
INCREASING CONNECTIONS TO SUPPORT SERVICES DURING CRISIS THROUGH TEXT MESSAGES

Using artificial intelligence to predict and prevent evictions during COVID-19



Increasing Connections to Support Services During Crisis through Text Messages

Executive Summary

SMS messaging offers a low-cost way to inform and connect residents to support services during a time of crisis. The City of Tulsa's Office of Performance Strategy and Innovation (OPSI) tested this concept and showed promising results through a randomized control trial conducted from June to November 2020, during the COVID-19 pandemic and resulting economic crisis.



**11 ADDITIONAL
HOUSEHOLDS RECEIVED
SUPPORT**



**\$16,500 IN HOUSING
ASSISTANCE PROVIDED**

The City partnered with the Behavioral Insights Team to design and implement the trial, and partnered with 211 Eastern Oklahoma, a community hotline and referral service, to connect residents to services and track calls.

Analysis from the trial indicates that the SMS message had an effect on call rates and connection rates, with statistically significant differences between the full test and control group in whether participants placed a call to 211 Eastern Oklahoma and were connected with referral services (Table 2). When controlling for messages that were not received due to kickbacks or carrier limits, the difference between test and control groups shows even stronger significance (Table 3).

Twenty percent of those who received the message placed calls to 211 Eastern Oklahoma, a database and referral source for a variety of providers, compared to 17 percent of the control group.

During the five-month trial, 144 households that received the message called 211 and received housing services (Table 1), resulting in approximately \$216,000 in housing assistance provided to these households. When comparing the expected rates of those that received services between those that received messages and those in the control group, there was a .51% increase from the test group. While this is not statistically significant, it resulted in 11 additional households receiving services (Table 4).

Background, Context, and AI Innovation

In Fall of 2018, the OPSI's Urban Data Pioneers Program examined the rising eviction rate in Tulsa County. Using eviction data gathered from court records and compiled by OK Policy Institute, OPSI and the team developed a predictive model using artificial intelligence deep neural networks to identify households at risk of eviction. The full process is documented and available on [GitHub](#).

In Fall of 2019, the City of Tulsa enacted the Affordable Housing Strategy, which outlines goals and action steps to address housing inequities in Tulsa and includes a focus on reducing evictions. In 2018, Tulsa had the 11th highest eviction rate in the country, resulting in thousands of Tulsans experiencing housing instability and financial insecurity every year.

The City sought to reduce evictions using behavioral nudges and identified households at risk of eviction using the predictive model. Due to the timing of the trial launch, which coincided with the COVID-19 pandemic, the key question was reframed to focus more broadly on connecting at-risk households to support services as the primary outcome, with an exploratory outcomes of decreased housing instability.

For this project, the City partnered with Community Service Council's 211 Eastern Oklahoma hotline, a 24/7 free service that is available to Tulsans that maintains a comprehensive database of 7,600 vetted services and serves as a clearinghouse for disaster resources in the event of a community emergency, such as the COVID-19 pandemic and during the Tulsa area's historic flooding of 2019, and serves as the primary connection point for people who need housing assistance.

The SMS message helps to eliminate the following potential barriers to calling 211 to connect to services:

- Lack of awareness of 211 services: customers may not know that 211 services exist.
- Cognitive overload: cognitive load refers to the total amount of mental effort being used in the working memory. Our capacity to perform mental work is a limited resource that can be taken up by planning, remembering, worrying, self-control, etc. Since poverty and global pandemics can be a source of chronic cognitive load, Tulsans experiencing financial distress may find it more difficult to follow through on tasks such as pursuing assistance (especially for those for whom calling 211 is a new or unknown experience).

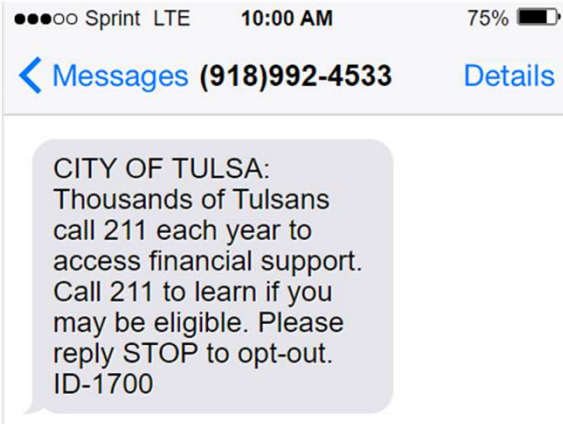
Methodology

City of Tulsa sent an SMS message to Tulsans who are identified as experiencing financial distress based on a predictive model using water billing data. The SMS alerted recipients that they can access support services through 211.

Key trial question: During a time of crisis, does an SMS message encourage people selected by a predictive model to call 211 and receive services?

The SMS message read: "CITY OF TULSA: Thousands of Tulsans call 211 each year to access financial support. Call 211 to learn if you may be eligible. Please reply STOP to opt-out. ID-####"

OPSI added a unique four-digit ID number after the first round of text messages in June received several carrier bounce backs.



Participants

Target Population: Tulsa residents who are experiencing financial distress, as determined by a predictive model based on water bill payment history.

Sample: Tulsa renters who display predictive characteristics of eviction in the month prior to the SMS message being sent. The predictive characteristics that determine whether someone is included in the sample are data points included in water billing data: current charge and amount past due. The predictive model does not take outcome data into account and participants will only enter the sample once over the course of the trial (previously included residents will be removed from the new list of sample members each month). This prevents endogenous effects from the treatment.

The sample is limited to residents who rent single-family homes. Therefore, the sample may differ from the target population in meaningful ways, and the results of this trial should not be presumed to apply to Tulsa residents who own their homes or live in multi-family buildings.

The control group comparison did not receive a text message. They had access to the 211 support services as normal in the “business as usual” conditions through online searches, word of mouth and existing marketing initiative. Due to increased marketing of 211 during COVID-19, it is likely that treatment effect in the trial may be underestimated.

Blinding and masking: Participants did not know their treatment assignment. Treatment group members likely assumed that everyone received an SMS message. Control group members were not aware of the intervention or trial.

211 call takers did not know whether a caller had received an SMS message unless the caller explicitly offered that information, and the call takers were not aware that SMS messages were being evaluated.

Process

Each month, OPSI staff extracted the last 12 months of water billing data using SQL and ran it through the predictive model to define the sample using Python. Customers who had been

previously included were removed, and the remaining sample was randomly split into treatment and control groups. The City used Twilio to send SMS messages to the treatment group.

A list of trial participants' phone numbers (both control and test groups) was sent to 211 Eastern Oklahoma so that they could track whether the participants called. At the end of the trial, 211 exported the list of calls with phone numbers that matched trial participants, which showed the call outcome (dropped, disconnected, connected) and whether the caller was a UniteUs client (the coordinated referral system used to indicate whether housing services were provided). The data was then cleaned to remove duplicate calls and analyzed using Python; all results were validated in Microsoft Excel.

Analysis

The results of the trial were analyzed using Welsch's T tests to determine differences between the full test and control groups and differences between those that received the messages in three areas (Table 2, Table 3):

1. Whether a call was placed to 211 – yes/no
2. Whether the caller was connected to 211 services (used to indicate referral services received) – yes/no
3. Whether the caller is a UniteUs client (used to indicate housing services received) – yes/no

A secondary analysis compared the actual number of calls placed and services rendered to the expected numbers based on sample size, assuming equal variance (Table 4.)

Cost: Each SMS message sent or received from Twilio costs \$0.0075. Over the trial, 5351 messages were processed for a total cost of \$40.14.

Table 1. Overall Data

Group	Total Participants	Contacted 211 (Placed call)	Connected to 211 (Connected to referral service)	UniteUs Client (Received housing assistance)
Control	5171	857	608	151
Test (all)	5177	978	676	165
Test (received only)	4192	839	585	144

Table 2. Full Test, Control Groups

Group	Total	Contacted 211	Connected 211	UniteUs Client (Housing assistance)
Test (All)	5177	978	676	165
Control	5171	857	608	151
Welsch's T-test Results		(statistic=-3.063, pvalue=0.002)	(statistic=-2.006, pvalue=0.045)	statistic=-0.789, pvalue=0.430)
Interpretation		p <.05 Significant difference between two groups	p <.05 Significant difference between two groups	p> .05 Nonsignificant difference

Table 3. Test group (received messages only), Control Groups

Group	Total	Contacted 211	Connected 211	UniteUs Client (Housing assistance)
Test (received)	5177	978	839	585
Control	5171	857	608	151
Welsch's T-test Results		(statistic=-4.270, Pvalue < .001)	(statistic=-3.148, pvalue=0.002)	statistic=-1.407, pvalue=0.159)
Interpretation		p <.05 Significant difference between two groups	p <.05 Significant difference between two groups	p> .05 Nonsignificant difference

Table 4. Actual vs Expected Values

	Group	Total	Contacted 211	Connected 211	UniteUs Client (Housing Assistance)
Actual	Test (Message Received)	4192	839 20.01%	585 13.96%	144 3.44%
	Control	5171	857 16.57%	608 11.78%	151 2.92%
Expected (based on equal variance)	Test (Message Received)	4192	766.87 18.23%	538.95 12.86%	133.21 3.18%
	Control	5172	945.97 18.23%	664.81 12.86%	164.32 3.18%