



ASHOKA
UNIVERSITY



Centre for
Social and
Behaviour
Change

Evaluating the Effectiveness of Designed Interventions on Improving Utilization of Antenatal Care (ANC) Contacts During Pregnancy

PROJECT REPORT

MAY 2021

Confidential

© CSBC 2022. All rights reserved.

While care has been taken in the collection, analysis, and compilation of the data presented in this report, the Centre for Social and Behaviour Change, Ashoka University, does not guarantee or warrant the accuracy, reliability, completeness, or currency of the information in this publication.

Acronyms and glossary

ANC	Antenatal care
WHO	World Health Organisation
ID	Institutional delivery
NFHS4	National Family Health Survey 4
IVRS	Interactive Voice Response System
AAY	Antyodaya Anna Yojana

Table of contents

Abstract	4
Introduction	5
Methods	10
EXPERIMENTAL DESIGN OVERVIEW	
SAMPLE IDENTIFICATION	
RANDOMISATION	
TREATMENT ARMS	
TREATMENT DEPLOYMENT	
PILOT DATA	
Outcome Variables	15
Results	22
DEMOGRAPHIC CHARACTERISTICS	
PRIMARY OUTCOMES	
SECONDARY OUTCOMES	
Discussion	41
Acknowledgements	43
Bibliography	44
Appendix	46

Abstract

Antenatal care (ANC) is critical for the mother and child's health. WHO recommends 8 ANC contacts, and Indian policy recommends at least 4 ANC contacts, with both pushing for the first contact to be within the first trimester. These requirements are not met in many districts in India due to a variety of reasons. Here, as a Phase I experiment, we tested different types of framing of message interventions in order to improve attendance of 4 ANC contacts in two districts in Uttar Pradesh by measuring intentionality to avail ANC contacts and the value perception of ANC services.



SECTION 01:

INTRODUCTION

Introduction

Antenatal care (ANC) is a critical window of opportunity to prevent adverse maternal and child health outcomes by tracking the well-being of the mother and fetus and increasing preparedness for any anticipated complications (L Say et al., 2014). Further, ANC is a critical platform for improving institutional delivery (ID) likelihood. IDs can address primary maternal mortality factors such as sepsis and haemorrhage, responsible for 28% and 10% of all maternal deaths, respectively, which are caused by delivery in unsanitary conditions and by unskilled birth attendants (L Say et al., 2014).

WHO recommends 8 ANC contacts during pregnancy (See Table 1 for details). The Government of India recommends 8 ANC contacts, emphasising at least four contacts during pregnancy. While most women in rural and urban India attend at least one ANC visit (Table 2), the percentage attending more than four is around 50%. In two districts in Uttar Pradesh, which were the focus of this study, the percentage of women who attended at least 4 ANC check-ups are 9.6% and 22.3% respectively, according to NFHS4 (44.1% and 24.9% according to validation data provided by IDinsight).

TABLE 1: 2016 WHO ANC MODEL

FIRST TRIMESTER CONTACT 1	Up to 12 weeks
SECOND TRIMESTER CONTACT 2	20 weeks
CONTRACT 3	26 weeks
THIRD TRIMESTER CONTRACT 4	30 weeks
CONTRACT 5	34 weeks
CONTRACT 6	36 weeks
CONTRACT 7	38 weeks

Return for delivery at 41 weeks if not given birth

Note: Intermittent preventive treatment of malaria in pregnancy should be started at ≥ 13 weeks.

TABLE 2: THE TIMING AND FREQUENCY INFORMATION OF ANC VISITS ACCORDING TO NFHS 4 (2015-2016)

Table 8.5 Number of antenatal care visits and timing of first visit

Percent distribution of women age 15-49 who had a live birth in the five years preceding the survey by number of antenatal care (ANC) visits for the most recent live birth, and by the timing of the first visit, and among women with ANC, median months pregnant at first visit, according to residence, India, 2015-16

Number and timing of ANC visits	Urban	Rural	Total
Number of ANC visits			
None	9.3	19.6	16.5
1	4.2	6.3	5.7
2	8.5	14.0	12.4
3	10.7	14.6	13.4
4+	66.4	44.8	51.2
Don't know/missing	1.1	0.7	0.8
Total	100.0	100.0	100.0
Number of months pregnant at time of first ANC visit			
No antenatal care	9.3	19.6	16.5
<4	69.1	54.2	58.6
4-5	14.7	19.4	18.0
6-7	2.9	3.9	3.6
8+	3.9	2.8	3.1
Don't know/missing	0.1	0.2	0.2
Total	100.0	100.0	100.0
Number of women	54,847	129,794	184,641
Median months pregnant at first visit (for those with ANC)	3.3	3.6	3.5
Number of women with ANC	49,771	104,404	154,175

CSBC worked with NITI Aayog to support program efforts on antenatal care and institutional deliveries by 1.) Conducting a system-level diagnosis to understand the barriers affecting delivery and uptake. 2.) Design and test behaviour change interventions to address these issues. 3.) Pilot and scale up successful solutions in collaboration with partners. Through primary and secondary research and

stakeholder interactions, we found high variability in the quality of ANC services provided. Challenges faced by frontline health workers in conveying the value of ANC contacts (other than material incentives) have led to women devaluing the ANC process. This, coupled with rigid social norms around the disclosure of pregnancies, has resulted in lowered motivation among women to participate in ANC contacts. Furthermore, women's participation in ANC is not adequately leveraged to provide counselling on institutional deliveries, which has led to many opting for unsafe, unsanitary home births.

Indicators of interest:

- Intention to utilize ANC visits
- Value perception of ANC visits

Based on our qualitative diagnosis, we designed interventions that we hypothesised would increase the value perception of ANC. Our main objectives for the interventions are:

1. Simplified communication, highlighting the unique identity of each of the 4 ANC visits in terms of benefits to the mother and child and risks associated with not availing timely care.
2. Increased awareness of this free and essential service emphasising incentives provided by framing them in non-pecuniary terms.
3. Detecting pregnancy signs and conveying the importance of pregnancy registration with a health worker within the first trimester.

This document outlines an experiment using randomised controlled methodology to assess the effectiveness of the proposed interventions in improving intention to utilise ANC contacts with the first contact completed within the first trimester, as well as other immediate outcomes, including value perception of ANC, risk perception of not attending ANC, self-efficacy in relation to attending ANC contacts, and social norms surrounding ANC.

The experiment tested different types of message framing of ANC interventions through a phone survey. Given the risks associated with the current COVID-19 pandemic, the experiment was planned for remote deployment and testing. This phase I concept testing experiment used a pragmatic sample – women of

reproductive age in our target demography instead of exclusively pregnant women.

SECTION 02: **METHODS**

Experimental Design Overview

Our design was a framed field experiment. Women of reproductive age (18-45 yrs.) were eligible and randomly assigned to one of the 7 groups (6 treatment arms and one control). Details of the recruitment criteria and the treatment arms are explained in the following sections.

Recruitment was followed by one phone survey that included both treatment deployment and a questionnaire to measure intentionality, value perception, knowledge, attitudes, past behavior, and standard demographics.

SAMPLE SIZE DETERMINATION

Our sample size was based on similar previous studies. This being a phase I study, we leaned towards a smaller sample to get a quick estimate of how our various messages compare. Datta et al., 2014 showed some efficacy of text-based messaging in improving ANC visits in rural Tamil Nadu using 120 people. They saw an increase in their knowledge score of ANC visits with an effect of 0.34 (Cohen's h). With 100 as an estimate and seven groups, we needed a sample of 700 women. Allowing for a buffer of 25% of data to account for exclusion due to not participating in the survey (after providing consent via IVRS) and incomplete surveys, we needed 934 women to consent to participate. With a 3% recruitment rate (seen in previous such studies) via mass IVRS, we needed to contact 31,134 people. With a sample of 100 per group, a 95% confidence interval, and a power of 0.8, we can expect to detect a group difference with an effect size of 0.4 (Cohen's d) or above.

DATA COLLECTION

1. The women were sent an IVRS, i.e., a recorded message in Hindi asking for their consent to be given via a key press, and then asked four screening questions:
 - a. What is your age?
 - b. Are you currently pregnant? If yes, which month of pregnancy are you in?
 - c. Do you have children? If yes, how many?
 - d. What is the primary source of pregnancy-related health care in your

household?

2. Phone Survey

- a. Informed consent was first confirmed along with the person's name, phone number and answers to the four screening questions. While this was a group assignment, and we couldn't alter the groups based on any corrections, during analysis, we ensured better control of these variables by making sure of their accuracy.
- b. Each group then received an audio message specific to that group (see Treatment Arms section below for details).
- c. This was followed by questions on our primary outcome variables: intentionality to utilise ANC services and value perception of these ANC contacts.
- d. Additional questions on attitudes, knowledge, beliefs and norms, and past behaviour were included as secondary outcome variables. Demographic information was also collected, as they are useful covariates.

RANDOMISATION

Participants who gave consent were assigned to one of 7 groups using stratified randomisation. A stratified random sampling process ensured that equal numbers of pregnant and nonpregnant women were assigned to the different treatment arms. Similarly, assignment to treatment arms was controlled for age groups (18-25, 26-35, 36-45), number of children (no children, children) and primary source of medical care during pregnancy in their households (ANC, private care, home remedies).

TREATMENT ARMS

We created a control group and six treatment groups characterised as sanitation (control), gain frame, loss frame, 4 ANC visits renamed, testimonial, non-pecuniary frame, and registration within the 1st trimester plus mental model of pregnancy detection.

Table 3 describes each of the treatment arms. The treatment deployment was done

during the phone survey. The enumerators played An audio script, followed by questions to measure outcome variables. The duration of each message is also shown in Table 3. The same female voice-over artist recorded all the messages. All messages were in Hindi, widely spoken in the two districts Fatehpur and Sonbhadra. They were written by the authors and translated by a professional copywriter. Scripts were tested on an appropriate sample to get feedback on the language, length, and their level of interest and engagement.

TABLE 3: A BRIEF DESCRIPTION OF THE MESSAGE IN EACH OF THE TREATMENT ARMS.

TREATMENT	DESCRIPTION OF MESSAGE	DURATION
T0: CONTROL	A description of ANC services followed by a message on Swachh Bharat, a public sanitation project (unrelated to ANC)	2 min 03 sec
T1: GAIN FRAMING MESSAGE OF ANC SCHEDULE	A description of ANC services followed by a message describing the 4 ANC visits. The tone is joyful. It highlights the unique benefits and goals of each ANC visit.	2 min 37 sec
T2: LOSS/ RISK FRAMING MESSAGE OF ANC SCHEDULE	A description of ANC services followed by a message describing the 4 ANC visits. Closely matched to the gain frame, it highlights the risks of not attending ANC visits.	2 min 28 sec
T3: RENAMING/ REBRANDING THE ANC VISITS	A description of ANC services followed by a message that assigns a unique identity to each ANC visit, giving it a name and a tagline.	1 min 38 sec

T4: JOYFUL TESTIMONIAL OF THE ANC VISITS	A description of ANC services followed by a message with a joyful testimonial describing the ANC visits and their benefits.	2 min 32 sec
---	---	--------------

T5: NON-PECUNIARY FRAMING OF THE MONETARY INCENTIVE	A description of ANC services followed by a message describing the monetary incentives for completing ANC visits. It is framed as a conversation between two women, highlighting the non-pecuniary possibilities of the incentives provided.	2 min 04 sec
--	--	--------------

T6: MESSAGE FOR REGISTRATION WITHIN 1ST TRIMESTER	A description of ANC services followed by a message describing the heuristics for detecting pregnancy with a call for registration within the 1st trimester.	1 min 59 sec
--	--	--------------

TREATMENT DEPLOYMENT

Enumerators from the ZRC agency were hired to administer the phone survey using a licensed software, Survey CTO. Enumerators conducted the survey on the phone and simultaneously typed the answers into survey CTO (installed on a second device). The call itself was not recorded. The duration of the survey was around 30 minutes. Only complete surveys were used for analysis, and no participants with partial surveys were contacted to resume the survey. While the enumerators were familiar with the broad outline of the study, they were not made aware of the details of the treatment groups in order to reduce potential bias. However, as the enumerator could hear the intervention message played, they were not blind to the treatment arms while conducting the endline survey.

PILOT DATA

The entire questionnaire was tested on 14 participants, 2 per group. This pilot data

was collected by the same enumerators where the calls were recorded to ensure the data quality and to address any concerns.

BACKCHECK

To ensure the quality of the data, 10% of the participants across treatment groups and enumerators were chosen for an additional short survey. A separate set of enumerators conducted these surveys a week after the main data collection. It included a few questions about the previous survey length and comfort rating, the stated preference questions from before, and a few knowledge, attitude, demographics and past behaviour questions.



SECTION 03:
OUTCOME VARIABLES

Outcome Variables

Our participants were women of reproductive age instead of exclusively pregnant women. Thus, we could not measure the actual registration behaviour within the 1st trimester or adherence to the ANC schedule. We primarily wanted to test the different types of framing of messages on a smaller sample. The treatment was a short message deployed only once, immediately before the survey. This limited the expected effect size of change in any outcome variable between treatment and control groups. However, it allowed us to gain insight into the efficacy of our different messages through trends and helped narrow down the intervention choices for Phase II with a larger sample.

Theory of KAP (knowledge, attitude and practice) (Webb TL et al., 2006) and TPB (theory of planned behaviour) (Kim TR et al., 1969) predict the role of knowledge, attitudes (such as risk perception and value perception), social norms, self-efficacy or perceived behavioural control, and demographics in determining behaviour. It also proposes 'intentionality to be the most immediate and important predictor of behavior (Kim TR et al., 1969) . Our primary outcome variables were intentionality to avail/adhere to the ANC schedule and value perception of the ANC services. See Table 4 for a description of primary outcome variables. Our questionnaire also included questions on knowledge of the ANC schedule, risk perception of not attending all 4 ANC visits or failing to register pregnancy within the first trimester, social norms behind adhering to the ANC schedule and registering the pregnancy within the first trimester, confidence in one's ability to attend all 4 ANC visits at the prescribed times, and demographics such as household income and caste. We hypothesised that the increase in intention to adhere to the ANC schedule and the value perception of the ANC services is caused by increased risk perception of non-compliance, knowledge of the ANC services, increased perception of adherence to the ANC schedule as a social norm, etc. See Table 5 for a full list of secondary outcome variables below and how each construct's outcome measure is created.

TABLE 4: DESCRIPTION OF PRIMARY VARIABLES

OUTCOME VARIABLE	DESCRIPTION¹	OUTCOME MEASURE
STATED PREFERENCE: INTENTIONALITY	Likelihood ratings from 1-5: registration within 1st trimester attending at least 1 ANC	Raw Likert score. Measured on a Likert Scale (1-5). Variable type: Two Ordinal variables (1-5).
REVEALED PREFERENCE: VALUE PERCEPTION	1.) Are they willing to donate INR 20 out of the INR 50 endowment to get more information either on ANC services or the monetary incentives provided on completion of ANC visits?	Variable type: Two dummy variables Donate INR 20 for ANC services Information = 1, else 0 Donate INR 20 for ANC Monetary Incentives Information = 2, else 0
	2.) How much are they willing to pay per ANC visit? A titration procedure estimates the price.	7 Steps (INR 20, 40, 60, 80, 100, 120, 140) An additional step for people who refuse to pay INR 20 (the minimum step). Variable type: Numerical (1-8)

¹ For further details on all outcome measures across tables, please refer to the survey instrument [here](#).

TABLE 5: DESCRIPTION OF SECONDARY VARIABLES

OUTCOME VARIABLE	DESCRIPTION	OUTCOME MEASURE
KNOWLEDGE	A total of 7 questions on ANC schedule, registration and monetary benefits.	Number of correct responses across seven questions. Variable type: Numerical (0-7)
RISK PERCEPTION	<p>2 Likert scale ratings of perceived harm due to late registration and non-compliance with ANC schedule. The same scale for both, with 1 being no harm and 5 being most harm.</p> <p>Two yes/no questions on acknowledging the risk associated with late registration and non-compliance with the ANC schedule.</p>	<p>Number with Likert-scale response '2' and above for the scale questions added to</p> <p>The number of questions with a response 'yes' for the binary questions.</p> <p>Variable Type: Numerical (0, 1, 2, 3, 4)</p>
PERCEIVED NORM²	<p>Three questions using a Likert scale rating of likelihood (1-5) of what most women would do:</p> <ul style="list-style-type: none"> - register within the first trimester - consider 4th ANC visit the most important - consider 1-2 ANC visits enough 	<p>Number with Likert-scale response '3' and above for the scale questions</p> <p>Variable Type: Numerical (0, 1, 2, 3)</p>

SELF EFFICACY	Two questions using Likert scale ratings of confidence (1-5) in one's own ability to	Number with Likert-scale response '3' and above for the scale questions
	-register your own pregnancy within 1st trimester - attend all 4 ANC visits if pregnant	Variable Type: Numerical (0, 1, 2)
TRUST EFFICACY	Two trust ratings (1-5, 1 being highly distrust and 5 being highly trust) on	Number with a Likert-scale response '3' and above for the scale questions
	- Govt provided services -whether this survey faithfully represents information given by the govt.	Variable Type: Numerical (0, 1, 2)
PAST BEHAVIOR³	On a subset of previously pregnant women: Registered pregnancy: never, after 1st trimester, within 1st trimester No. of ANC visits: 0-8+	Registered pregnancy categorical variable (0, 1, 2) and ANC visit number discrete variable added together.

² Note: two other questions on reasons for late registration and non-compliance will be treated as qualitative data and not part of this analysis

³ Note: 2 other questions on reasons for late registration and non-compliance were treated as qualitative. 2 more on pregnancy information source and pregnancy care source are already represented by the 'pregnancy care source' stratification, hence not included.

Demographic information is also collected, which will be used as covariates. See Table 6 for a full description of these variables.

TABLE 6: DESCRIPTION OF DEMOGRAPHIC VARIABLES

OUTCOME VARIABLE	DESCRIPTION	OUTCOME MEASURE
COVARIATES- DEMOGRAPHICS	Marital status: Unmarried, married, divorced/separate, widowed	2 levels: 1 = married, 2 = other Binary variable
	Completed education level: did not go to school/ did not complete primary school, primary school, secondary school, undergraduate degree, post-graduate degree,	Raw data used. 5 levels: 1,2,3,4,5 Variable Type: Ordinal (1-5)
	People in the household.	Grouped into three or less, 4-7, 8+ Variable Type: Ordinal (1-3)
	Monthly Household Income	The logarithm of household income per person Variable Type: Continuous
	Religion and Caste combined: Hindu- General, Hindu-OBC, Hindu-SC, Hindu- ST, Muslim, Christian, Sikh, Buddhist, Other	Variable (1-9) Variable Type: Categorical (1-9)
	Time to travel to the health centre: less than 5 min, 5-10 min, 10+ Employment Status: Employed, unemployed,	Variable (1,2,3) Variable Type: Ordinal (1-3)

homemaker

2 levels: 1 = Employed, 2 = other

Binary variable



SECTION 04: **RESULTS**

Model Specifications

Ordered Logistic Regression was used for ordinal outcomes (2 stated preference measures), logit regression for the categorical variable (1st revealed preference measure), and Ordinary Least Squares for the numerical variable (2nd revealed preference measure).

Ordinary Least Squares regression was used for discrete numerical variables (5 secondary outcome measures estimated by all the questions within each construct, except the knowledge construct).

For the knowledge variable, we applied censoring using a Tobit regression model.

Two models were estimated for every outcome measure, with and without controlling for demographic information. This was repeated for each of the six treatment groups.

M1: $Y \sim \text{treatment_assignment} + \text{strata_age} + \text{strata_pregnancy_status} + \text{strata_number_children} + \text{strata_primary_source_pregnancy_care} + \text{error}$

M2: $Y \sim \text{treatment_assignment} + \text{strata_age} + \text{strata_pregnancy_status} + \text{strata_number_children} + \text{strata_primary_source_pregnancy_care} + \text{demographic_covariates} + \text{error}$

Y = outcome measures in Table 4 (four primary outcome measures) and in Table 5 (6 secondary outcome measures)

treatment_assignment = dummy variable, 1 for treatment and 0 for control.

strata_age = stratified by three age groups (18-25, 26-35, 36-45)

strata_pregnancy_status = 1 for pregnant, 2 for not pregnant

strata_number_children = 1 for children, 2 for no children

strata_primary_source_pregnancy_care = stratified by the primary source of pregnancy care in the household, 1 = ANC, 2 = private care, 3 = home remedies.

All analyses, including randomisation, data checks, etc., were conducted using custom-made MATLAB (The MathWorks, Inc).

SAMPLE IDENTIFICATION

Our sample consisted of 885 women registered in the Govindbhai C Patel Foundation from two districts in Uttar Pradesh – Fatehpur and Sonbhadra. Women between the ages of 18 and 45 years were contacted via IVRS (Interactive Voice Response System), asking for their consent to participate in this study. This foundation has a large and diverse database of phone numbers: 68099284 rural women, stratified by age (18-29, 30-44, 45-59, 60+) and income (low, mid, and high) within the state of UP. 1,37,700 women were called, of which 64590 (46.9%) picked up the call, 2265 (1.64%) of them answered the consent question, and 1330 (0.97%) gave consent. Along with the informed consent, they were also asked four screening questions, which were used for stratification during group assignment. Participants who consented were assigned to one of 7 groups. Out of these 1330 consented, 885 (0.64%) completed the survey when called again. The intervention and questionnaire were combined in a single phone survey. Details of the data collection are described below.

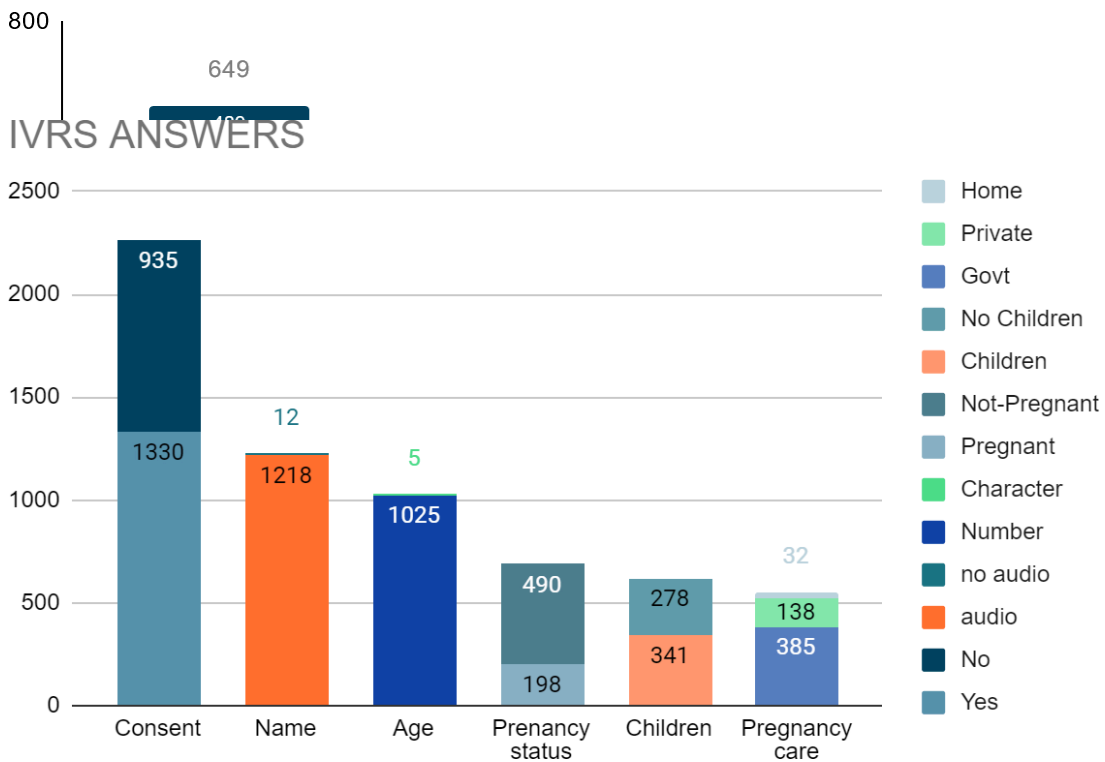
Participants were first contacted via IVRS, and Figure 1A describes the number of respondents who answered each screening question. The questions were presented in the same sequential order; therefore, a participant who answered the last question would have necessarily answered all the questions before it. Respondents were asked the same questions during the phone survey, and the two sets of answers were matched to investigate data accuracy collected via IVRS. Figure 1B shows the match between the IVRS answers (answers given through button presses to the IVRS questions) and the answers to the same questions asked in the survey.

FIGURE 1: IVRS SCREENING PROCESS AND ACCURACY

A)

B)

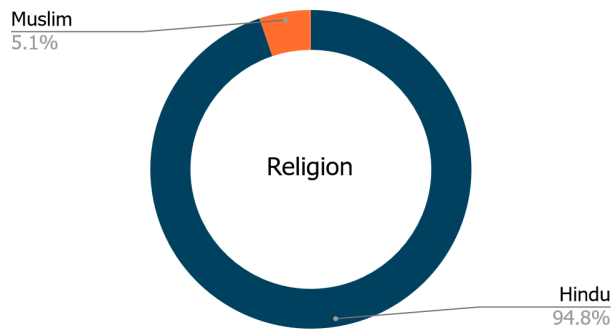
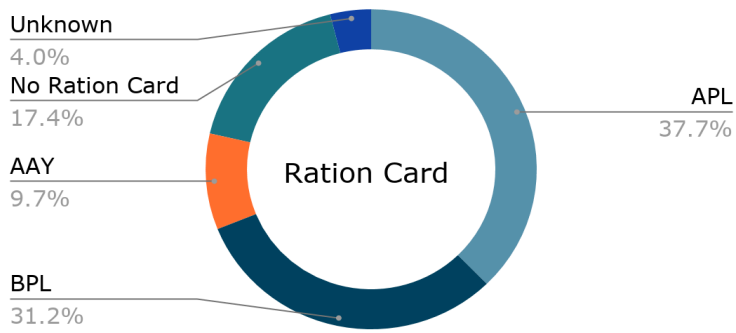
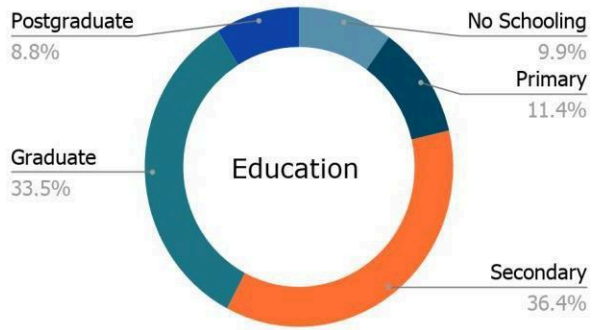
IVRS Screening Accuracy

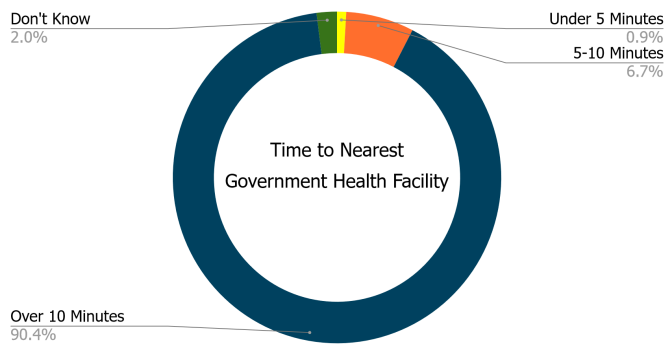
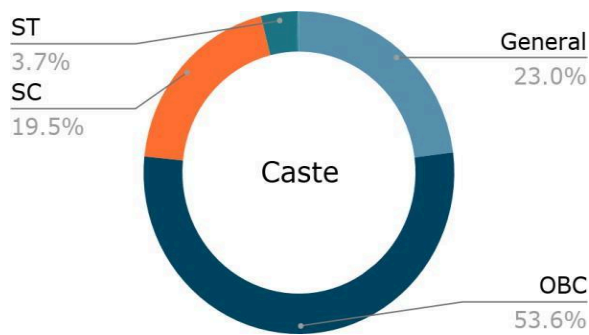


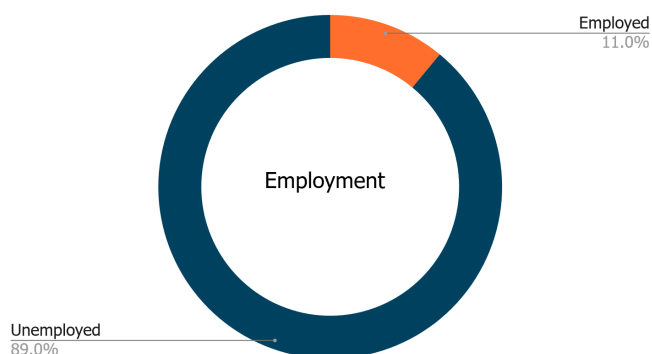
DEMOGRAPHIC CHARACTERISTICS

Respondents were women in the age range of 18-45 years (reproductive age). 87.5% of our sample were married women. Most respondents had received some education, and only 9.9% of the sample received no schooling. 89% of women were unemployed. Mean respondent age, percentage of pregnant respondents, and percentage of respondents with children were balanced across treatments and control groups (Figure 2).

FIGURE 2: SAMPLE CHARACTERISTICS







PRIMARY OUTCOMES

Table 7 describes the primary outcome for all the treatment groups with respect to the control. All the odd ratio values from the table are nearly 1.00. Thus, the data suggests no significant difference between the treatment and the control. None of the interventions showed improvements in ANC's early registration, adherence, and value perception. Intent to send an SMS for monetary incentives was lower in the gain frame than control (0.29 times).

TABLE 7: PRIMARY OUTCOME ODD RATIO

PRIMARY OUTCOMES	REGISTRATION	GAIN FRAME	LOSS FRAME	RENAMING	TESTIMONIAL	NON-PECUNIARY
INTENT TO REGISTER IN THEIR 1ST TRIMESTER	0.9	0.84	0.98	1.00	0.91	1.2
INTENT TO ADHERE TO ANC SCHEDULE	1.14	0.96	0.86	1.36	0.89	0.83
INTENT TO SEND SMS 1 (ANC BENEFITS, SERVICES)	1.16	1.11	0.94	1.03	0.81	0.82

INTENT TO SEND SMS 2 (MONETARY INCENTIVES FOR ANC)	0.75	0.29*	0.61	0.6	0.64	0.9
PRICE WILLING TO PAY FOR ONE ANC CONTACT	-11.64	-8.22	0.48	-8.49	-1.1	-6.35

All results were statistically insignificant except those marked * (uncorrected p<0.05)

Intentionality

The Intentionality score included two likelihood rating (1-5) questions where the respondents were asked about their intention for early registration and adherence to ANC. None of the treatment groups showed significant differences from the control.

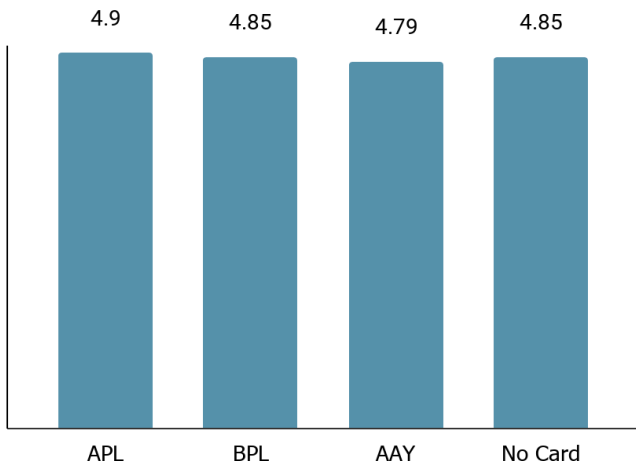
Some key demographic characteristics impacted the intentionality score (Figure 3). Women with no card were more likely to choose a higher rating for intent towards early registration than women with AYY (Antyodaya Anna Yojana) cards (P(AYY/No card) = 0.04; p= 0.05).

Married women were almost twice as likely to choose a higher intent rating to register within the first trimester by one unit than unmarried women (P(married/unmarried) = 1.94, p =0.05).

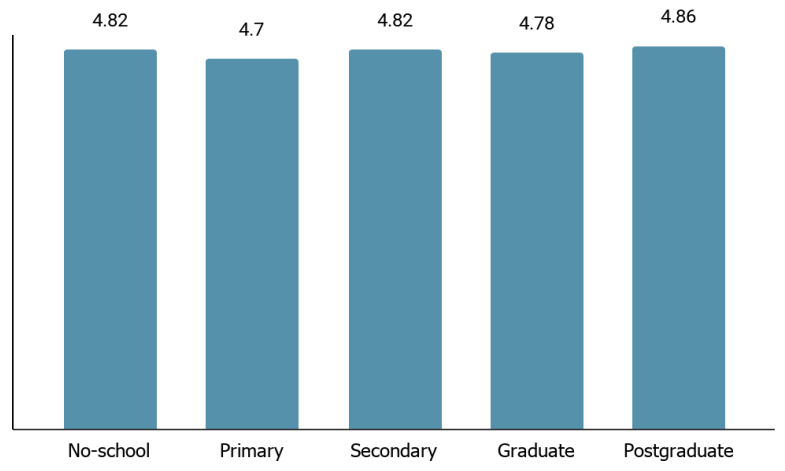
Education showed a significant impact on the intention to adhere to the ANC schedule (P(graduate/postgraduate) = 0.36; p =0.03, P(primary/postgraduate) = 0.27; p = 0.02), whereas income showed no significant impact (P(unit change in monthly income) = 1; p =0.02).

FIGURE 3: DEMOGRAPHIC VARIABLES AND INTENTIONALITY SCORE

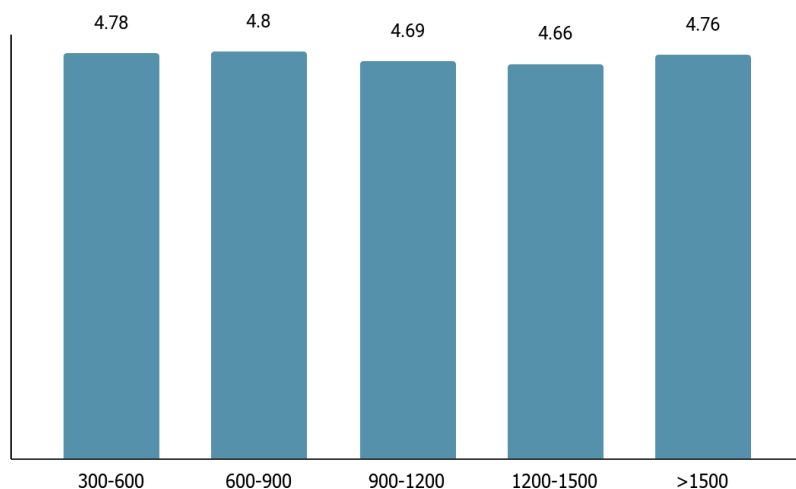
Registration, by Ration Card (Scale of 1-5)



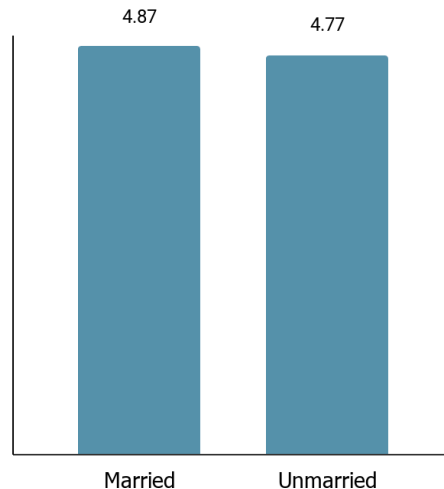
Adherence to ANC Schedule, by Education (Scale of 1-5)



Adherence to ANC Schedule, by Income (Scale of 1-5)



Registration, by Marital Status (Scale of 1-5)



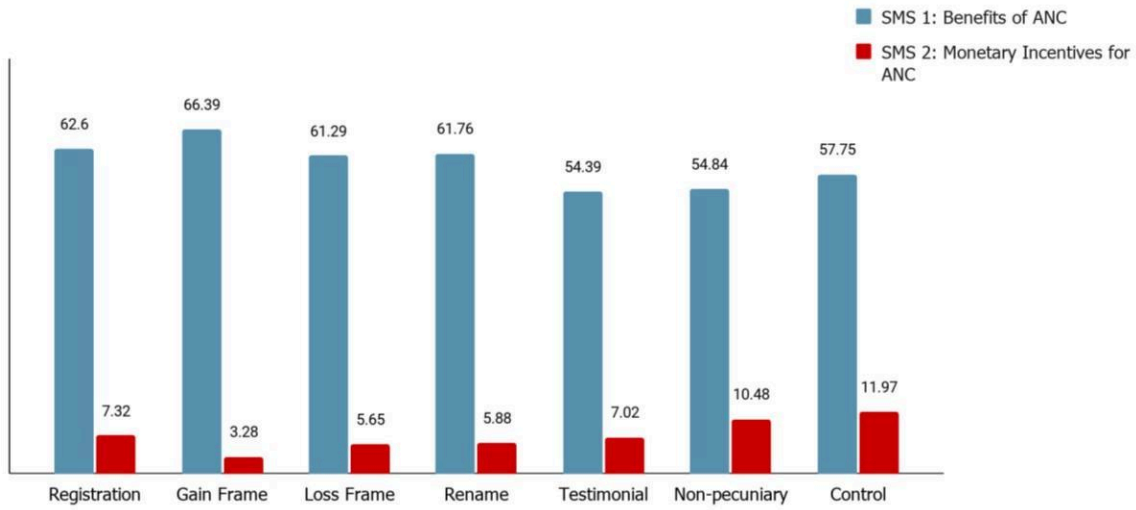
Value Perception

These revealed measures determined the preference for getting substantive information on ANC (between health benefits, monetary incentive, or no message) and willingness to pay for one ANC contact (if they were not provided free by the government). Respondents were given another 50 INR mobile recharge, where they chose to either use 20 INR to send ANC-related information to two of their contacts or keep the entire 50 INR. One set of messages gave them comprehensive information on health benefits and services provided during ANC visits. The second set of messages included information on the financial incentives linked to ANC services and how to avail of them. The odds of sending message one versus not sending a message were equal in different income groups; however, the odds of sending message two versus no message were higher in control than in the gain frame ($P(\text{gain frame/control}) = 0.29$, $p = 0.05$). The intent of sending a message was higher for postgraduates than all other education levels (SMS 1: $P(\text{no-school/postgraduate}) = 0.24$, $p = 0.00$, $P(\text{primary/postgraduate}) = 0.26$, $p = 0.00$, $P(\text{secondary/postgraduate}) = 0.43$, $p = 0.03$), and than most other levels (SMS 2: $P(\text{primary/postgraduate}) = 0.22$, $p = 0.04$, $P(\text{graduate/postgraduate}) = 0.31$, $p = 0.06$).

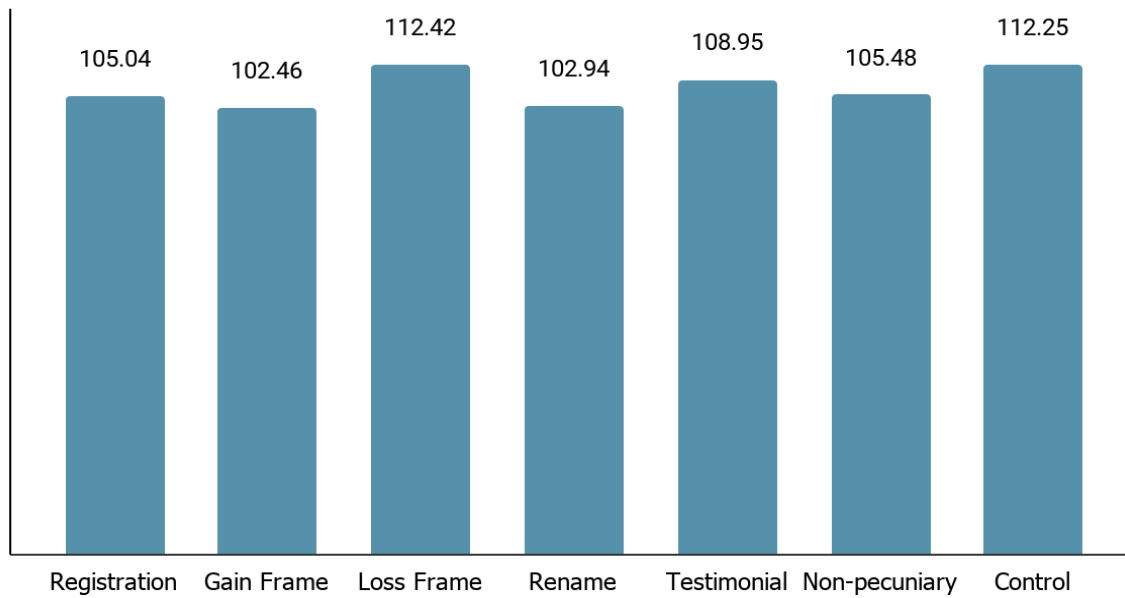
None of the treatments was significantly different from the control with regard to price estimation. Approximately 8% chose not to pay at all (Figure 4).

FIGURE 4: DEMOGRAPHIC VARIABLES AND VALUE PERCEPTION

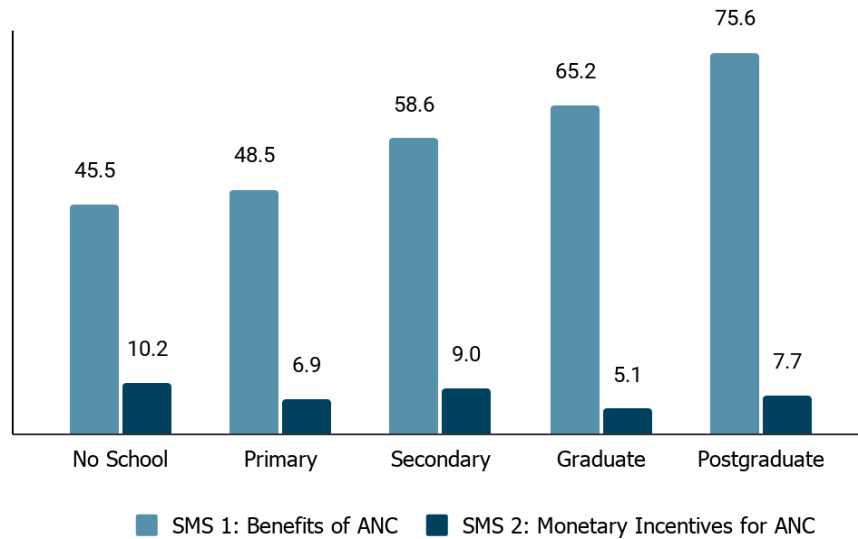
Respondents Willing to Pay to Send SMS, by Condition (%)



Estimation of the Price of an ANC Contact, by Condition (INR)



Respondents Willing to Pay to Send SMS, by Education Level (%)



SECONDARY OUTCOMES

As the odds ratio values (Table 8) are close to 1.00, none of the treatment groups showed any significant difference from the control group. The interventions did not improve any of the secondary outcomes.

TABLE 8: SECONDARY OUTCOME ODDS RATIO

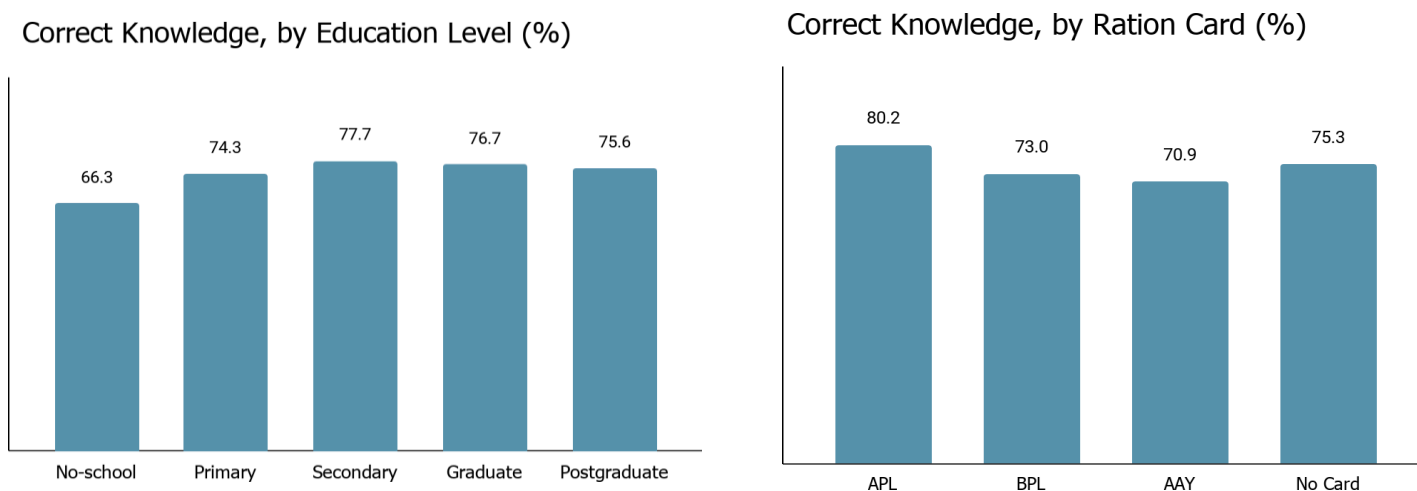
PRIMARY OUTCOMES	REGISTRATION	GRAIN FRAME	LOSS FRAME	RENAMING	TESTIMONIAL	NON-PECUNIARY
KNOWLEDGE	1.07	1.04	1.03	1.04	1.00	0.99
RISK PERCEPTION	1.01	1.01	1.00	1.00	1.00	1.01
PERCEIVED NORM	1.03	0.94	1.06	0.98	0.92	1.01

SELF-EFFICACY	0.99	1.00	1.00	0.99	1.00	0.98
TRUST-EFFICACY	0.99	1.00	0.99	0.99	1.00	0.99
PAST BEHAVIOUR	0.98	1.02	1.02	0.97	0.91	0.88

Knowledge

Knowledge score is a constructed variable describing how many of the seven knowledge questions were correctly answered regarding ANC schedule, registration, and monetary benefits. The results were calculated as per cent correct, and none of the treatment groups was found to be significantly different from the control. However, the percentage of correct knowledge increased with respect to Education (Education level: $F = 2.53$, $p = 0.04$) and Ration Card status (Ration Card: $F = 5.17$, $p = 0.00$). Respondents with secondary-level education showed greater knowledge about ANC contacts than those without schooling ($t_{382} = 3.53$, $p = 0.0152$). Similarly, respondents with APL show higher knowledge than AAY ($t_{400} = 3.26$, $p = 0.0078$) (Figure 5).

FIGURE 5: SECONDARY OUTCOME: KNOWLEDGE

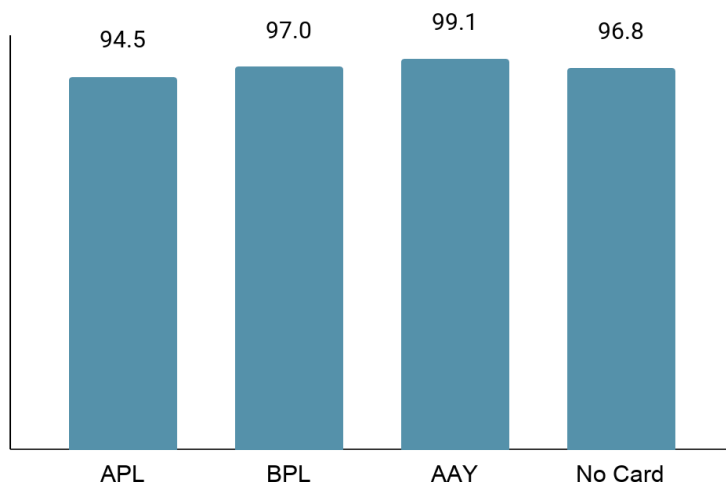


Risk perception

Risk perception was inferred from four questions (two Likert scales and two yes/no types) regarding the perceived harm due to late registration and non-compliance with the ANC schedule. The treatment groups showed no increase in risk perception compared to the control group. Lower poverty (i.e. the ownership of APL ration cards as opposed to BPL or AAY cards) lowered the risk perception of not attending ANC contacts, as opposed to the effect of increasing the highest level of education, which increased risk perception (Figure 6).

FIGURE 6: SECONDARY OUTCOME: RISK PERCEPTION

High Risk Perception of Not Attending ANC, by Ration Card (%)

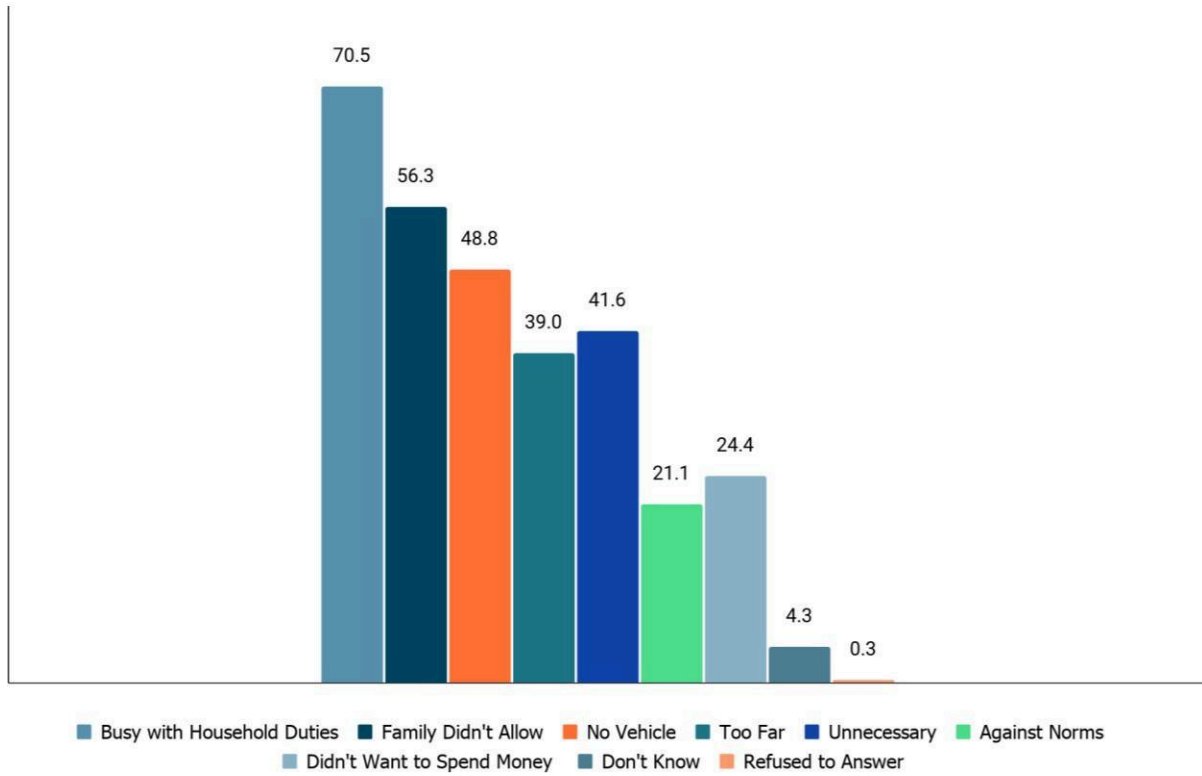


Perceived norm

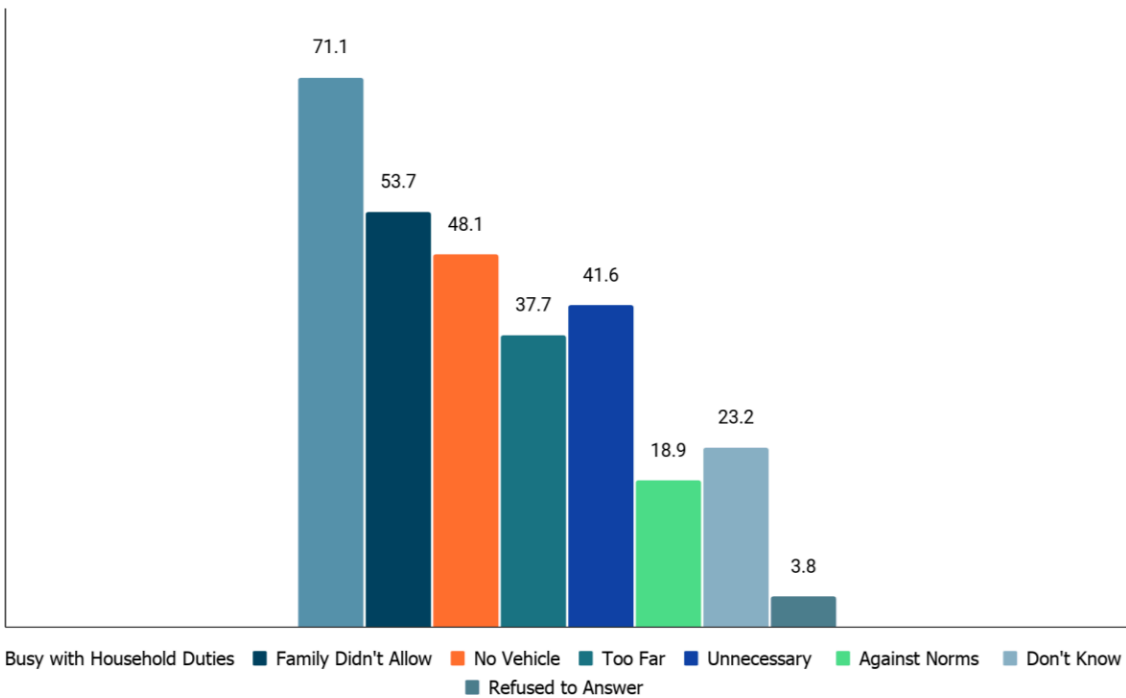
The perceived norms regarding registration and adherence for other women were assessed through 2 questions. Respondents answered why other women fail to adhere to ANC contacts and register early. None of the treatments was different from the control. Figure 7 shows the common reasons for non-adherence and late registration for ANC. Respondents stated that being busy with household duties was the primary reason for other women to not register their pregnancy early and non-adherence to the ANC contacts.

FIGURE 7: SECONDARY OUTCOME: PERCEIVED NORM

Why do others not register their pregnancy early? (%)



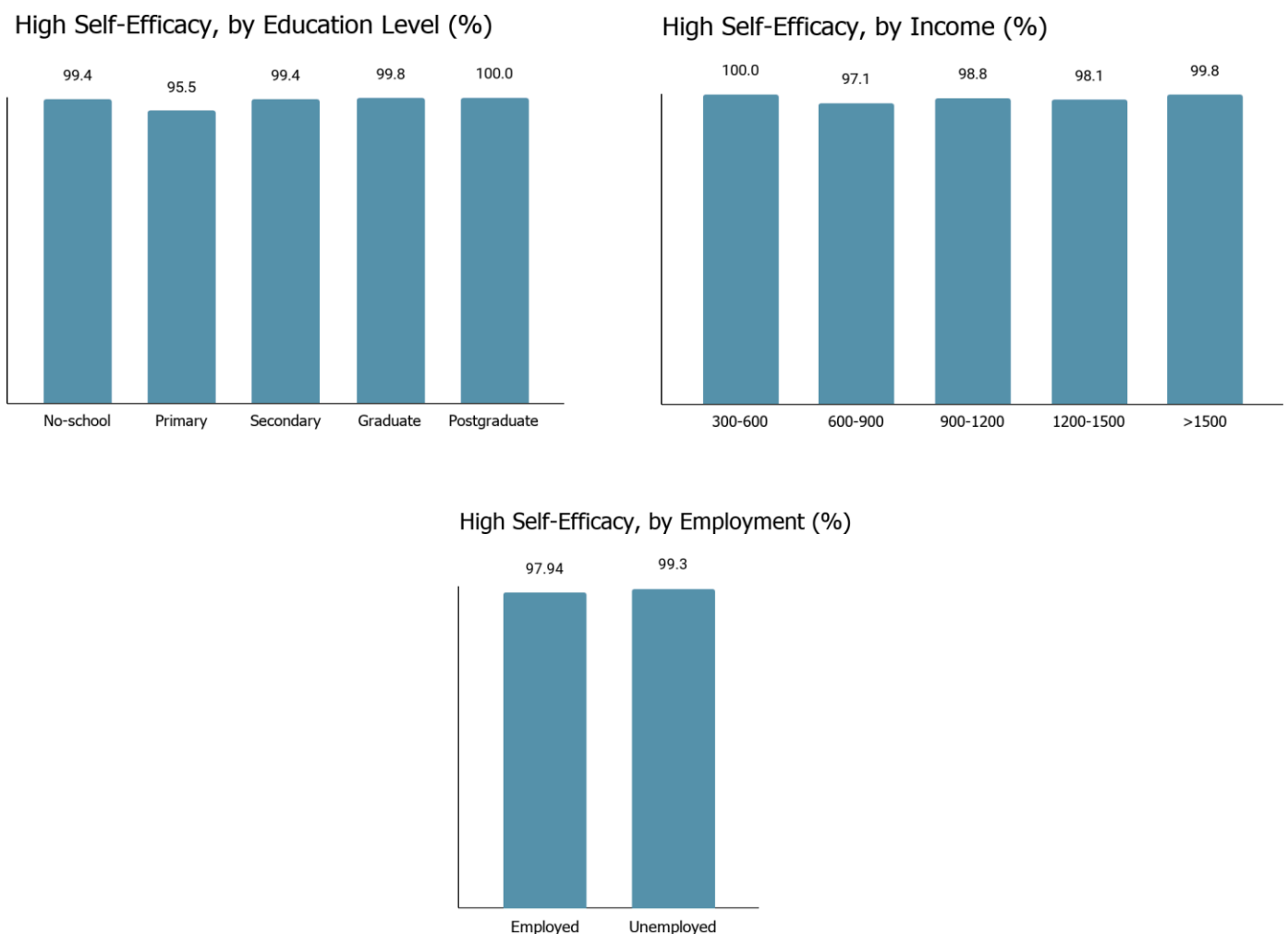
Why do others not attend 4+ ANC visits? (%)



Self-efficacy

2 Likert scale questions measured self-efficacy. The respondents rated their confidence in registering within the first trimester and following the ANC schedule. Income ($F = 1.87$ $p = 0.00$) showed an effect with regard to self-efficacy, although it was mixed across levels (Figure 8). Respondents with only primary education had lower self-efficacy than those with all other levels ($F = 5.61$ $p = 0.00$). Unemployed respondents showed greater self-efficacy than the employed ($F = 5.81$ $p = 0.02$).

FIGURE 8: SECONDARY OUTCOME: SELF-EFFICACY



Trust efficacy

Trust efficacy included 2 Likert scale questions. The respondents rated their trust in government services and this survey. The results showed high trust value in government functionalities and the survey; however, there was no significant difference between any of the treatment and control groups.

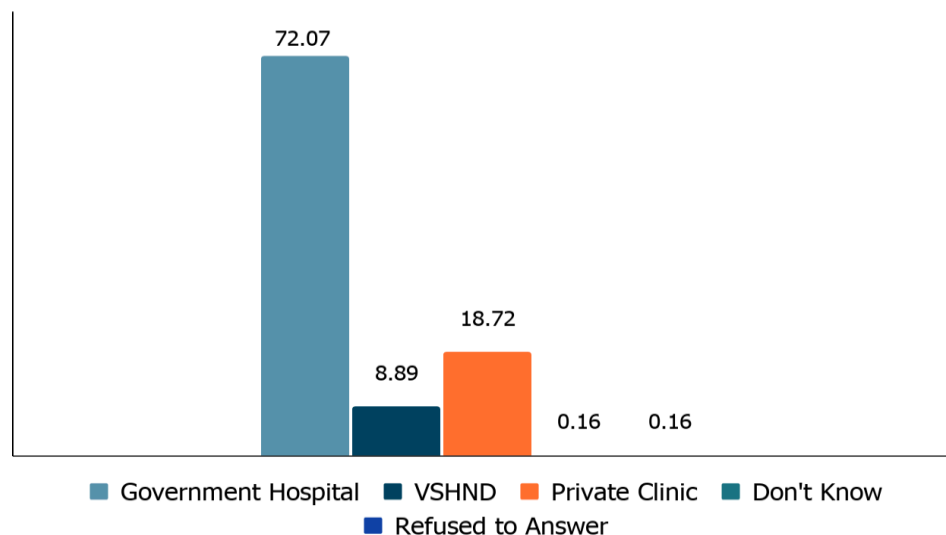
Past Behaviour

This section included questions about their last pregnancy registration and ANC visits. The treatment groups did not show any significant difference from the control.

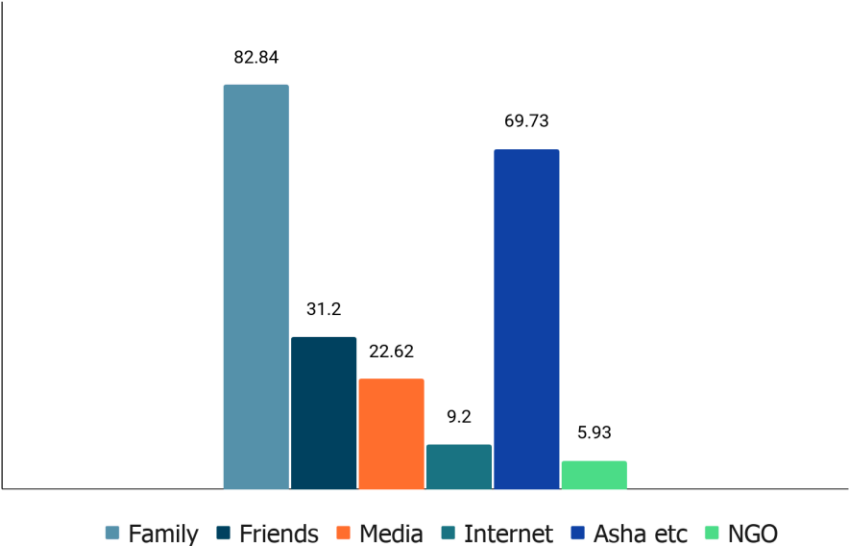
About 72% of the sample stated that they had registered their last pregnancy at a government hospital, indicating that our intervention targeted the desired population. Most women relied on or trusted their family members for healthcare information during pregnancy rather than ASHAs and other healthcare functionaries. IFA tablets followed by blood and urine tests were the most common interventions received during past ANC visits. Nearly half of all respondents said that the reason for registering late in their last pregnancy was that they were unaware of being pregnant at such an early stage. 'Busy with household duties' was the primary reason for not adhering to ANC visits (Figure 9).

FIGURE 9: SECONDARY OUTCOME: PAST BEHAVIOUR

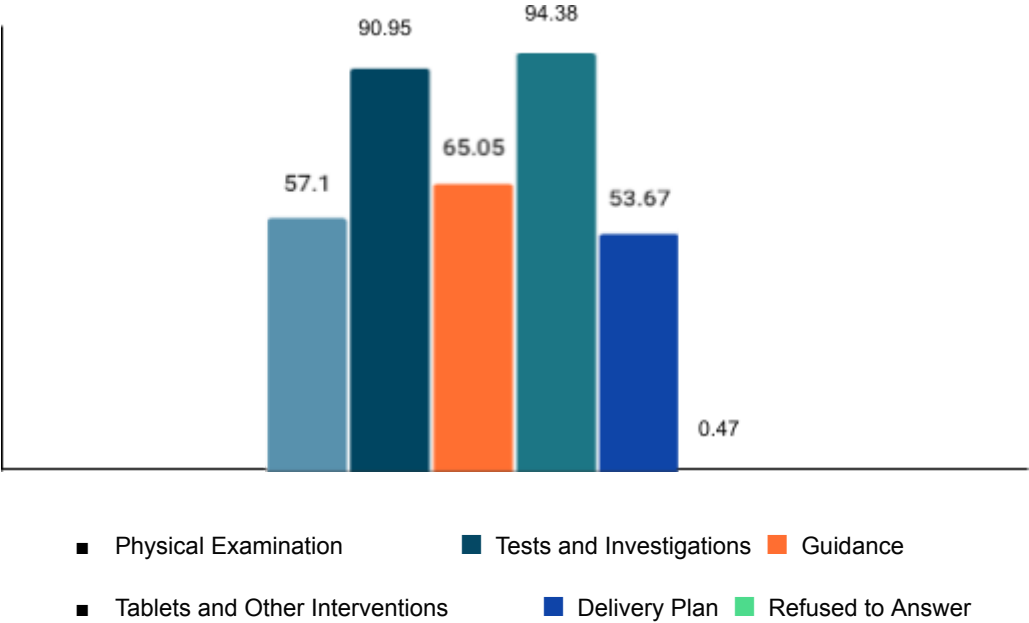
Registration Location (%) (n = 641)



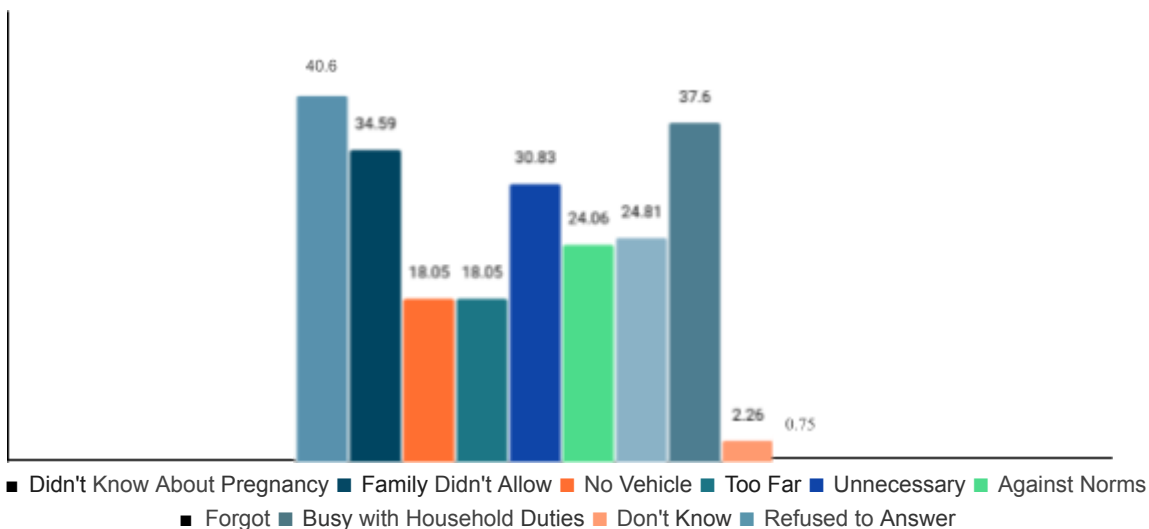
Source of ANC Information (%) (n = 641)



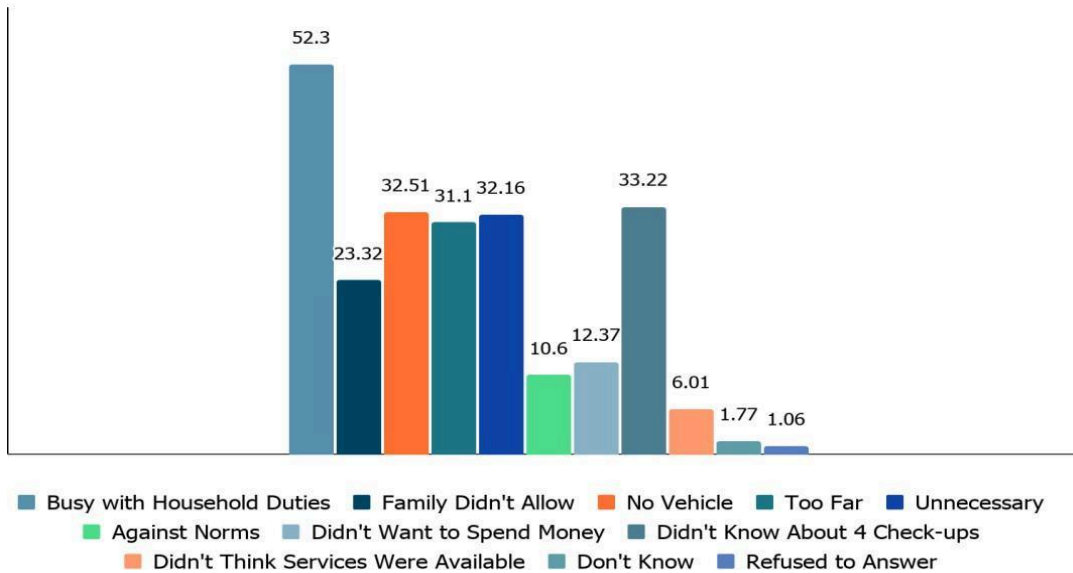
Services Availed (%) (n = 641)



Reasons for Late Registration(%) (n = 133)



Reason for Non-Adherence (%) n = 283





SECTION 04: **DISCUSSION**

Discussion

The interventions did not show improvements in stated (early registration, adherence to ANC schedule) or revealed preference measures (increased interest in knowing about ANC, increased value perception of ANC).

Respondents showed a high knowledge of IFA pills and basic tests (blood and urine tests) offered at ANC contacts; however, there is less awareness of other services like counselling and birth planning. More women said they would advise their friends to save money to buy nutritious food instead of attending ANC and utilising the monetary incentives. This was consistent between the non-pecuniary framing treatment group compared to other groups. Even though women were aware of the health risks for the mother and child for not attending ANC contacts, it is due to the lack of knowledge of the services and monetary assistance ANC provides that they do not advise or avail of these services.

Lack of time due to household responsibilities was the most critical barrier identified via norm perception and past behaviour against early registration and ANC adherence.

Respondents also indicated that they trusted their family members for healthcare information during pregnancy rather than ASHAs and other healthcare functionaries; hence, permission from family was another barrier observed from the data. Being unaware of the pregnancy early was another critical reason for late registration.

The lack of a pure control group and no baseline data were significant limitations of our study. As the audio messages were played on speaker mode through a second device, the audible clip and background noise inconsistency may have affected the message comprehension. Description of ANC was provided across messages for all groups, which may have led to confusion among respondents about the key elements of the message they listened to, distorting the representativeness of responses.

Acknowledgement

We would like to express our sincere gratitude to all those who have contributed to the completion of this research project. We thank Dr. Sharon Barnhardt, our advisor, for their invaluable guidance, continuous support, and constructive feedback throughout the research process.

We are also grateful to our colleagues and peers for their insightful discussions and feedback, which have greatly enriched this study. Additionally, we acknowledge our study participants for their time and willingness to contribute, without whom this research would not have been possible.

Project Team and Authors

Dr. Sneha Shashidhara

Deepika Ghosh

Tanya Aggarwal

Diksha Radhakrishnan

Akanksha Sharma

SECTION 05: **BIBLIOGRAPHY**

1. L Say, D Chou, A Gemmill, Tunçalp O, Moller A-M, Daniels J, Gülmezoglu AM, Temmerman M, and Alkema L. (2014). Global Cause of Maternal Death: a WHO systematic analysis. *The Lancet Global Health*, 2(6), e323-e333. [http://dx.doi.org/10.1016/S2214-109X\(14\)70227-X](http://dx.doi.org/10.1016/S2214-109X(14)70227-X)

2. Datta SS, Ranganathan P, and Sivakumar KS. (2014). A study to assess the feasibility of Text Messaging Service in delivering maternal and child healthcare messages in a rural area of Tamil Nadu, India. *AMJ*, 7(4), 175-180. <http://dx.doi.org/10.4066/AMJ.2014.1916>

3. Webb TL, Sheeran P. (2006). Does Changing Behavioral Intentions Engender Behavior Change? A Meta-Analysis of the Experimental Evidence. *Psychological Bulletin*, Vol. 132, No. 2, 249–268.

4. Kim TR, Ross JA, Smith DP. (1969). Trends in Four National KAP Surveys, 1964-67. *Studies in Family Planning*, Jun., 1969, Vol. 1, No. 43 (Jun., 1969), pp. 6-11



SECTION 06:

APPENDIX

BALANCE CHECK

All the baseline indicators were balanced between the 7 (6 treatment and one control) groups (Table1). There was no significant difference between the groups.

TABLE 1: BALANCE CHECK BETWEEN INDICATORS

	Control	Gain Frame	Loss Frame	Rename	Testimonial	Non-pecuniary	Registration	F-value	p_value
mean_age	27.9	30.0	29.0	29.3	28.3	28.7	28.7	1.145	0.334
prop_married	88.46%	94.92%	90.35%	85.48%	84.91%	87.07%	83.93%	1.583	0.149
prop_pregnant_status	10.77%	12.71%	8.77%	8.06%	12.26%	12.07%	9.82%	0.405	0.876
prop_have_children	76.15%	85.59%	81.58%	77.42%	78.30%	81.03%	79.46%	0.742	0.616
prop_govt_healthcare	78.46%	76.27%	78.95%	81.45%	78.30%	83.62%	78.57%	0.599	0.732
prop_pvt_healthcare	19.23%	17.80%	19.30%	15.32%	20.75%	14.66%	18.75%	0.599	0.732
prop_no_school	6.92%	14.41%	10.53%	8.87%	11.32%	9.48%	8.04%	0.030	1.000
prop_primary_school	14.62%	5.93%	9.65%	15.32%	8.49%	12.93%	10.71%	0.030	1.000
prop_secondary_school	40.00%	38.14%	37.72%	33.06%	39.62%	33.62%	40.18%	0.030	1.000
prop_graduate	32.31%	30.51%	33.33%	34.68%	33.02%	36.21%	34.82%	0.030	1.000
prop_postgraduate	6.15%	11.02%	8.77%	8.06%	7.55%	7.76%	6.25%	0.030	1.000

	Control	Gain Frame	Loss Frame	Rename	Testimonial	Non-pecuniary	Registration	F-value	p_value
prop_ration_card_apl	39.23%	37.29%	47.37%	33.87%	38.68%	42.24%	33.04%	1.525	0.167
prop_ration_card_aay	16.15%	10.17%	6.14%	9.68%	9.43%	10.34%	8.93%	1.525	0.167
prop_ration_card_nocard	12.31%	16.95%	18.42%	22.58%	20.75%	12.07%	25.00%	1.525	0.167
prop_hindu_gen	22.31%	21.19%	17.54%	20.97%	24.53%	16.38%	24.11%	0.557	0.764
prop_hindu_obc	46.15%	50.85%	50.00%	46.77%	51.89%	58.62%	52.68%	0.557	0.764
prop_hindu_sc	23.85%	19.49%	21.93%	21.77%	12.26%	20.69%	14.29%	0.557	0.764
prop_ration_card_bpl	32.31%	35.59%	28.07%	33.87%	31.13%	35.34%	33.04%	1.525	0.167
prop_hindu_st	3.08%	2.54%	3.51%	4.84%	5.66%	1.72%	5.36%	0.557	0.764
prop_hindu_NA	0.00%	0.85%	0.00%	0.00%	0.00%	0.00%	0.00%	0.557	0.764
prop_muslim_gen	2.31%	1.69%	3.51%	3.23%	1.89%	0.86%	0.89%	0.557	0.764
prop_muslim_obc	1.54%	3.39%	2.63%	2.42%	2.83%	1.72%	1.79%	0.557	0.764
prop_muslim_sc	0.77%	0.00%	0.88%	0.00%	0.94%	0.00%	0.89%	0.557	0.764
prop_healthcenter_lessthan5min	0.77%	0.85%	0.00%	0.81%	0.94%	0.00%	3.57%	1.921	0.075
prop_healthcenter_5to10min	5.38%	6.78%	7.02%	7.26%	4.72%	6.03%	10.71%	1.921	0.075
prop_healthcenter_morethan10min	93.85%	92.37%	92.98%	91.94%	94.34%	93.97%	85.71%	1.921	0.075
prop_employed	10.77%	11.02%	12.28%	12.90%	10.38%	12.07%	6.25%	0.570	0.754
mean_monthly_income_member	1,203.48	1,274.37	1,507.61	1,236.04	950.39	1,275.33	1,203.53	0.816	0.557

