in the program, couples completed an online registration form. They also had to complete an application survey and program entrance survey during the first workshop session.

In addition to the text message reminders designed for the present study, UF offered several supports to encourage couples' participation in the program. Each workshop session included 30 minutes for a shared meal. Each member of the couple received a \$10 gift card for attending the first two sessions and completing the application and program entrance surveys as well as a \$25 gift card for attending all five sessions and completing a program exit survey. In addition, for couples in need of childcare, the program coordinator compiled a list of childcare providers located near each workshop for instructors' distribution to participants on request. Given that most counties offered several concurrent ELEVATE workshops on different days of the week, couples could drop into a workshop offered on a different day to make up a missed session. Couples could also make up one missed session by watching an online video recording of the session. Findings from the earlier implementation study suggest that the make-up options were important for boosting attendance (Alamillo et al. 2020). Unlike some other HMRE programs, the ELEVATE program did not provide supplemental services such as intensive case management or employment services.

ELEVATE served a demographically diverse mix of couples from the following six counties across the state: Alachua, Citrus, Duval, Manatee, Palm Beach, and Santa Rosa. The counties vary in terms of population size, demographic composition, urban location, and poverty rates (Alamillo et al. 2020). Palm Beach and Duval counties are primarily urban counties with nearly 1 million residents each, whereas Citrus and Santa Rosa counties are more rural counties and home to smaller populations. Alachua and Manatee counties are mid-sized counties with 250,000 to 400,000 residents each. Alachua County, where UF is located, accounted for the largest number of participants. Across the six counties, most participants (6 in 10) were between the ages of 25 and 44 (Table 1). About 56 percent of participants were non-Hispanic White, 20 percent were non-Hispanic Black, 17 percent were Hispanic, and 7 percent identified with other racial/ethnic groups. Although most participants were married (59 percent), the program also served unmarried participants.



**Table 1. Characteristics of study participants who attended ELEVATE workshops**

Baseline characteristics	Mean or percentage
<b>Age</b>	
Younger than 25	12%
25–34	34%
35–44	26%
45–54	14%
55 and older	14%
<b>Race/ethnicity</b>	
White, non-Hispanic	56%
Black, non-Hispanic	20%
Hispanic/Latino	17%
Other	7%
<b>Relationship and cohabitation status</b>	
Married	59%
Unmarried, but living together all of the time	27%
Unmarried, but not living together all of the time	15%
<b>Number of children</b>	
0	51%
1	17%
2	17%
3 or more	15%
Average number of children	1.1
<b>Highest education level</b>	
Less than high school	2%
High school degree/GED	12%
Some college or currently enrolled in college	47%
Bachelor's degree or higher	39%
<b>Employment status</b>	
Currently employed	81%
<b>Earnings per month</b>	
Less than \$500	17%
\$500–\$1,000	9%
\$1,001–\$2,000	18%
\$2,001–\$3,000	20%
More than \$3,000	36%
<b>Difficulty in paying bills</b>	
Never	82%
Somewhat often	12%
Very often	6%
<b>Motivation for enrolling</b>	
To learn how to improve my personal relationships	72%
To learn about being a better parent	3%
My spouse/partner asked me to come, or my friends were coming	23%
Other reason	3%
<b>Sample size</b>	<b>2,570</b>

Source: Applicant characteristics and entrance surveys.

Note: Table includes all study participants who were sent text messages and attended the first session of an ELEVATE workshop. Not all percentages add to 100 percent because of several items being rounded, endorsed or missing responses.

Compared to clients in typical federally funded HMRE programs, participants in the ELEVATE program differed in three important ways. First, they had higher education levels. Across the 2015 cohort of HMRE grantees funded by OFA, just over half (55 percent) reported that they had attended college or received a postsecondary degree (Avellar et al. 2020). In contrast, 86 percent of ELEVATE participants reported that they completed at least some postsecondary education (Table 1). Second, ELEVATE participants reported lower levels of economic insecurity. For example, across the 2015 cohort of HMRE grantees funded by OFA, 38 percent of participants reported that they earned less than \$1,000 in the month before enrollment (Avellar et al. 2020). In contrast, 26 percent of ELEVATE participants reported that they earned less than \$1,000 in the month before enrollment. Third, ELEVATE participants had, on average, one fewer child than did participants across the 2015 cohort of HMRE grantees (an average of one versus two, respectively). To the extent that education levels, financial circumstances, and the presence of children in the household can affect consistent attendance at HMRE group workshop, these differences mean that the attendance patterns we found for the ELEVATE participants might not be typical of other federally-funded HMRE program for couples.

### Development of text message reminders for HMRE group workshops

#### Designing text message reminders

To develop the text message reminders used for the study, we followed a process called “behavioral diagnosis” to identify, understand, and try to mitigate potential barriers to attendance at HMRE group workshop sessions. The process involved identifying the barriers or “bottlenecks” couples may face in attending workshop sessions and then developing nudges that target the barriers. At the outset of the study, three members of the study team conducted site visits to four of the six Florida counties that planned to host the ELEVATE workshops. During the site visits, the study team members collected information from program leaders and staff about the intended population, program logistics, workshop design, and curriculum content. In addition, the team members consulted with program staff during the site visits and then conducted follow-up telephone discussions with program staff about staff perceptions of the attendance challenges faced by workshop participants. Further, study team members reviewed past studies of HMRE programs for evidence on couples’ motivations for enrolling in HMRE programs and the challenges faced by such programs in encouraging couples to participate in those earlier HMRE group workshop sessions.

Drawing on the above information, we developed a list of possible reasons for non-attendance at HMRE group workshop sessions and then identified one or more behavioral bottlenecks corresponding to each reason (Table 2). For example, the list of possible reasons for non-attendance included forgetting the date or time of the session, lacking childcare or reliable transportation, and losing the initial motivation to attend. We mapped each possible reason with underlying behavioral bottlenecks that were preventing attendance. For example, if a couple does not attend a session because both members forget the date or time of the session, the underlying bottleneck could be inattention or memory failure. By contrast, if a couple does not attend a session because both members view other activities as more important, the couple might discount the future payoff from the workshop relative to more immediate payoffs from other activities (present bias), or the couple might perceive the program’s benefits as abstract and not applicable to their lives (psychological distance).

**Table 2. Possible behavioral bottlenecks**

Reason for not attending a session	Behavioral bottlenecks
Forget that they have a session, or forget to attend the session at the appropriate time	Inattention, memory failure
Have last-minute childcare or transportation difficulties or schedule conflicts	Hassle factors
Fail to plan for childcare, transportation, work schedule, other family activities	Cognitive overload, procrastination
Think the workshop won't be informative or helpful	Mistrust/skepticism, psychological distance
Think other activities are more important	Present bias, psychological distance
Lose initial motivation or urgency relative to the time of enrolling	Psychological distance
Experience fatigue	Low motivation
Think that their relationship has already improved and that they no longer need the sessions	Over-optimism
Think/feel that their relationship is not salvageable and/or that the sessions haven't or won't help	Mistrust/skepticism
Fear what they or others might learn about themselves, their partner, or the relationship	Avoidance
Think/feel that the HMRE sessions are making things worse	Mistrust/skepticism, avoidance

After we listed all the possible reasons for non-attendance and diagnosed the corresponding behavioral bottlenecks, we identified priority bottlenecks that we would seek to address. We did so by identifying the reasons that seemed most relevant for UF's ELEVATE program and the bottlenecks that could feasibly be addressed via text message reminders—without necessitating a change in program offerings or logistics. For example, perhaps a major reason that couples miss a session is that they perceive other activities as more important. In that case, messages that remind couples that workshop participation could potentially improve their relationship skills or relationship quality could feasibly address the underlying bottlenecks of psychological distance and present bias. As another example, perhaps a significant reason that couples miss a session is that they fail to plan for childcare and transportation. In that case, messages that prompt couples to make plans for childcare and transportation well in advance of workshop sessions could address the underlying bottlenecks of cognitive overload and procrastination. In contrast, some couples may miss a session because of last-minute childcare or transportation difficulties. We did not attempt to address the underlying bottleneck of “hassle factors” because preprogrammed text message reminders could not address such matters. The study team drew on discussions with program leadership and staff as well as past studies of HMRE programs to identify priority bottlenecks. We identified the following priority bottlenecks: inattention, memory failure, cognitive overload, procrastination, mistrust/skepticism, psychological distance, and present bias.

After identifying priority bottlenecks, we developed text message reminders that could target the bottlenecks. Some types of reminders included simple messages that stated the day and time of the upcoming class, while others included behavioral nudges. For example, one type of reminder included future-oriented motivational messages based on program goals (see text box). Some messages were accompanied by images that aimed to reinforce the content of the text message. We also tested alternative implementation of some types of text message reminders. For example, we tested changes in the frequency of messages by comparing attendance outcomes when sending three messages in the first week versus two messages in the first week. In another instance, we assessed the extent to which outcomes

differed when we sent messages to only one member of the couple instead of both members. In developing the reminders, we analyzed characteristics of ELEVATE program participants in terms of demographics, marital and cohabitation status, family structure, language preference, employment status, and motivation for enrolling. We drew on behavioral science theory, earlier studies of the effectiveness of reminders, and previous qualitative research of HMRE programs. We consulted with Dr. Ariel Kalil, an expert in behavioral insights research, and with Mathematica staff with expertise in behavioral insights or HMRE research. We also solicited feedback on the messages from the program’s leaders and staff. In later sections of this report, we describe all the types of text message reminders that the study assessed.

We continuously updated our assessment of behavioral bottlenecks as the study progressed. As discussed in greater detail later in the report, the study used an adaptive random assignment design that enabled us to collect and analyze information on attendance patterns on an ongoing basis. In addition, we held regular discussions with program staff, who conveyed workshop participants’ feedback on the messages. We also conducted site visits and focus groups with a subset of workshop participants to hear their direct feedback on the messages. For a subset of workshop participants who missed at least one session, we conducted follow-up telephone calls to understand more fully their reasons for non-attendance. We used the latest information from these sources to develop and refine the text message reminders iteratively.

Throughout the study, we personalized all text message reminders with the recipient’s name. We always sent the messages in the early evening, when participants were less likely to be distracted by other demands such as work and more likely to be able to communicate with their partner about the upcoming workshop session. For most types of reminders, we sent between one and three messages per week, including one message the evening before the upcoming class. Messages were in either English or Spanish, depending on the participants’ language preference stated at the time of enrollment.

### Delivering text message reminders

We used an automated text message software called SignalVine to send text messages to participants. The automated software enabled us to preprogram the text messages to be received by each couple at designated times and days. To facilitate programming, members of the study team uploaded a small set of information about each participant: his or her first name; the first name of his or her partner; telephone number; county of program; name, time, and dates of the couple’s workshop series; and an indicator for

#### Example: Future-oriented motivational reminder with image

“*[Joanna]*, you won’t want to miss tomorrow’s ELEVATE class about managing conflict and finding compromise. It will help you and *[Mike]* build a stronger future together.”



the type of reminder to be sent. SignalVine sent participants the text messages associated with their study group at specified times and dates relative to their next session.

As compared to manually sent reminders, the automated text messages provided several advantages. Automation kept costs low. It also guaranteed consistency in our messages so that the timing, frequency, and wording of messages were identical for all couples within a study group. At the same time, the software could efficiently personalize messages by filling in details such as participants' names and dates of upcoming sessions by drawing on data uploaded by the study team for each workshop series. We could iteratively test different types of reminders by periodically modifying, adding to, or dropping from the software the preprogrammed strings of messages.

However, the use of an automated text message software involved two limitations. First, the software did not easily allow for interactive conversation. For example, if a recipient responded to a reminder message with a question about parking options for the upcoming session, they did not receive an immediate answer. Instead, the recipient received an automatic response asking them to contact the local program office for assistance. Second, participants may have perceived the messages as impersonal because they were sent by an automated software system rather than by program staff.

### Test 1: Impacts on continued workshop attendance

For the first two years of the study (January 2017 through December 2018), we examined the impacts of text message reminders on *continued* workshop attendance among couples that attended the first session. Specifically, for couples that attended the first workshop session, we examined if sending them text message reminders could increase their attendance at the next four workshop sessions. To that end, we posed the following research questions: (1) Can text message reminders have an *impact on couples' continued attendance* at HMRE group workshop sessions? (2) If so, which types of reminders are most effective?

For this test, we randomly assigned couples that attended the first session either to a control group that received no reminders or to one of several treatment groups, each associated with one type of text message reminder. Once we randomly assigned a couple to a treatment group, the couple would receive the associated type of text message reminders for the duration of the workshop. We used an adaptive design and did not test all the types of text message reminders simultaneously. We began the study by testing three types of reminders against the control group. Then, when we had collected enough data for the initial set of text message reminders to have relatively high confidence in their estimated impacts, we dropped some treatment groups and introduced new ones. Details on our adaptive procedures appear in the appendix to this report.

Over the course of 24 months, we tested the following types of reminders at different time points:

1. **Simple reminders (nine messages)** stated the date and time of the next session. We sent each member of the couple a total of nine messages.
  - For example: “Joanna, your next ELEVATE class is on Thursday at 7 p.m.”
2. **Simple reminders (five messages)** stated the date and time of the next session. We sent each member of the couple a total of five messages.
  - For example: “Joanna, your next ELEVATE class is on Thursday at 7 p.m.”



3. **Planning prompts (nine messages)** encouraged the recipient to do any planning needed to facilitate attendance at the next session. We sent each member of the couple a total of nine messages.
  - For example: “Joanna, your next ELEVATE class is on Thursday at 7 p.m. Have you and Mike made your plans to attend? Don’t let anything get in your way!”
4. **Future-oriented motivational reminders (nine messages)** described the content of the next session and motivated attendance by emphasizing the benefits for the couple. We sent each member of the couple a total of nine messages.
  - For example: “Hi, Joanna! Tomorrow’s ELEVATE class is about trust and commitment. It will help you and Mike build skills for understanding and supporting each other. See you at 7 p.m.!”
5. **Future-oriented motivational reminders with graphics (five messages)** were similar to the future-oriented motivational reminders but included graphic images to reinforce the content of the message. We sent each member of the couple a total of five messages.
6. **Men-only future-oriented motivational reminders with graphics (five messages)** were the same as the future-oriented motivational reminders with graphics but were sent only to the male member of the couple. For couples with two males, we randomly selected one member to receive the messages. We sent these men a total of five messages.
7. **Women-only future-oriented motivational reminders with graphics (five messages)** were the same as the future-oriented motivational reminders with graphics but were sent only to the female member of the couple. For couples with two females, we randomly selected one member to receive the messages. We sent these women a total of five messages.

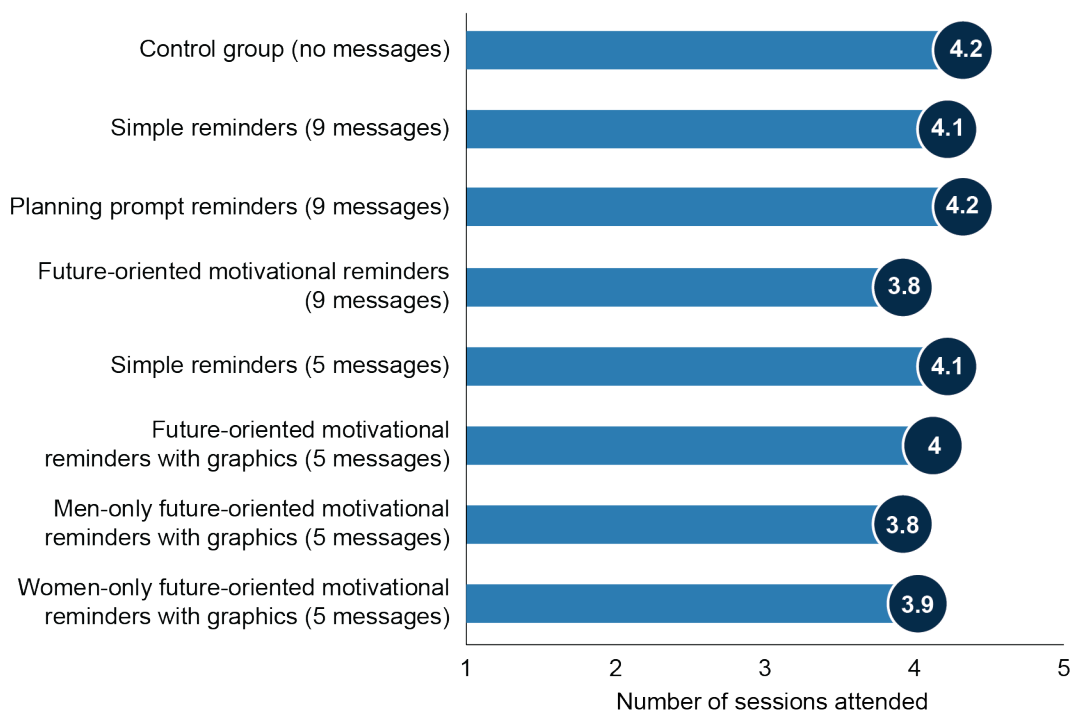
We used a Bayesian adaptive design (Finucane et al. 2018) to assign couples randomly across the treatment groups, a strategy that allowed us to test a large number of interventions more efficiently than would be possible with a more traditional randomization procedure. When the test started in January 2017, we randomly assigned couples in equal probability to either the control group or one of the first three treatment groups listed above (simple reminders, planning prompt reminders, or future-oriented motivational reminders). After the first three workshop cycles, we began conducting monthly analyses of couples’ average workshop attendance to determine whether and how the different text message reminders were supporting continued session attendance. Under the Bayesian adaptive design, we used results from these monthly (interim) analyses to determine how we should randomly assign future enrolling couples to study groups. Over time, we reduced the number of couples randomly assigned to treatment groups that appeared less effective and instead began assigning couples to new treatment groups. This approach enabled us to test a larger number of text message reminders than would have been possible under a traditional random assignment design. Additional detail on the random assignment procedures appears in the appendix to this report.

After 24 months, we found that average session attendance was generally high for all the research groups (Figure 1). We randomly assigned a total of 907 couples during the first 24 months of the study. Because assignment probabilities for each treatment group change under the Bayesian adaptive design, the number of couples varied across groups, from a low 44 to a high of 245. We found that, on average, couples attended about 4 out of 5 group workshop sessions regardless of the group to which they were randomly assigned. For this test, all the couples had attended the first workshop session. Therefore, our results imply that most couples attended three additional workshop sessions after the first one. In total, participants attended an average number of HMRE group workshop sessions that, across groups, ranged

from 3.8 sessions (future-oriented motivational reminders and men only: future-oriented motivational reminders with graphics) to 4.2 sessions (planning prompt reminders and no reminder messages).

Consistent with the finding of generally high session attendance for all the research groups, we found little evidence to suggest that any one of the text message reminders was more effective than others in increasing session attendance, after adjusting for couple characteristics. We also found no evidence that any of the reminders was more effective than sending no reminders (control group). As described in greater detail in the appendix to this report, part of our Bayesian adaptive random assignment design involved estimating the likelihood that each text message reminder had an impact on session attendance that was both positive (relative to the control group) and larger than the estimated impact for any other reminder. The planning prompt reminders proved to be the most effective strategy among the non-control arms of the trial, though the prompts had only a 12 percent chance of resulting in the highest attendance rates after controlling for covariates (Table 3). We found a 61 percent likelihood that sending no reminder messages (control group) led to the highest adjusted attendance rates for follow-up sessions. In sum, we found no evidence that sending any type of text message reminders improved average session attendance, compared to sending no reminders.

**Figure 1. Average session attendance, by research group**



**Table 3. Relative performance of text message reminders on overall attendance**

Type of reminder message	Probability that approach resulted in the highest overall attendance
Control: No reminders	61%
Simple reminders (nine total messages)	7%
Future-oriented motivational reminders (nine total messages)	2%
Planning prompt reminders (nine total messages)	12%
Simple reminders (five total messages)	5%
Future-oriented motivational reminders with graphics (nine total messages)	6%
Men only: Future-oriented motivational reminders with graphics (nine total messages)	3%
Women only: future-oriented motivational reminder with graphics (nine total messages)	5%

Source: Mathematica analysis of program attendance data.

Note: Sample comprises all couples that attended the first workshop session, consented to participate in the study, and provided a valid mobile telephone number for at least one partner. Probabilities may not add to 100 because of rounding. Overall attendance is measured as the total number of sessions attended.

## Test 2: Impacts on initial workshop attendance

For the third year of the study (January 2019 through December 2019), we shifted our focus to assessing impacts on initial workshop attendance among couples that registered for a workshop. We made the shift when attendance data from the first two years of the study indicated that the program’s biggest attendance challenge was how to motivate couples that had registered for the program to attend the first session. During the first two years of the study, over one-third of couples that registered online for the program failed to attend the first session. As a result, we formulated the following new research questions: (1) Can text message reminders have an impact on couples’ *initial attendance* at HMRE group workshop sessions? (2) If so, which types of reminders are most effective?

For this part of the study, UF program staff modified the program’s online registration form to include a question asking couples if they wanted to participate in a study of text message reminders as a voluntary supplement to the program. Participation in the study was voluntary; couples could opt out of the study and still enroll in the program. Five days before the first session of each workshop, program staff entered information on all registered couples into a study database. Members of the study team then identified the subset of couples that had agreed to participate in the study as the sample eligible to receive text message reminders.

For this test, we randomly assigned couples either to receive no reminders (control group) or to receive one of the following types of reminders:

1. **Simple reminders (two messages)** stated the date and time of the next session. We sent each member of the couple a total of two messages.
  - For example: “Joanna, your next ELEVATE class is on Thursday at 7 p.m.”
2. **Future-oriented motivational reminder with graphics (two messages)** emphasized the potential benefits of the program for the couple. We sent each member of the couple a total of two messages.

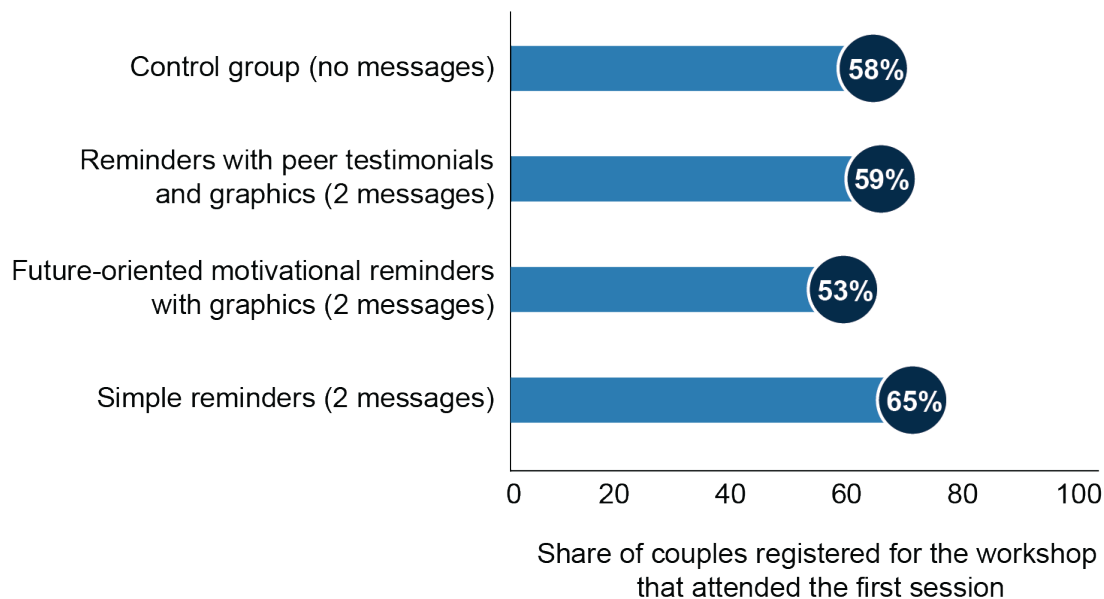


- For example: “Hi, Joanna, we are glad to have you and Mike join our ELEVATE class! This informal and fun workshop will help you learn how to communicate better, support each other, deal with conflict, and find compromise.”
3. **Reminder with peer testimonial and graphics (two messages)** included descriptions of past program participants’ satisfaction with the program. We sent each member of the couple a total of two messages.
- For example: “Hi, Joanna, we are looking forward to seeing you and Mike at our ELEVATE class tomorrow! Many couples have told us that the skills they learned in our workshop helped them to become more understanding and supportive partners—and happier together.”

As in Test 1, we used a Bayesian adaptive design to assign couples randomly across the research groups. When this part of the study started in January 2019, we randomly assigned couples in equal probability to either the control group or one of the three treatment groups. Once we randomly assigned a couple to a treatment group, we sent each couple only the type of text message reminder associated with that group. After the next two workshop cycles, we adjusted the random assignment probabilities for newly enrolled couples based on interim analyses of the attendance data we had collected to date.

After 12 months, we found that the percentage of couples attending the first workshop session varied across groups by up to 12 percentage points (Figure 2). We randomly assigned a total of 835 couples in this part of the study. Among couples that completed an online registration for the workshop and agreed to participate in the study, the attendance rate at the first session was 65 percent for couples receiving simple reminders, 53 percent for couples receiving future-oriented motivational reminders, 59 percent for couples receiving reminders with peer testimonials, and 58 percent for couples not receiving reminders. Interestingly, the two study groups that received the reminder with peer testimonials and the future oriented motivational reminders were no more likely to attend the first session than were the control group. However, couples that received the simple reminder messages were more likely to attend than were couples randomly assigned to any of the other three groups.

**Figure 2. Initial attendance and sample size, by research group**



Consistent with the observed differences in attendance rates, we found a high probability that the simple text message reminder was more effective than other message types or sending no messages in increasing couples' initial workshop attendance (Table 4). As with Test 1, part of our Bayesian adaptive random assignment design involved estimating the chances that each text message reminder had an impact on initial session attendance that was both positive (relative to the control group) and larger than the estimated impact for any other reminder. Based on this model, we found an 80 percent chance that the simple text message reminder led to the highest attendance rates for the initial workshop session. Conversely, the probability that sending no reminder messages was the optimal strategy to promote attendance at the initial session was only 9 percent.

**Table 4. Relative performance of text message reminders on initial attendance**

Type of reminder message	Probability that approach resulted in the highest attendance rate
Control: No reminders	9%
Simple reminder (two total messages)	80%
Future-oriented motivational reminder with graphics (two total messages)	2%
Reminder with peer testimonials and graphics (two total messages)	9%

Source: Mathematica analysis of program attendance data.

Note: Sample comprises all couples that signed up for the workshop, consented to participate in the study, and provided a valid mobile telephone number for at least one partner. Initial attendance is measured as attendance at the first session of the workshop series.

## Discussion and lessons learned

This study examined the impacts of sending text message reminders on attendance at ELEVATE, an HMRE program for couples in Florida. ELEVATE aimed to equip adult couples with practical strategies to improve their relationship skills and experiences. It was delivered through group-based workshops that comprised five weekly sessions each lasting 2.5 hours. ELEVATE workshops were offered in six counties across Florida: Alachua, Citrus, Duval, Manatee, Palm Beach, and Santa Rosa. To conduct the study, Mathematica partnered with staff at the University of Florida who developed and operated the ELEVATE program. An earlier report from the study documented that ELEVATE was implemented as intended (Alamillo et al. 2020). To measure impacts of the text message reminders, the study team randomly assigned more than 1,700 couples to either a control group that received no reminders or one of several study groups that each received a different type of text message reminder. We assessed the effectiveness of each type of reminder by comparing the attendance outcomes of these study groups.

### Summary of key findings

We conducted two tests that delivered two key findings. First, for Test 1, among all couples that attended the first workshop session, attendance rates were high for the rest of the workshop sessions for all research groups. Most couples attended three additional sessions after the first one and missed one session over the course of the workshop. We found no evidence to suggest that any one of the text message reminders was more effective than others (or sending no reminders) in increasing session attendance. We found a 61 percent likelihood that sending no reminder messages (control group) led to the highest adjusted attendance rates. Second, for Test 2, we found that simple text message reminders increased the share of couples that attended the first session of a workshop, among all couples that registered for a workshop. The attendance rate at the first session was 65 percent for couples that received simple reminders as compared to 58 percent for couples that did not receive reminders. The simple reminders also outperformed the reminders with enhanced behavioral content.

These findings are based on the attendance patterns of couples who participated in the ELEVATE program and therefore do not necessarily generalize to all couples served by federally funded HMRE programs. ELEVATE served a demographically diverse mix of couples from six counties in both urban and rural parts of the state. The participants were of different ages and included both married and unmarried couples from diverse racial and ethnic backgrounds. However, ELEVATE participants had higher levels of education and earnings and fewer children, on average, than is typical for federally funded HMRE programs for couples. To the extent that education, financial circumstances, and the presence of children in the household can impact a couples' ability to attend HMRE group workshops, these differences mean that the findings from this study of ELEVATE might not generalize to other HMRE program for couples.

In addition, we cannot say if these findings generalize to HMRE programs that differ in content or format from the ELEVATE program. ELEVATE offered approximately 12.5 hours of programming across five workshop sessions, which is similar to the average for recent HMRE grantees (Avellar et al. 2021a). However, HMRE programs can vary considerably in their characteristics, with some offering much longer workshops or additional content and services (Avellar et al. 2011, 2012, 2020; Bir et al. 2012; Miller et al. 2012). For example, the two HMRE programs in ACF's Parents and Children Together Evaluation (HOME and Supporting Healthy Relationships) had considerably longer relationship skills workshops: 18 hours and 27 hours respectively (Zaveri and Baumgartner 2016). Furthermore, both programs had additional service offerings beyond the core relationship skills workshop, such as job and career advancement services, case management, and supplementary workshops on a variety of topics. There is no rigorous evidence on how workshop characteristics influence attendance, but one recent descriptive study of HMRE and responsible fatherhood grantees found that making workshop sessions longer and more frequent was associated with greater attendance (Avellar et al. 2021b). To the extent that a HMRE program's format and service offerings can influence not only the composition of program participants but also their interest and ability to participate in services, the findings from this study may not generalize to programs that differ substantially from ELEVATE.

### **Considerations for HMRE programs**

Our results suggest that text message reminders can be effective in increasing attendance at HMRE group workshop sessions but that providers must pinpoint the source of the leak in the attendance pipeline and then target reminders accordingly. Because ELEVATE was a new program, we did not have any existing data on program attendance to guide us and initially focused on identifying ways to promote continued attendance among couples that attended the first session. As the study unfolded, we learned that (1) among couples that attended the first session, continued attendance was high at remaining sessions and (2) text message reminders did not further increase attendance. Most couples that attended the first session went on to attend three additional sessions. In addition, when we interviewed program staff and participants to assess why some couples missed a session after the first one, we found that the reason usually involved something outside the scope of a text message reminder; for example, someone was called in for an unexpected shift at work (Alamillo et al. 2020). In looking at attendance data from this first part of the study, we learned that the largest drop in attendance occurred between workshop registration and the first session. We then shifted the study's focus to improving initial attendance among workshop registrants and found that simple text message reminders increased the initial attendance rate by around 7 percentage points (relative to the control group). Our experience highlights the importance of looking at attendance patterns to identify the source of couples' difficulties with initial or regular attendance and then directing the reminder messages accordingly.

The findings from this study also suggest that simple reminders may work best for HMRE program participants as compared to messages with enhanced behavioral content. Although earlier studies from the health care field indicate that reminders incorporating behavioral content might be effective in some circumstances, our results suggest that the value of enhanced content likely depends on context and that, in some cases, enhanced content can detract from the value of simple reminders. This study does not allow us to conclude why the simple reminder was most effective, but we can suggest a few possibilities. Given the personal nature of romantic relationships, it might be difficult to design enhanced content that captures couples' many possible motivations for attending HMRE group workshop sessions. A goal-oriented reminder highlighting a program's potential to improve relationship quality might work for some couples but unintentionally offend others, depending on how couples perceive their relationships and their varying motivations for attending the workshop. Capturing these motivations might be particularly tough for programs that serve diverse populations, as ELEVATE did. When we talked with program participants during focus groups, we found differences by age and cultural context in factors such as how people perceived messages intended to be humorous and their feelings about the intrusiveness of text messages. The importance and subtlety of these differences became apparent only in the course of the study and were difficult to foresee despite the extensive behavioral diagnostics and resources the study team applied when initially designing the text message reminders. It is possible that some HMRE program providers know their clients well enough or serve a narrow enough population that they could craft carefully worded text message reminders that resonate with everyone. For most HMRE programs, however, our findings from ELEVATE suggest that it may be advisable to keep the content simple.

### **Directions for future research**

Future research should explore whether and to what extent text message reminders can help support attendance at HMRE programs serving different populations. ELEVATE served a demographically diverse mix of couples from six counties in different parts of the state. However, as compared to clients served by other federally funded HMRE programs, the ELEVATE participants had higher education levels, lower levels of economic insecurity, and one fewer child, on average. These characteristics might have contributed to relatively high program attendance in our control group and might have limited the potential for text message reminders to produce an impact. For federally funded HMRE programs that serve clients with more barriers to regular workshop attendance, such as couples with lower incomes or parents with more children, reminders might have a greater impact on attendance. Future research should consider such a possibility by testing the effectiveness of text message reminders with programs serving different populations.

Future studies should also test different methods for sending text message reminders. This study used an easy and efficient automated system. However, even though automation offers cost savings, it does not allow for interactive dialogue such that recipients may perceive automated messages as impersonal. In early 2020, our study team also attempted to test text message reminders that were sent by program staff instead of through the automated platform. Staff members sent the initial reminders and were also able to view and respond to any return messages sent by program participants. The COVID-19 pandemic necessitated the shutdown of the in-person workshops and termination of the test in March 2020. Although we did not have ample time to assess the impacts of having staff members send reminders, we did find some preliminary evidence of benefits—including an uptick in return messages sent by program participants and interactive texting between program participants and staff before the first workshop session. Future research should provide rigorous evidence of the impacts and cost-effectiveness of these and other more personalized approaches for sending text message reminders.

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## **Technical Appendix**

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This technical appendix supplements the impact study of text message reminders on couples' attendance at ELEVATE workshops. The first section of the appendix provides additional detail on the study enrollment procedures. The second section describes the data sources used for the impact study. The third and fourth sections provide technical information on the study's Bayesian adaptive random assignment design and its approach to estimating program impacts, respectively.

## Study enrollment

Study enrollment and recruitment for UF's ELEVATE program were conducted over a three-year period from January 2017 to February 2020. ELEVATE staff's recruiting efforts aimed at driving potential participants to UF's program website (SMARTcouples.org), where couples could find available workshops in their county and register.

For the first two years of the study (January 2017 through December 2018), couples were enrolled at the first ELEVATE workshop session. During this session, program staff asked couples if they wanted to participate in a study of text message reminders as a voluntary supplement to the ELEVATE workshop sessions. Participation in the study was voluntary; couples could continue to attend the workshop sessions regardless of their study participation. To participate in the study, a couple had to meet the following three requirements: (1) both members of the couple had to provide consent to the STREAMS evaluation, which included authorization for Mathematica to send text message reminders to both members of the couple; (2) both members had to provide valid phone numbers to receive text messages, and (3) neither member could have previously attended an HMRE workshop offered by UF.

For the last year of the study (January 2019 to February 2020), the timing of study enrollment changed to happen when couples first registered for the program. UF managed program registration through an online event registration and ticketing system called Eventbrite. For the last year of the impact study, UF modified the online registration form to include a question that asked couples if they wanted to participate in a study of text message reminders as a voluntary supplement to the program. As discussed in the main impact study report, this change in the timing of study enrollment coincided with the study team's switch from testing the impacts of text message reminders on couples' continuing workshop attendance (Test 1) to testing the impacts of text message reminders on couples' initial workshop attendance (Test 2). Participation in the study remained voluntary; couples could complete the online registration form for the program regardless of their study participation. The UF institutional review board approved the study consent form and procedures.

## Data sources

The impact study drew on data from two sources:

1. **Electronic attendance records.** Immediately following each workshop session, UF program staff recorded attendance data for couples in a secure electronic database called Information, Family Outcomes, Reporting and Management (nFORM), which OFA made available to UF as part of a federal grant. Each participant's attendance was recorded at each of the five workshop sessions. For participants who missed a regularly scheduled session, UF program staff offered the following two make-up options: (1) watching an online video recording of the session or (2) attending a drop-in session offered on an alternative day. Data from the first two years of program implementation indicated that 22 percent of couples made up at least one session by watching an online video recording and 10 percent attended at least one drop-in session (Alamillo et al. 2020). For the impact

study, we counted a couple as having attended a session whether they chose the regularly scheduled session or either make-up option.

2. **Applicant characteristics survey.** The terms of UF's OFA grant required all participants to complete a brief application survey during the first workshop session. The survey collected information on participants' demographic characteristics, financial well-being, relationship status, and reasons for enrolling in the program. Participants completed the survey on tablet computers. Survey responses were stored in nFORM. For the impact study, we only had survey data for couples who attended the first workshop session. Couples did not complete the survey if they registered online for the workshop but never attended sessions.

## Random assignment design

For the present study, we used a Bayesian adaptive design (Finucane et al. 2018) to randomly assign couples to research groups. Broadly, an adaptive design involves conducting interim analyses of the study outcome data to make mid-course changes to the random assignment procedures and in how future study participants are randomly assigned (Green and Offer-Westort 2018). This approach contrasts with a static random assignment design that applies consistent random assignment procedures to all study participants and traditionally requires waiting until the end of the study to analyze outcome data. Using an adaptive design required periodically analyzing outcome data on couples' workshop session attendance, using these interim analyses to assess whether and how different text message reminders were improving session attendance, and adjusting the random assignment probabilities for future study participants based on the interim results. The design is further described as Bayesian to reflect that we used a Bayesian hierarchical regression model to analyze the workshop attendance data and measure the impacts of the text message reminders. We describe the details of this model in a later section of the appendix.

We selected a Bayesian adaptive design for this study for two interrelated reasons. First, it enabled more efficient estimation of the impacts of the text message reminders on couples' workshop session attendance. These efficiency gains stemmed in part from using a Bayesian hierarchical regression model to estimate impacts, and in part from using the adaptive random assignment procedure to periodically adjust the random assignment probabilities for future study participants. We used the Bayesian hierarchical regression model to promote efficiency by estimating the impacts of different text message reminders simultaneously in a single model that accounted for an assumed relationship among the impact estimates (Gelman et al. 2013). The adaptive random assignment procedure promoted further efficiency by optimizing the relative sample sizes of the different research groups. In part, because of these efficiency gains, the design also provided us flexibility to evaluate different types of text message reminders as the study unfolded. This flexibility was a second reason we selected a Bayesian adaptive design.

### Test 1: Assessing impacts on couples' continued workshop attendance

For the first two years of the impact study, we assessed the impacts of different text message reminders on continued workshop attendance among couples who attended the first ELEVATE workshop session. When this part of the study first started in January 2017, we randomly assigned couples in equal probability to one of the following four research groups:

1. A control group that did not receive reminders
2. A treatment group that received simple reminders (nine messages in total) that stated the date and time of the next session
3. A treatment group that received planning prompts (nine messages in total) that encouraged the recipient to do any planning needed to assure attendance at the next session
4. A treatment group that received future-oriented motivational reminders (nine messages in total) that described the content of the next session and motivated attendance by emphasizing benefits for the couple

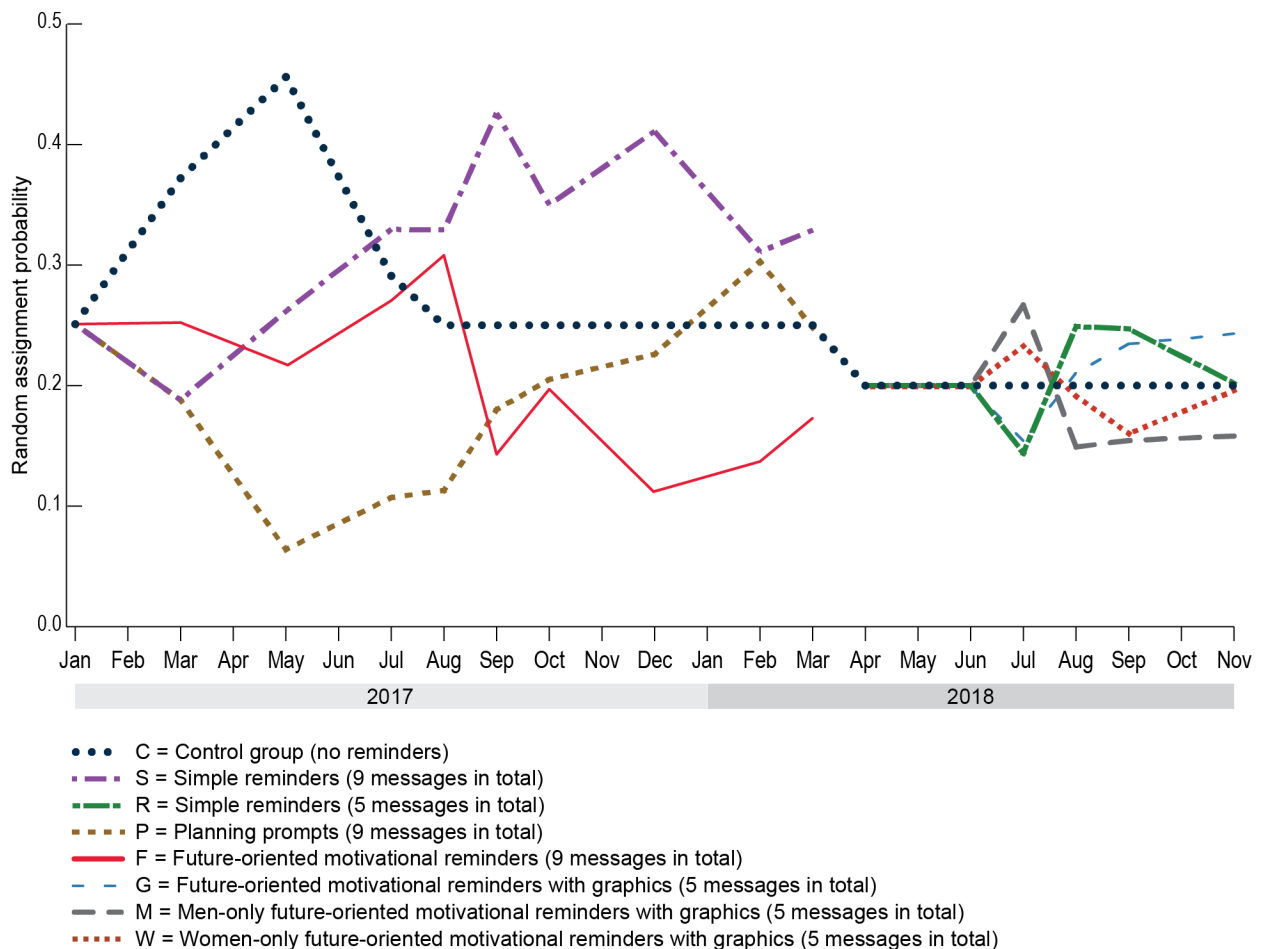
We followed this approach to random assignment for the first four workshop cycles. After these initial workshop cycles, we had a large enough sample to initiate the adaptive random assignment procedure. We began by extracting couples' attendance data and survey responses from nFORM, where UF program staff entered and stored the data. For each couple, we extracted five weeks of attendance data corresponding to each of the five weekly workshop sessions. Next, we input these data into a Bayesian hierarchical regression model to estimate the impacts of each text message reminder based on the attendance data collected to date. For each of the three treatment groups, the model produced separate estimates of the probability that the impact for that group was larger than the impact for any other group. We describe the details of this calculation in a later section of the appendix. We used these estimated probabilities from the model as the basis for updating the random assignment probabilities for study participants enrolled in the next workshop cycle. We repeated these procedures at the end of each subsequent workshop cycle.

As expected, the adaptive random assignment procedure led us to regularly adjust the proportion of study participants assigned to each research group. To illustrate, Figure A.1 shows how we adjusted the random probabilities over the first 14 months of the study, from January 2017 through March 2018. We had initially planned to adjust the random assignment probabilities to align with the estimated probabilities generated from the Bayesian hierarchical regression model, as suggested by earlier research (for example, Berry et. al. 2011). In practice, however, we found we needed to add restrictions to this procedure to avoid having the random assignment probabilities become too high or low for any one research group. For each treatment group, we set a lower-bound probability of 10 percent to ensure having at least 10 percent of study participants in each workshop cycle randomly assigned to each group. For the control group, we set a lower-bound probability of 20 percent and upper-bound probability of 33 percent to keep the percentage of study participants randomly assigned to the control group within this designated range. After applying these restrictions to affected groups, we then scaled the random assignment probabilities for the remaining groups, so that the probabilities across all groups summed to 100 percent.

We made one manual adjustment to the random assignment probabilities during the first two years of the study. After the first 14 months of sample enrollment, we had collected enough data on the initial set of text message reminders to have relatively high confidence in the impact findings for these reminders. Therefore, beginning in April 2018, we manually adjusted the random assignment probabilities for these reminders to equal zero and did not assign additional study participants to these groups. In turn, this adjustment allowed us to introduce and randomly assign participants to a new set of text message reminders. For consistency, we also continued randomly assigning participants to the control group. The new set of groups was as follows:

1. A control group that did not receive reminders
2. A treatment group that received simple reminders (five messages in total) that stated the date and time of the next session
3. A treatment group that received future-oriented motivational reminders with graphics (five messages in total) that described the content of the next session, motivated attendance by emphasizing the benefits for the couple, and included graphics to reinforce message content
4. A treatment group that received men-only future-oriented motivational reminders with graphics (five messages in total) that were the same as #3 but were sent only to the male member of the couple. For couples with two males, we randomly selected one member to receive the messages.
5. A treatment group that received women-only future-oriented motivational reminders with graphics (five messages in total) that were the same as #3 but were sent only to the female member of the couple. For couples with two females, we randomly selected one member to receive the messages.

**Figure A.1. Random assignment probabilities, by research group**



Note: Random assignment probabilities were derived from our adaptive Bayesian model based on data to date on continued attendance and couple characteristics. We implemented the probabilities for couples who enrolled in the next workshop series.

After making this manual adjustment, we randomly assigned participants in equal probability to one of these five research groups for the next three workshop cycles. We then re-initiated the adaptive design, using the same procedures described earlier. As expected, the adaptive design led to additional adjustments of the random assignment probabilities across the new set of text message reminders.

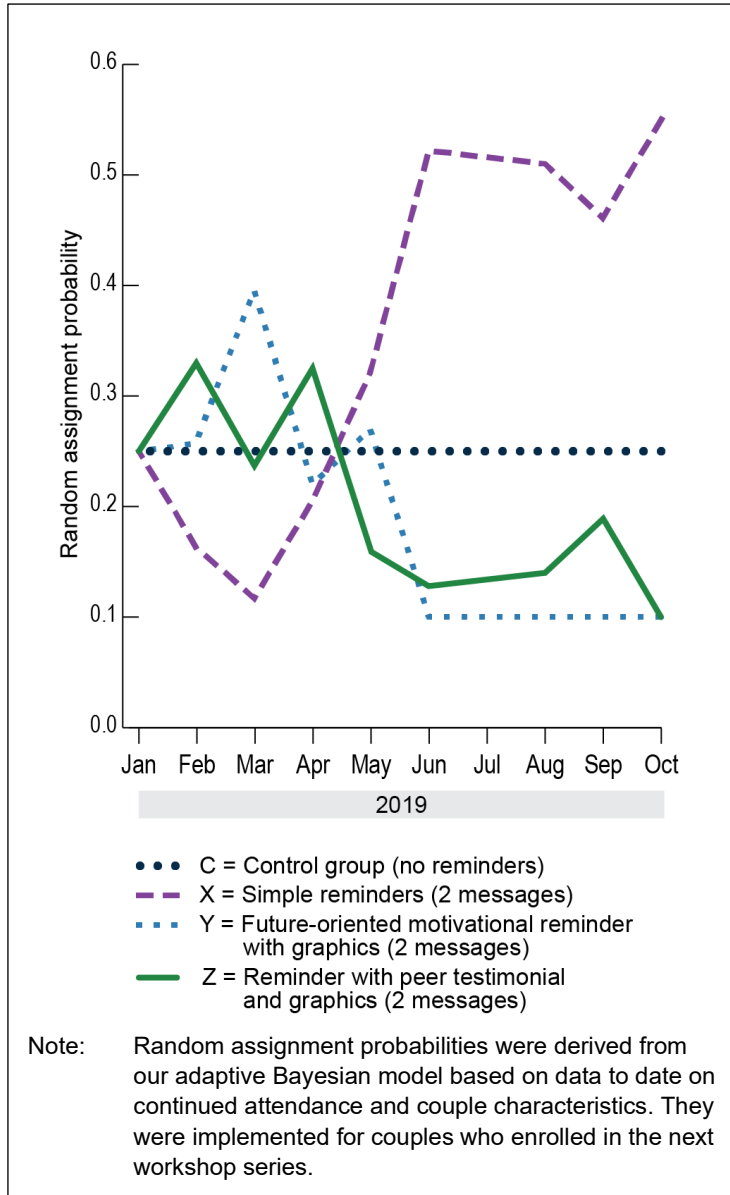
### **Test 2: Assessing impacts on couples' initial workshop attendance**

For the last year of the study, we shifted the design to assess the impacts of text message reminders on attendance at the initial ELEVATE workshop session among couples who had completed the online registration for the program. This part of the study used the same Bayesian random assignment design but was conducted independently of our earlier testing on couples' continuing workshop attendance. We enrolled different sample members and did not account for our earlier findings when using the adaptive random assignment design to adjust the random assignment probabilities. When this part of the study started in February 2019, we randomly assigned couples in equal probability to one of the following research groups:

1. A control group that did not receive reminders
2. A treatment group that received simple reminders (two messages) that stated the date and time of the next session
3. A treatment group that received a future-oriented motivational reminder with graphics (two messages) that emphasized the potential benefits of the program for the couple
4. A treatment group that received a reminder with a peer testimonial and graphics (two messages) that included descriptions of past program participants' satisfaction with the program

After these initial three workshop cycles, we initiated the adaptive random assignment design using the sample procedures described earlier. We continued adjusting the random assignment probabilities for subsequent workshop cycles through the end of sample enrollment (Figure A.2).

**Figure A.2. Random assignment probabilities, by research group**



## Approach for estimating impacts

For both our interim analyses of couples' workshop session attendance data and the final analysis presented in the main impact report, our approach for estimating the impacts of the text message reminders on couples' workshop session attendance involved three interrelated steps. We began by estimating a Bayesian hierarchical regression model using Stan (Carpenter et. al. 2017), a probabilistic programming language designed to fit Bayesian regression models using Markov Chain Monte Carlo (MCMC) sampling. Next, we used the results of our regression model to extract the posterior distribution of the impacts of the text message reminders—that is, our estimate of the distribution represented by the impacts of the different text message reminders, given the observed attendance data. Finally, to reflect the level of uncertainty in the impact estimates, for each reminder, we calculated the proportion of MCMC iterations for which the reminder had an estimated impact that was both positive (relative to the control group) and larger than the estimated impact for other reminders.

For the test assessing impacts on continued attendance among couples who attended the first workshop session, we estimated the Bayesian hierarchical regression model as follows:

$$\log\left(\frac{p_{it}}{1-p_{it}}\right) = \alpha_t + b_i^{cpl} + b_{l[i]}^{loc} + b_{c[i]}^{chrt} + X_i\beta + \sum_{j=1}^J \theta_j Trt_{ij}$$

In this model,  $i$  is an index for each couple enrolled in the study;  $t$  is an index for weeks 2, 3, 4, and 5 of the ELEVATE workshop sessions;  $p_{it}$  is the probability that couple  $i$  attended the workshop session for week  $t$ ;  $\alpha_t$  reflects time-specific intercepts controlling for differences in average attendance by week ( $t$ );  $b_i^{cpl}$  are random effects for each couple ( $i$ );  $b_{l[i]}^{loc}$  are random effects for each program enrollment location ( $l$ );  $b_{c[i]}^{chrt}$  are random effects for each workshop cycle;  $j$  is an index of the different text message reminders;



$\theta_j$  is the estimated impact for reminder  $j$ ; and  $Trt_{ij}$  is the treatment status indicator variable for couple  $i$  to group  $j$ .  $X_i\beta$  reflects controls for couple-level covariates measured from the applicant characteristics survey such as age, race and ethnicity, language, marital status, pregnancy status, education, employment, number of children, baseline relationship quality, and motivation for enrolling.

The key term in the model is  $\theta_j$ , which reflects the log odds ratio of attendance for each treatment group ( $j$ ) relative to the control group. For this term, we assumed a normal prior for impact distribution across treatment groups,  $\theta_j \sim N(\theta_0, \tau^2)$ , where  $\theta_0$  represents the average log odds ratio across treatment groups and  $\tau^2$  is the variance of the impacts across groups. This assumption for the prior promotes borrowing of strength across the treatment groups—if the observed impact for any one group is abnormally high or low based on the data, the model shrinks the estimate toward the average impact across all treatment groups ( $\theta_0$ ). The shrinkage is greatest when the sample size is small and lessens as the sample size grows. This feature of the model helps to prevent overfitting to small samples, which could result in estimating extremely high or low impacts based on few observations, early in the study period.

For Test 2, which assessed impacts on initial workshop attendance among couples who completed the online registration for the program, we made two corresponding adjustments to the model. First, we changed the outcome variable to measure couples' attendance only at the first workshop session. Because of this change, we dropped the index for week ( $t$ ) and random effects for each couple ( $b_i^{cpl}$ ). Second, because we had survey data only for couples who attended the first workshop session, we dropped the controls for couple-level covariates ( $X_i\beta$ ). In all other respects, the model matched the one we previously estimated for assessing impacts on couples' continued workshop attendance.

### Details of impacts on attendance

We conducted two tests, which delivered two key findings. First, for Test 1, among couples who attended the first session, attendance rates were high for the rest of the workshop sessions after the first one, and were similar across all research groups (Table A.1). Most couples attended three additional sessions after the first one and missed no more than one session over the course of the workshop. The data did not suggest that any one of the text message reminders was more effective than others in increasing session attendance. Second, for Test 2, we found that many couples who registered for a workshop did not attend the first session, but for all couples who registered, simple text message reminders increased the share of couples who attended the first session of a workshop (Table A.2). The attendance rate at the first session was 65 percent for couples who received simple reminders, compared to 58 percent for couple who did not receive reminders.

**Table A.1. Average session attendance and sample size, by research group**

Type of reminder message	Average number of workshop sessions attended	Sample size (number of couples)
Control: No reminders	4.2	245
Simple reminders (nine total messages)	4.1	218
Future-oriented motivational reminders (nine total messages)	3.8	113
Planning prompt reminders (nine total messages)	4.2	111
Simple reminders (five total messages)	4.1	73
Future-oriented motivational reminders with graphics (nine total messages)	4.0	52
Men only: Future-oriented motivational reminders with graphics (nine total messages)	3.8	44
Women only: future-oriented motivational reminder with graphics (nine total messages)	3.9	51

Source: nFORM data

Note: Sample comprises couples who attended the first workshop sessions held in January 2017 through December 2018, consented to participation in the study, and provided a valid mobile phone number for at least one partner.

**Table A.2. Initial attendance and sample size, by research group**

Type of reminder message	Percentage of couples attending first session	Sample size (number of couples)
Control: No reminders	58%	206
Simple reminder (two total messages)	65%	284
Future-oriented motivational reminder with graphics (two total messages)	53%	163
Reminder with peer testimonials and graphics (two total messages)	59%	182

Source: nFORM data

Note: Sample comprises couples who signed up for the workshops in January 2019 through December 2019, consented to participation in the study, and provided a valid mobile phone number for at least one partner.

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