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OVERCOMING BEHAVIORAL IMPEDIMENTS TO MATERNAL CARE:
EXPERIMENTAL EVIDENCE ON DOMAIN KNOWLEDGE
AND NUDGEABILITY FROM RECALCITRANT PAKISTAN

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Overcoming Behavioral Impediments to Maternal Care: Experimental Evidence on Domain
Knowledge and Nudgeability from Recalcitrant Pakistan
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ABSTRACT

We conducted a large-scale field experiment to calibrate phone messaging to its potential of overcoming behavioral barriers to maternal care uptake in the countryside of a developing country, where a significant share of women forgoes life-saving maternity-related care even when within reach. The high-arching goal of our intervention is to test if and to what extent filling out insufficient domain knowledge (i.e., childbearing-related health literacy) generates responsiveness to nudges for adopting maternal care among the rural poor of Pakistan. We find that informational nudges sent in a random order using the appropriate medium of communication, voice messages, during pregnancy significantly improve care-seeking behaviors, measured by antenatal care, postpartum checkup, and postnatal visits, through improved literacy. Importantly, we document that high-frequency voice calls timed to gestational age substantially increase the efficacy of informational nudges, including boosting facility deliveries, once domain knowledge is built and nudgeability established. Nevertheless, small financial incentives trump the productivity of informational voice calls in both improving health literacy and boosting care uptake, likely due to participants equating the intrinsic value of the intended behavioral change to the size of the monetary reward. These results are scalable to a large number of populations across developing nations.

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1. Introduction

Despite the well-known factum that receiving childbearing-related medical care, such as prenatal care, facility delivery, and postnatal visits, is critical to saving maternal and infant lives (WHO 2004, 2017; Okeke and Chari, 2018; Daysal et al., 2015), millions of women living in (especially) the rural areas of developing countries do not get proper healthcare during pregnancy, at delivery, and after childbirth (WHO 2004, 2017; Chou et al. 2015; Campbell and Graham, 2006). Strikingly, in spite of significant improvements in maternity-related healthcare availability coming within reach due to decades of healthcare facility investments, behavioral obstacles continue to hamper women from adequately utilizing much-needed modern maternal care, resulting in a significant share of childbearing aged women in the countryside of developing nations meted preventable ill-health and even death. The oft-cited culprits are low overall and maternal health literacy, social taboos, and stigma attached to reproductive health practices, exacerbating the burden of economic hardship (Murthy, 2009; Campbell et al., 2011; Akter et al., 2020; Banik, 2016; Lowe et al. 2016; Tsegaye et al. 2021; Azugbene, 2017; Lund et al., 2012; Nuamah et al., 2019; Tey and Lai, 2013; Sumankuuro et al., 2017). Hence, how to surmount such barriers effectively and on a large scale is still a less studied area.

In this paper, by exploiting the toolkit of behavioral economics, we undertake a mobile phone-based intervention to circumvent inadequate domain knowledge (childbearing-specific health literacy) and substandard reading proficiency as barriers to maternal care use in the countryside of a developing country. To address demand-side impediments to care seeking behaviors of rural women, we augment their choice architecture (i.e., the environment under which people make their choices) via informational voice messages, consistent with libertarian paternalistic type (soft) interventions offered by Thaler and Sunstein (2008). Our findings

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suggest that informational voice calls during pregnancy can (i) substantially improve pregnancy-specific health knowledge of women living in the rural areas of developing countries and (ii) significantly increase their maternal care utilization upon augmenting people's choice architecture.

While the use of mobile phone messaging (Sondaal et al., 2016; Lee et al., 2016) has become a popular demand-side initiative in eliminating attitudinal barriers to maternal care use, with special emphasis on facility deliveries, randomized controlled trials (RCT) evaluating the effectiveness of the associated interventions in the rural areas of developing countries fail to show that cellphone messaging to individuals increases maternity-related care utilization (Lund et al., 2012; Grépin et al., 2019) even though the field experiments conducted in urban settings or those that do not separate the effects by urban versus rural status find that SMS messaging can improve childbearing-related healthcare use and health knowledge (Lund et al., 2012, 2014).[1,2,3]

A review of this line of inquiry suggests that leveraging behavioral economics can greatly benefit mobile phone interventions in enhancing care-seeking behaviors among rural populations while ignoring it can be perilous with suboptimal policy outcomes.[4] To begin, evidence shows

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[1] Predominantly, investments in physical capital to supply-side constraints, such as facility development and increasing the availability of skilled healthcare professionals (Willis-Shattuck et al., 2008; Quick et al., 2014) and insurance coverage expansions to achieve universal health coverage. Albeit falling behind the targeted goals, with the burden falling disproportionately on rural inhabitants, these efforts have led to significant progress towards providing universal primary care and reducing maternal and infant mortality (WHO, 2017, 2019).

[2] Several other demand-side interventions have been considered, including cash transfers, free health coverage, informational interventions via mobile phones, neighborhood initiatives, and the involvement of community health workers, among others (Murray et al., 2014; August et al., 2016; Colaci et al., 2016; Gabbe et al., 2017; Tokhi et al. 2018 Zuñiga et al., 2021).

[3] There is also credible experimental work conducted in developing countries with substantially better income, poverty, education, health, and public safety net profiles, such as Indonesia, than those characterized by high poverty, high infant and maternal mortality, low income, low education, and substandard public safety programs, such as Tanzania, Kenya, Pakistan, India, Nigeria, Bangladesh. For instance, Lenel et al. (2020) examine the role of an informational intervention via mobile phones to improve health knowledge and practices among conditional cash transfer (CCT) beneficiaries in Indonesia. They find that supplementing CCT programs with SMS messaging improves health knowledge and behaviors.

[4] See Sondaal et al. (2016) and Lee et al. (2016) for a review of this literature.

that nudges fail to influence the behavior of those who do not already appreciate the value of intended changes in behavioral outcomes, bringing to the fore the essentiality of domain knowledge in determining the nudgeability of participants (Mrkva et al., 2021; de Ridder et al. 2022).[5] This critical factor is often ignored in designing and implementing communication campaigns for rural populations worldwide, where more than two-thirds of stillbirths take place, maternal healthcare utilization is inadequate (Lawn et al., 2011), and large-scale communication campaigns are in demand to nudge women toward adopting modern maternal care during pregnancy, at delivery, and after birth. As rural populations in developing nations with their known low health knowledge and substandard reading proficiency are indifferent to modern medical care, it comes as no surprise that SMS reminders have had limited effectiveness in such localities (Lund et al., 2012; Lund et al., 2014). Second, existing work has paid limited attention to disambiguating the effects of different messaging practices, e.g., high- versus low-frequency messaging (Grépin et al., 2019) and reminders versus informational nudges. Finally, previous interventions were primarily conducted through existing healthcare facilities, which implies that such findings may not apply to those who are outside the reach of existing health infrastructure.[6]

To fill the void in the literature, we conduct a large-scale village-level cluster-randomized field experiment (with N = 1,556 at baseline) to explore the potential role of phone messaging in boosting maternal healthcare uptake in rural areas of a developing country, Pakistan. We

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[5] In a series of experiments, Mrkva et al. (2021) document that whether and to what degree nudges result in welfare enhancing decisions depend heavily on participant characteristics, including socioeconomic status, domain knowledge, and literacy and numeracy skills. The authors conclude that nudges are a useful tool for individuals who are aware of the potential benefits of their decisions and desire to improve their welfare.

[6] While Grépin et al. (2019) constitute an exemption as they focus on rural populations and do not necessarily have continues access to care. However, their primary focus is testing the efficacy of vouchers and cash transfers. They also examine whether SMS messaging may improve the efficacy of cash transfers. They find little evidence that SMS messages influence maternal care use.

implement a mobile phone-based intervention that builds domain knowledge to ensure

nudgeability without resorting to strong incentives or moral suasion. We randomize message

timing (synchronized to gestational age versus sent in random order), call frequency (once versus

twice per week), and the provision of small monetary incentives to understand if and how much

such provisions improve the efficacy of informational nudges during pregnancy. To assuage

sample selection bias and assure the representability of our sample, we provided mobile phones

to those who did not own one.

Women living in poor rural areas of the world may have never had a thorough

understanding of the importance, efficacy, or conditional essentiality of maternal medical care

for the mother's and newborn's wellbeing. Our informational nudges seek to build this

comprehension. Catering to the low reading proficiency prevalent among a significant fraction of

women in rural parts of developing nations (including Pakistan), we implemented a voice

message-based intervention (instead of SMS messages) to circumvent literacy barriers. This

differential consideration for the needs of rural women and employing an appropriate medium of

communication seeks to empower women's agency in health-seeking behavior, providing them

with relevant knowledge behind the veil of tradition, literacy barriers, and hierarchical household

decision-making.[7]

Rural Pakistan presents an ideal environment to conduct this experiment. More than sixty

percent of its citizens live in rural areas with less than perfect healthcare infrastructure and face

severe public health problems, including high infant and maternal mortality rates (Majrooh et al.,

2014; Alvi, 2018; Aziz et al., 2020). It is among the top ten countries with the highest incidence

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[7] While we considered randomizing SMS messaging to gauge their efficacy compared to voice messages, we decided against this idea considering the low literacy rates of target populations and the findings of previous literature showing little evidence that SMS messaging is effective among rural poor.

of maternal mortality.[8] Lack of awareness of pregnancy complications and delays in seeking

maternal healthcare are among the leading causes of maternal and child mortality in rural

Pakistan (Midhet and Becker, 2010). Meanwhile, cellphone ownership is highly prevalent in

Pakistan's countryside, matching other nations with high rural poverty rates and inadequate

health coverage and approaching near-universal levels as the mobile phone subscription rate

increased from about 70 to 84 percent between 2015 and 2021.[9] In another respect, too, Pakistan

is similar to other developing societies where poor health knowledge and limited overall literacy

skills impede maternal medical care utilization (Zakar et al., 2011; Aziz et al., 2015; Zakar et al.,

2017). In employing this intervention, our work lights up an avenue toward redesigning the

provision of primary healthcare systems in low-resource environments by addressing behavioral

limitations.

Our experiment meets power requirements and survives standards validity checks. It has

adequate power to detect 13-percentage points minimum effect size on binary outcomes and 0.25

standard deviations for continuous outcomes. The endline sample achieves balance on baseline

characteristics. While 10 percent of the recruited women did not make it to the endline for

different reasons, we document that the likelihood of attrition is unrelated to treatment

assignment. Finally, we guard against the potential multiple inference problem by employing

summary index measures as our key dependent variables based on the method of Anderson

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[8] The top ten countries with the highest maternal mortality rates, all developing societies including Nigeria, India, Congo Democratic Republic, Ethiopia, Tanzania, Indonesia, Pakistan, Afghanistan, Chad, and Uganda, account for three out of five deaths (WHO, 2017).

[9] According to Pakistan Telecommunication Authority (PTA), the cellular phone penetration rate was 70.8 percent in 2015-2016 (PTA, 2021 – https://www.pta.gov.pk/en/telecom-indicators/2#annual-teledensity-subscribers accessed on August 1st, 2021). As of June 2021, the number of mobile phone subscriptions is about 184 million, and subscriptions per hundred people equals 84.

(2008). Moreover, adjusting the standard errors using Holm's (1979) multiple hypothesis testing, offered by List et al. (2019), does not alter our conclusions.

The results show that informational voice nudges increase maternal health literacy substantially, regardless of message timing or frequency. In particular, weekly random-order informational voice messages sent during pregnancy increases maternal healthcare literacy by 0.81 standard deviations. Informational nudges synchronized to the gestational age and sent in low-frequency (once weekly) and high-frequency (twice-weekly) improve literacy in similar magnitudes by 0.91 and 0.87 standard deviations. Nevertheless, the effect size for low-frequency messages attached with a small monetary compensation for listening to additional content is 0.64 standard deviations, which is about 30% less than the comparable treatment arm, suggesting that there may be unintended consequences to providing small monetary rewards to improve the efficacy of the intervention. We find similar effects when we estimate the impact of our interventions on the components of maternal healthcare literacy. Therefore, we conclude that informational voice messages during pregnancy may provide competent means to eliminate inadequate domain knowledge as a barrier to care-seeking behaviors.

We next explore the impact of informational nudges on maternal medical care utilization, which is the desired terminus for saving mother and newborn lives. Given large gains in health literacy, this exercise allows us to test the marginal product of nudge frequency and the use of small monetary rewards in boosting the efficacy of information nudges. Results show that enhancing maternity-specific domain knowledge through informational voice calls improves maternal care use. In particular, weekly un-timed messages boost care use by 0.36 standard deviations. Importantly, we find that transforming informational voice calls to high-frequency nudges sent twice a week synchronized to gestational age substantially enhances the efficacy of

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informational voice calls, with effect size increasing by 0.74 standard deviations. Nevertheless, offering small financial incentives to listen to extra content lowers the efficacy of low-frequency informational nudges by a hefty 46 percent. The effects on prenatal visits, postpartum checkups, and postnatal visits are similar to those on the composite care-seeking behaviors index. Notably, high-frequency nudges also improve facility deliveries, the most critical maternal care use indicator for women's and child's health, by eight percentage points.

Our findings help reconcile the conflicting results regarding the efficacy of mobile phone messaging among rural populations. As discussed above, while SMS reminders improve medical care uptake among urban populations, they are found to be largely ineffective in rural areas of developing countries (Lund et al., 2012, 2014; Grépin et al., 2019). This discrepancy could be because nudges are more valuable to those who already know the benefits of care utilization, such as urban populations. Related to this conclusion, our results imply that changing people's choice architecture via information provision can increase the marginal product of reminder messages enabling the target populations to appreciate the value of the intended behavioral changes. Moreover, our finding that high-frequency targeted messages have the largest effect on behavioral outcomes is consistent with recent findings in the literature, which show that high-frequency reminders are effective in improving behaviors, including vaccine adherence (Milkman et al., 2021); student outcomes (Berlinski et al., 2021), and energy consumption (Allcott, 2011).

What could explain the 'implausible' finding to conventional economic reasoning that small monetary rewards hinder the efficacy of informational voice calls? While financial incentives have been shown to enhance the productivity of health behavior interventions in some cases, there is also evidence that they have little or no effect on booting health behaviors (Vlaev

et al. 2019; Chang et al., 2021; Campos-Mercade 2021 Schwalbe et al. 2022). Our finding is consistent with the explanation that minor financial incentives induce the participants to equate the value of the informational content and associated behavioral changes with the magnitude of the reward (Gneezy and Rustichini, 2000). We conclude that while monetary incentives can improve the success of many interventions, policymakers should keep in mind that they can work contrary to intended goals as well (Gneezy et al., 2011).

We next also explore the treatment effect heterogeneity as its importance has been stressed in the literature, given that such analysis can provide valuable information on the scalability of an intervention (Allcott and Taubinsky, 2015; Taubinsky and Rees-Jones, 2018; Allcott and Kessler, 2019). We perform the subsample estimates by educational attainment, distance to the nearest hospital (or healthcare facility with a labor and delivery ward), age, parity status, and the district of residence to examine if our results apply to large segments of the population and test whether and to what extent our results are driven by different sub-groups. For health literacy, we find that informational voice calls have a sizeable positive impact on maternity-specific health knowledge among all subgroups, with some differences among different subsamples. Furthermore, small financial incentives to listen to additional messages lower the efficacy of informational messages in enhancing health knowledge in all subgroups.

Prospectively, regarding care use, twice-weekly informational nudges timed to gestation, our preferred intervention, have a reasonably large, positive, and statistically significant effect on the standardized maternal care use index, regardless of the subgroup. However, there exists some heterogeneity, with less educated women (versus more educated ones), those living closer to hospitals (versus the ones living farther away), and especially multiparity mothers (compared to first-time maternal candidates) exhibiting greater benefits from informational voice nudges in

terms of care seeking behaviors. Therefore, the use of informational voice calls during pregnancy is scalable to a large number of populations as they remain effective in enhancing care-seeking behaviors across subsamples. Moreover, given that boosting skilled care use during pregnancy, at delivery, and after birth is offered as the most potent tool for reducing maternal and infant mortality in the developing world, the effective use of mobile phone messaging can be instrumental in saving a substantial number of maternal and infant lives.[10]

This study contributes to several strands of literature. To begin, our work contributes to the emerging behavioral health economics literature aiming to minimize behavioral impediments to care-seeking and health-improving behaviors (List and Samek, 2014; Altmann and Traxler, 2014; Galizzi and Wiessen, 2018; Courtemanche et al., 2020; Dai et al., 2021; Milkman et al., 2021). By providing informational voice messages, we show evidence that health knowledge is conducive to care-seeking behaviors among those with low health knowledge and reading proficiency. Therefore, as evidence suggests that the value of preventive medicine is underappreciated even in developed societies (Loewenstein et al., 2007; Altmann and Traxler, 2014), informational voice nudges may have substantial benefits to hundreds of millions of women living in rural areas of southeast Asia and Africa. Moreover, as evidenced by our results that the efficacy of high-frequency informational nudges outperforms that of low-frequency ones and small financial incentives lead to unintended consequences, the findings of this research suggest that the people of developing societies respond to nudges and small financial incentives correspondingly to those residing in the Global West, once their choice architectures are leveled off.

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[10] https://www.who.int/news-room/fact-sheets/detail/maternal-mortality

The rest of the article is organized as follows. Section 2 describes our experimental design, contextual environment, and study participants. Section 3 introduces the data and outcomes. Section 4 presents the empirical strategy and results, performs robustness tests, and explores the heterogeneity of our findings. Finally, section 5 discusses and concludes.

2. Background and Experimental Setup

2.1. Background

Pakistan still has one of the world's most inferior pregnancy-specific health outcomes (WHO, 2015; Aziz et al., 2020).[11] In particular, the gap in maternal mortality ratio between rural and urban is striking (319 vs. 175, respectively).[12] Moreover, as in other low-resource countries, poor health literacy is one of the leading barriers to health-seeking behaviors among our target population (Azugbene, 2017; Sabzwari, 2017; Aziz et al., 2020).

In rural Pakistan, pregnancy-specific healthcare utilization from skilled professionals and facility delivery rates are pretty low (UNICEF, 2019). According to the most recent Pakistan Demographic Health Survey 2012-2013, prior to our intervention, more than two-thirds of pregnant women (73%) received at least one antenatal care during their pregnancy; however, only 36% of pregnant women had the recommended at least four antenatal care visits with dramatic differences between urban and rural areas, 62% and 26%, respectively (National Institute of Population Studies (NIPS) Pakistan, 2013). On the other hand, less than half of births (48%) took place in a health facility, with a wide gap between urban and rural 68% vs. 40%.

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[11] Maternal mortality ratio was estimated as 431 deaths in 1990 and declined to 178 deaths in 2015 per 100,000 live births (WHO 2015).
[12] Pakistan Demographic and Health Survey 2006–2007. Islamabad and Calverton: National Institute of Population Studies and Macro International Inc.; 2008. https://dhsprogram.com/pubs/pdf/fr200/fr200.pdf

Likewise, only 44% of rural births were delivered at a hospital or health clinic, whereas the ratio was 71% in urban births. Lastly, while 44% of rural women did not have any postnatal visits in the first two days after birth, the corresponding ratio was only 23% among urban women.

Care-seeking behaviors and pregnancy outcomes among rural Pakistani women are similar to those observed in other developing countries, making our findings immediately relevant to large parts of the world. For example, according to Demographic Health Surveys from 28 African countries,75% of pregnant women received at least one antenatal care, on average; and antenatal care utilization was even less than 50% in some countries such as Zimbabwe, Burkina Faso, and Ethiopia (Chukwuma et al., 2017). Moreover, 38% of pregnant women received the recommended four or more antenatal care visits in Africa (Singh et al., 2014). Likewise, only 43% of births took place in a facility in sub-Saharan countries, where neonatal mortality rates are the highest in the world (Montagu et al., 2011; Liu et al., 2012). Finally, in low-income countries worldwide, only 37% of women received postnatal care within the first two days after birth (WHO *World Health Statistics, 2014*).

Delayed recognition of pregnancy complications, inadequate antenatal and postnatal care as well as eschewing facility deliveries are among the major factors leading to high maternal and neonatal mortality ratios in South Asia and sub-Saharan Africa (Liu et al., 2012; Lawn et al., 2009; Costello et al., 2001). However, these deaths could largely be prevented through behavioral modifications to health-seeking behaviors, including antenatal and postnatal care use from skilled professionals and facility deliveries. In this line, our intervention aims to advance pregnancy-related healthcare utilization via informational voice nudges among pregnant women in rural Pakistan with potential applicability to similar populations elsewhere.

The study was implemented in the Chakwal and Swabi districts of Punjab and Khyber Pakhtunkhwa Provinces, respectively, between April 2015 and May 2016. Potohari and Pushto are the local languages in the two districts, respectively. The districts represent different social environments within the tapestry of Pakistani cultures. The villages, interior and away from urban areas, were identified from each district. In each village, all pregnant women over 18 years of age who were in the first trimester of pregnancy were contacted and invited to participate between February and March 2014. A printed informed consent form was read and explained to the women in the respective local language. If the participant could not sign the form, it was signed by a household member in their presence and witnessed. A baseline survey, with a structured questionnaire to elicit demographics and previous maternal history, was administered to each subject during initial home visits.

2.2. The Content of Voice Messages

The maternal healthcare literacy messages provide information about pregnancy-specific health with a heavy emphasis on proper maternal medical care utilization from skilled healthcare professionals as well as information on diet and hygiene practices. Depending on the timing of recruitment, participants in any of the treatment arms could get up to 26 different messages, displayed in Message Content Appendix A.

We prepared a second set of voice recordings to provide additional health information to one of the treatment arms. Message Content Appendix B presents these messages, providing information on a broad spectrum of health topics, including infant health in utero, household hygiene, child vaccinations, and infectious diseases. All messages were recorded in local languages and a female voice.

2.3. Experimental Set-Up

Our design aims to test the efficacy of informational nudges in improving maternal health knowledge and care uptake using voice messages as the medium of communication. We manipulate call frequency, message timing, and the provision of small financial incentives. Participants received voice messages for up to 26 weeks, depending on the time of the recruitment. All treatments are implemented at the cluster level to minimize spillover effects across treatment arms. In this village-level cluster randomized controlled trial, we compare the outcomes of the four treatment arms, A, B, C, and D, to the control arm, E. We summarize the experimental design as follows:

- *Treatment Arm A: Weekly Random Order Info. Nudge.* This group received one message per week in a random order, i.e., the message content was not synchronized to the gestational age.
- *Treatment Arm B: Weekly Timed Info. Nudge.* This group received one weekly message timed to gestational age.
- *Treatment Arm C: High-Frequency Timed Info. Nudge.* This group received two weekly messages timed to gestational age.
- *Treatment Arm D: Weekly Timed Info. Nudge + Small$ for Extra Info.* This group received one weekly message timed to gestational age. In addition, at the end of the weekly voice calls pertaining to the maternal healthcare literacy messages, the participants were offered a small financial incentive (20 Rupees) if they agreed to listen to a general health message by pressing '1' on the keypad, displayed in Message Content Appendix B. If they accessed the additional information, it would give them a phone balance transfer of 20 Rupees (~USD 0.20). Therefore, Arm C assesses the value of financial incentives in boosting the efficacy of informational voice nudges.
- *Control Group* (*Arm E*). The control group has access to status quo health information through conventional sources.

Our experimental design aims to answer several important questions awaiting compelling answers by large-scale RCTs conducted exclusively in the countryside of developing nations. The first-order question we investigate is whether and to what extent mobile phone-based informational nudges can help address behavioral impediments to pregnant women's maternity-specific care-seeking in such localities.

The overarching goal of the treatment Arm A (*Weekly Random Order Info. Nudge*) *is* to examine the impact of addressing domain literacy regarding childbearing-specific health on circumventing behavioral barriers to maternal healthcare use among the rural poor. The credibility of this empirical test is contingent on whether *Weekly Random Order Info. Nudge*s enhance health literacy among the target population. Arm A sends messages randomly to separate the role of information from the reminder property of nudges. However, because all the voice calls occur during pregnancy, some unavoidably coincide with the associated timing of pregnancy or take a few weeks before or after it. Therefore, we acknowledge that Arm D may impact our outcomes partly through information and partly through serving as reminders. Having noted this caveat*, Weekly Random Order Info. Nudge* is a customized version of standard (e.g., mass-media-based) public health information campaigns.

Arm B investigates if and how much synchronizing message timing with the appropriate stage of pregnancy improves the efficacy of informational voice calls without changing call frequency.

Arm C explores whether shifting to high-frequency timed messages increases the effectiveness of informational nudges.

Arm D allows us to gauge whether small financial incentives can improve the effectiveness of informational nudges on learning and behavior.

The comparison between treatment Arm C and B tests the difference between high- and low-frequency informational nudges.

The comparison between D and B informs us if small monetary compensation improves the efficacy of low-frequency informational nudges synchronized to gestational timing.

Finally, comparing D to C and B answers whether there exists a substitution relationship between message frequency and small financial incentives.

3. Recruitment, Data Collection, and Outcome Measures

3.1. Recruitment of Participants

We hired rural female community health workers, known as Lady Health Workers (LHW), to administer the recruitment protocol to the rural women in the study villages. We deployed them to visit every household in their locality to identify and register pregnant women. In each village (cluster) of the sample, we targeted to reach all the pregnant women who were in the first trimester of pregnancy.

Participation was voluntary and obtained by the use of approved and standard informed consent procedures. Accordingly, a printed informed consent form was read and explained in the local language to the women. Individuals who granted consent were registered. Given that LHWs have been institutionalized and reasonably acceptable in rural Pakistan (Douthwaite and Ward, 2005), we did not face any resistance to participation in our study. Initially, 1556 women were recruited in 403 villages in Pakistan's Chakwal and Swabi districts. Following this, the villages (clusters) were randomly assigned to five arms, four treatment (A, B, C, D) arms, and a control group.

To eliminate the possibility of sample selection bias, we provided free mobile phones to 300 participants who did not have one because our interventions required access to a mobile phone. If any participant had access to another family member's cellphone, that number was recorded for women who reported that they could receive calls on it. In addition to the phone

number of the participants, their preferred times, and days to receive calls throughout the week were recorded to increase the likelihood that women, including those having partial access to shared phones, could listen to the messages.

We managed to register nearly all pregnant women in the first trimester of their pregnancy at the time of recruitment and provided a mobile phone to those who did not have one. Thus, we are confident that our sample is representative of the study population at hand and is scalable to hundreds of millions of women in similar conditions in South Asia and Sub-Saharan Africa.

3.2. Data Collection

A baseline survey, aiming to elicit participant demographic information, household characteristics, and maternal history, was administered by LHWs in person to each of the 1556 subjects at the time of recruitment.

Then, to administer data collection at the endline, we contracted Lady Health Visitors (LHVs), trained as skilled birth attendants, to ensure the accuracy of the endline information as more specific information on delivery and conditions around it was needed. The LHVs collected data using an Android cellphone application developed to ensure the accurate and standardized administration of the endline survey. It was successfully administered to 1,399 participants, gathering pregnancy-specific health knowledge and care utilization, such as prenatal care, facility delivery, and postnatal care.

3.3. Outcome Measures

The first set of outcomes, reflecting maternity-related health literacy, comes from answers to the following questions:

- *If your pregnant friend suffers from any pregnancy-related complications, under whose supervision would you recommend she deliver? (Possible answers: a = Nurse; b = Traditional birth attendant; c = Lady Health Worker; d = Lady Doctor).*
- *Consider any pregnant women you know who suffered from pregnancy complications last month. Her current test results and reports are normal. Will you recommend that she delivers under the supervision of a traditional birth attendant? (Possible answers: a = Yes; b = No).*
- *If your pregnant friend suffers from any pregnancy-related complications, which of the following hospitals is the best place for the delivery? (Possible answers: a = Nearest health facility; b = Public hospital in the city; c = Private hospital in the city).*
- *Which of the following complications requires hospital delivery? (Possible answers: a = Fever; b = High blood pressure; c = Child pulling legs in the abdomen).*
- *During the initial days of pregnancy, the child's position was accurate, but now it is noticed that the baby is suddenly repositioned, what should you do first? (Possible answers: a = Nothing should be done; b = Should consult with the traditional birth attendant; c = Should consult with a nurse or lady health worker; d = Should consult with a lady doctor).*
- *Which of the following could be the first nutrition for a newborn? (Possible answers: a = Milk (of any kind); b = Mother's milk; c = Honey; c = Nothing; e = Any food).*
- *During pregnancy, a proper diet is essential. Whom would you consult for dietary advice? (Possible answers: a = Traditional birth attendant; b = Nurse; c = Lady health worker; d = Lady doctor).*
- *If your pregnant friend does not suffer from any complications, what should she do about [dietary] iron tablets? (Possible Answers: a = Not necessary to take; b = Should take daily; c = Should take once a week; d = Should regularly take for three months; e = should eat mean once a week).*

Using these questions, we create eight dichotomous maternity-specific health(care) literacy indicators and an index variable, which aggerates these items into a single variable. The first health literacy indicator, *Deliver Under SBA,* is a dummy variable representing the likelihood of suggesting a friend deliver her baby under the supervision of a skilled birth attendant, i.e., a nurse or a doctor, when she has birth complications. *Do Not Deliver Under TBA* is set equal to one for respondents who would not recommend a fellow woman to deliver under the supervision of a TBA even if she does not suffer from any current complications. If the

respondent recommends hospital delivery to a friend suffering from any pregnancy-related complications, *Pregnancy Complications Requires Hospital Delivery* is coded equal to one, and it is set equal to zero for those who recommend delivery at the nearest health facility. The dichotomous indicator, *High Blood Pressure Requires Hospital Delivery,* represents the respondent's likelihood to choose the correct answer from the available alternatives, i.e., t symptoms of fever, high blood pressure, and child pulling legs. We set *Consult SHP for Malposition* equal to one if the respondent would recommend a friend to see a skilled healthcare professional (SHP), i.e., maternity nurse or lady doctor, in case the baby is discovered to be repositioned in the womb nearing term, and zero when it is not the case. *Breastmilk or Any Milk for Newborn* is coded as one for those who answered any type of milk or mother's milk as the appropriate first nutrition and zero otherwise. *Consult SHP for Diet* is a binary variable equated to one for participants who would suggest consulting an SHP for pregnancy-related diet, and it is set equal to zero otherwise. Dichotomous *Take Iron Supplements Daily* captures if the respondent declares advising a friend to consume iron supplements daily even with no pregnancy-related complications. Finally, we construct a *Maternal Health Literacy Index*, summarizing health knowledge based on the methodology of Anderson (2008). This approach generates a weighted summation of the variables described above by using the inverse covariance matrix, assigning a lower weight to indicators exhibiting higher correlation among each other. We use the standardized values of the index, with a mean of zero and a standard deviation of one, in the analysis.

Our second set of dependent variables represents maternity-specific medical care use and is constructed based on the following endline questions:

- *Did you visit a skilled healthcare professional for antenatal care? If the answer is yes, who did you visit? (Possible answers: a = Nurse; b = Lady Health Worker; c = Dispenser; c = Lady Doctor).*
- *If you answered yes to the previous question, how many times did you visit skilled medical care professionals for antenatal care? (Possible answers: open-ended)*
- *Where did you deliver your child? (Multiple answers group under home, local hospitals, district public hospitals, and district private hospitals).*
- *After the delivery, did you get a postpartum checkup for the child from a skilled healthcare professional, such as a nurse or lady doctor? (Possible answers: a = Yes; b = No)*
- *Since your child's birth, have you visited a skilled healthcare professional for postnatal care, such as a nurse or lady doctor? (Possible answers: a = Yes; b = No)*

By using answers to the first two questions above, *Four Plus Skilled Antenatal Visits* is coded equal to one for those who visited skilled healthcare professionals for antenatal care at least four times, and it is set equal to zero otherwise. *Facility Delivery* is a dummy variable indicating whether the birth occurred at a healthcare facility. If the mother visited a skilled healthcare professional after giving birth to get her post-delivery health and recovery screened, we code *Postpartum Check-up* equal to one, and it is set equal to zero otherwise. The dummy variable, *Four Plus Skilled Postnatal Visits*, represents whether the child was taken to a skilled healthcare professional at least four times for a post-natal visit. Finally, we also construct the *Maternal Healthcare Utilization Index* by using the Anderson (2008) method described above. In the analysis, we employ the normalized value of the index to a mean of zero and a standard deviation of one.

4. Econometric Specification and Empirical Analysis

4.1. Econometric Specification

We estimate the impact of our interventions on maternal health literacy and care uptake using equation (1):

(1) $Y_{ij} = \alpha + \beta_1 A_j + \beta_2 B_j + \beta_3 C_j + \beta_4 D_j + \varepsilon_i$

Y_{ij} reflects, depending on the specification, measures of maternal health knowledge or medical care use for mother i living in village j. $\beta_1, \beta_2, \beta_3,$ and β_4 estimate the impact of the corresponding treatment arm on the outcome of interest.

(2) $Y_{ij} = \alpha + \beta_1 A_j + \beta_2 B_j + \beta_3 C_j + \beta_4 D_j + \lambda X_{ij} + \varepsilon_i$

Then, in equation (2), we test the resilience of our estimates to controlling for baseline characteristics represented by vector X, including educational attainment, age, and age squared, maternal history, home ownership, cellphone ownership, whether the respondent received a cellphone as part of the intervention, household electricity status, household refrigerator status, distance to the nearest local clinic, distance to the closest hospital, and tehsil (i.e., the administrative subdivision of a district) fixed effects. Finally, standard errors are adjusted for clustering at the village level, which is the unit of randomization, in each case.

4.2. Attrition Analysis

As shown in Figure 1, of the 1556 women who consented to join the study, 157 did not make it to the culmination of the intervention, leaving us with 1399 participations at the endline. Among these, 78 had to be excluded due to miscarriage or abortion, and 79 could not be located at the endline survey. To gauge whether and to the extent attrition can bias our results, we estimate attrition indicators on our interventions in Table 1. Unsaturated models in Panel I show

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that treatment assignment is unrelated to the termination of pregnancy (Colum 1), the chances of

not being located at the time of the endline interviews (Column 2), and the aggregate attrition

indicator (Column 3). In Panel II, repeating this exercise by controlling for the full set of

exogenous covariates produces identical conclusions. Consequently, we infer that attrition should

not bias our findings as it is orthogonal to our interventions.

4.3. Evidence on Balancing

Table 2 performs a balancing test on pre-intervention observable characteristics. Columns

(1) to (5) display the mean values for treatment arms A, B, C, D, and E, respectively. Then, in

columns (6) to (9), we show if the baseline characteristics for A, B, C, and D are different from

those for E. Notably, the difference is not statistically significant at the 5-percent level in any of

the cases.[13] Finally, in column (10), comparing the mean values of baseline characteristics in all

the treatment arms to the comparison arm shows no statistically significant differences in

observable baseline characteristics between the control and treatment groups. Therefore, we

conclude that our interventions achieve balance.

4.4. The Impact of Informational Voice Nudges on Maternal Health Literacy

In Table 3, we present the estimates of the health literacy index. Panel I shows the

unadjusted estimates, and Panel II presents the results from models with the complete set of

controls, including information on education, age, multiple parity status, homeownership, phone

ownership, household electricity status, refrigeration ownership, distance to the nearest local

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[13] In only 2 of the 44 pairwise comparisons (B versus E for *Owns the Home*; and A versus E for *Has Electricity*), the difference in means between treatment arms and the comparison group is marginally statistically significant at the 10 percent level, suggesting sporadic differences instead of particular selection patterns.

clinic, distance to the closest hospital, and tehsil (town) fixed effects. The pattern of estimates displayed in Panels I and II document that controlling for observable baseline characteristics has no significant bearing on our estimated coefficients, implying the success of our randomization.[14]

In column (1) of Panel II, *Weekly Random Order Info. Nudge* increases health literacy by 0.81 standard deviations. Sending informational voice nudges in a synchronized manner improves health literacy by 0.91 standard deviations. The high-frequency (twice-weekly) informational nudges timed to gestational age impact health literacy similarly by 0.87 standard deviations. Nevertheless, offering small financial incentives to listen to additional content at the end of low-frequency informational nudges timed to gestational age causes the index to increase by 0.64 standard deviations. By comparing the coefficients on the treatment arms, we conclude that voice-message-based childbearing-related information provision to pregnant women is highly effective, with the coefficient estimates ranging from 0.61 to 0.91 standard deviations in column (1). In columns (2) to (9), we find that weekly voice calls substantially increase health knowledge, regardless of the frequency and synchronicity of message contents to the appropriate pregnancy stage, except column (7), testing the knowledge of appropriate diet for the newborn.

Strikingly, the provision of small financial incentives to listen to additional messages to enhance informational voice nudges (Arm D) lowers the magnitude of the impact to 0.64 standard deviations, corresponding to a 30 percent reduction in effect size relative to the once-a-week time-targeted informational voice messages (Arm B).

Overall, the results show that informational voice nudges substantially improve domain knowledge about maternity-specific health. While message timing and frequency do not

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[14] The full set of coefficients on control variables are presented in Appendix Table 1.

meaningfully influence this relationship, the provision of small financial incentives operates contrary to the intended goal. Therefore, these results suggest that informational voice nudges may help weaken inadequate domain literacy preventing the use of modern medical care among rural women of developing countries to the extent that lack of maternal-, infant-, and child-health-related health knowledge constitute a behavioral impediment to such care use. We explore this conjecture in the following subsection.

4.4. The Impact of Informational Voice Nudges on Maternal Care Uptake

We now focus on testing whether our informational interventions' impact extends beyond domain literacy. Panels I and II of Table 4 show the coefficient estimates with no control variables and conditioning on baseline characteristics. It is worth mentioning that this exercise provides additional evidence on the exogeneity of treatment assignments to baseline characteristics, as the effect sizes are nearly identical.

In the first column of Panel II, weekly informational voice nudges sent in a random order boost maternal healthcare utilization by 0.36 standard deviations.[15] Synchronizing the deployment of weekly informational nudges to the appropriate stage of pregnancy produces similar estimates to those we observe for Arm A. Shifting to twice-weekly informational voice nudges dramatically improves the efficacy of informational messages to 0.74 standard deviations. Finally, providing small financial incentives to enhance the efficacy of low-frequency nudges is counterproductive to the intended goal as it lowers the effect size substantially to 0.2 standard deviations.

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[15] We display the full set of coefficients on control variables in Appendix Table 2.

In columns (2) to (5), we estimate the impact of our interventions on *Four Plus Skilled Antenatal Visits*, *Facility Delivery*, *Postpartum Check-up*, and *Four Plus Skilled Postnatal Visits.* We find that being placed in treatment arms A, B, C, and D positively impacts the likelihood of at least four antenatal care visits by 21, 31, 42, and 13 percentage points, in that order. High-frequency nudges increase the likelihood of facility delivery, the most critical maternity-specific care use indicator, by 8 percentage points, and it is statistically significant at the 10 percent level. Because our data enable us to capture up to 12-13 percentage points effects on binary outcomes, the finding that high-frequency voice nudges boosts maternal care use should rather be taken as suggestive.

The mother's likelihood of receiving a postpartum checkup increases by 32, 31, 34, and 19 percentage points for treatment arms A, B, C, and D, respectively. Finally, in the last column, mothers who received weekly random order voice calls also exhibited an increase in the likelihood of making postnatal care visits by 11 percentage points. We find that low- and high-frequency informational nudges increase the adoption of postnatal care by 11 and 25 percentage points.

In Appendix Tables 3 and 4, we display Holm's (1979) p-values adjusted for multiple hypothesis testing following the methodology described by List et al. (2019) for literacy and care utilization models, respectively. Inference based on these p-values leads to identical conclusions.

4.5. Treatment Effect Heterogeneity

We explore treatment effect heterogeneity by education, distance to the nearest hospital, age, and parity to gauge if our findings apply to large population segments. Subgroup analysis also informs one on the likelihood of the success of scaled-up policy implementations of nudge-

type interventions in particular (Mrkva et al., 2021) and experiments in general (Al-Ubaydli et al., 2019), which depends on the population characteristics under the study. We limit the heterogeneity analysis to index measures because they summarize maternal health literacy and care utilization reasonably well and allow us to retain statistical power even when the number of observations is reduced roughly by half, as evidenced by the magnitudes of the impact of informational nudges on the index variables in Tables 3 and 4.

Table 5 shows the effect-heterogeneity analysis for the health-literacy index by subsample. In the first two columns, we split the sample based on educational attainment (at most primary school versus at least middle school) to test whether the responsiveness of individuals differs based on their formal education.[16] These estimates suggest that voice-message-based informational interventions substantially improve the health knowledge of more and less educated women. However, the detrimental effect of offering 20 Rupees (~USD 0.20) for listening to additional content is greater among those with fewer years of schooling, suggesting that small monetary rewards may constitute a greater detriment to the health knowledge of women with lower schooling.

Evidence shows that women living far away from hospitals are disadvantaged as they have limited access to modern medical care, especially facility deliveries (Gage et al., 2019). Therefore, in columns (3) and (4), we estimate the health-literacy index on our treatment arms by dividing the sample based on the median distance to the nearest hospital, which is 15.45 km. The results show that the learning outcomes do not greatly differ by distance to the closest hospital.

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[16] The analysis sample is limited to those with non-missing information on schooling.

In columns (5) and (6), we divide the sample based on the median age of 25 and find that our interventions improve the learning outcomes of younger and older women qualitatively similarly.

In columns (7) and (8), exploring the impact heterogeneity by parity, we find that voice-message-based based informational interventions similarly impact the learning outcomes of those who gave birth before and did not.

Finally, in columns (9) and (10), we reproduce our estimates by the district of residence, Chakwal of Punjab, and Swabi of Khyber Pakhtunkhwa. These estimates are qualitatively similar to the estimates by educational attainment in the first two columns. That is, health literacy effect sizes are usually larger in Chakwal (with 5.2 years of formal education) than in Swabi (with 3.6 years of schooling). Similarly, small monetary incentives are more detrimental in less educated Swabi than in more educated Chakwal.

After showing that voice-message-based informational messages substantially increase health literacy, we explore the impact heterogeneity of treatment arms A to D on *Maternal Healthcare Utilization Index* in Table 6. In columns (1) and (2), we find that the impact of informational voice messages on behavioral outcomes is generally higher among less educated women. This finding is consistent with the argument that those with lower education may benefit more from informational nudges regarding maternal care uptake.

In columns (3) and (4) of Table 6, we explore impact heterogeneity by median distance to the closest hospital. The results show that informational nudges have higher effects on maternal care utilization of those living closer to healthcare facilities, consistent with the notion that living closer to healthcare facilities increases the nudgeability of participants, possibly due to the lower cost of reaching health facilities.

In columns (5) and (6) of Table 6, we do not find systematic differences in younger versus older women's responsiveness to informational nudges.

In columns (7) and (8), we examine the effect of our interventions on care use in multiparity and primiparity samples, respectively. Overall, we find stronger effects among women who had previously had a child. These findings are not surprising because women who already had children (1) may better appreciate the virtues of healthcare and (2) have greater agency in deciding the venue of birth delivery; hence, they may be more nudgeable.

Finally, in columns (9) and (10), we explore the effect heterogeneity by the district of residence, Chakwal, and Swabi. As was the case for health literacy estimates, these estimates show similar patterns to those by the level of formal education. In particular, the impact of informational voice calls on maternal care use is usually larger among the residents of Chakwal, where educational attainment is lower than in Swabi.

5. Conclusion and discussion

From the knowledge of the general usefulness of a tool to its fine calibration often lies the success of a policy instrument in low-resource environments. Such is the case of phone messaging, not unknown for its uses but its refinement to incorporate behavioral evidence for the rural poor in developing societies is a continuing effort. In this article, the results indicate that mobile phone nudges, equipped with certain features, can be instrumental in addressing behavioral hurdles to accessing maternal care among women living in the countryside of developing countries.

In our interventions, we augment participants' choice architecture by providing informational nudges while employing an appropriate communication medium, voice messages.

In doing so, we show that informational voice calls improve the nudgeability of participants via increased health knowledge, regardless of call frequency or timing. Then, we further demonstrate that while improved health literacy is conducive to maternal care utilization in and of itself, high-frequency voice nudges timed to gestational age substantially improve the efficacy of informational voice messages in inducing women into adopting maternal care. This result has an important policy implication that high-frequency nudges can effectively improve behavioral outcomes upon mediating the knowledge gap among the participants via providing information. Notably, our finding regarding the efficacy of high-frequency informational voice calls aligns with studies undertaken in Western nations documenting that high-frequency reminders are the most effective in improving vaccine adherence, student outcomes, and energy conservation (Milkman et al., 2021; Berlinski et al., 2021; Alcott, 2011).

We find that the provision of small financial incentives led to a substantial reduction in the effectiveness of the low-frequency informational nudges for maternal health literacy and care uptake outcomes. Moreover, subsample analysis demonstrates that such monetary incentives constitute a greater obstacle to the welfare of less educated women, who face stronger barriers to much-needed maternal care. These results are consistent with the explanation that small monetary compensation lowers the intrinsic value of the intervention, likely due to participants equating the value of the informational content to the size of the small monetary cash incentive and adjusting their behaviors accordingly (Gneezy and Rustichini, 2000). This finding points to another similarity between those living in more prosperous countries of the world and those residing in the rural areas of poorer ones and suggests that although monetary incentives can enhance welfare, they can also act against the intended goals. Therefore, policymakers aiming to

improve an intervention's efficacy by providing financial incentives to the rural residents of developing countries should exhibit extra caution.

Low overall literacy and substandard domain knowledge are commonly observed among our target population. We employ voice messages as the medium of communication to surmount the literacy barrier, and by directly reaching out to pregnant women, we augment their agency to decide on healthcare during pregnancy and childbirth. Our intervention potentializes technology and makes health literacy immediately accessible to women. Not only mobile phone technology is affordable, but it is also possible to tailor cellphone messaging and individualize it for large numbers to enhance health behaviors. This step toward potentializing cellphones with health literacy that is behaviorally consistent can be a leap toward high-impact health interventions. Thus, there is a high potential for expanding healthcare choices using cellphone networks for maternal healthcare in the rural developing world.

Our work demonstrates that beyond creating the choice of modern maternal care in the close vicinities of pregnant women, women need to be equipped with actionable health literacy, without which the available healthcare choices may not be appropriately legible to them. Health literacy unlaces malformed opinions and manifests healthcare choices in bold relief, allowing women to adopt health behaviors beneficial to them and their newborns. In some ways, health literacy can allow for accurate reading of the choice architecture available to pregnant mothers, otherwise seen through the translucency of free-flowing opinions.

Getting lifesaving solutions into the field and rolling them out through health systems is an ongoing struggle all over the world. Such translational efforts meander forward with varying degrees of success. In the case of extending lifesaving maternal and newborn care in rural parts of the developing world, the progress has been slower than anticipated, sometimes hampered by

speed bumps. While governments spend millions of dollars on expanding healthcare networks into the rural areas, making efforts to staff these facilities with skilled healthcare workers and equipping them with necessary supplies, these healthcare systems perform at low potential due to variegated adoption of healthcare by pregnant mothers. As a consequence, intolerable numbers of preventable deaths around childbirth continue to take place. Refining and calibrating solutions to reorganize health systems within available resources can save many lives.

Recall that increasing maternal care utilization, especially facility deliveries, among the rural poor living developing societies, has been considered an important and urgent policy target by the WHO. Crude back-of-the-envelope calculations assuming different levels of efficacy regarding the impact of maternal care utilization on child and maternal mortality suggest that informational voice nudges pass the cost-benefit tests even when the conjectured impact of maternal care utilization on maternal and infant mortality is fairly small.

Our findings invite future work to investigate whether and to what extent providing information campaigns, such as public health education, via targeted voice calls can improve domain knowledge (such as health literacy) and induce welfare-enhancing behavioral improvements (e.g., appropriate medical care use) in other settings, where they are constrained by behavioral impediments and social barriers.

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Figure 1. Trial Profile

	All	Arm A Weekly Random Order Info. Nudge	Arm B Weekly Timed Info. Nudge	Arm C High-Frequency Timed Info. Nudge	Arm D Weekly Timed Info. Nudge + Small$ for Extra Info	Control Group
Baseline	1556 women 403 villages	328 women 79 villages	318 women 85 villages	299 women 80 villages	280 women 79 villages	331 women 80 villages
Attrition	157 women 39 villages	30 total 15 not found 15 abortion or miscarriage	40 total 22 not found 18 abortion or miscarriage	35 total 16 not found 19 abortion or miscarriage	26 total 13 not found 13 abortion or miscarriage	26 total 13 not found 13 abortion or miscarriage
End-line	1399 women 372 villages	298 women 73 villages	278 women 78 villages	264 women 72 villages	254 women 73 villages	305 women 76 villages

Table 1. Attrition

VARIABLES	(1) Abortion or Miscarriage	(2) Not Found	(3) Total Attrition
Panel I. No Control Variables			
Weekly Random Order Info. Nudge	0.006	0.006	0.013
	(0.016)	(0.035)	(0.037)
Weekly Timed Info. Nudge	0.017	0.030	0.047
	(0.017)	(0.031)	(0.033)
High-Frequency Timed Info. Nudge	0.024	0.014	0.039
	(0.018)	(0.023)	(0.028)
Weekly Timed Info. Nudge + Small$ for Extra Info	0.007	0.007	0.014
	(0.016)	(0.030)	(0.033)
Observations	1,556	1,556	1,556
R-squared	0.002	0.002	0.003
Panel II. Full Set of Control Variables			
Weekly Random Order Info. Nudge	-0.002	0.011	0.008
	(0.016)	(0.032)	(0.036)
Weekly Timed Info. Nudge	0.004	0.040	0.045
	(0.016)	(0.030)	(0.033)
High-Frequency Timed Info. Nudge	0.021	0.007	0.028
	(0.017)	(0.026)	(0.031)
Weekly Timed Info. Nudge + Small$ for Extra Info	-0.002	-0.005	-0.006
	(0.016)	(0.031)	(0.033)
Observations	1,556	1,556	1,556
R-squared	0.031	0.092	0.055

Notes: Arm A received one message per week but in random order, not timed to gestation age; Arm B received one message per week timed to gestational age; Arm C received two messages per week timed to gestational age; and Arm D received one message per week with a subset of 20 messages provided the option to access additional information for a phone balance transfer of Rs. 20 per message. Robust standard errors, clustered on the village, are in parentheses. *** $p<0.01$, ** $p<0.05$, * $p<0.1$. The controls in Panel II include education indicators, age, age squared, multiple parity status, home ownership, phone ownership, household electricity status, refrigeration ownership, distance nearest local clinic, distance nearest hospital, and tehsil (town) fixed effects. To retain the sample size, we control for missing variable dummies for each control variable with missing information and replace the missing values with zero.

Table 2. Baseline Balance

Variable	(1) Arm D	(2) Arm B	(3) Arm A	(4) Arm C	(5) Control Arm E	(6) D versus Control (1)-(5)	(7) B versus Control (2)-(5)	(8) A versus Control (3)-(5)	(0) C versus Control (4)-(5)	(10) All Treatment Arms (D, B, A, and C) versus Control Arm E P-value
Primary School	0.171	0.160	0.141	0.183	0.172	-0.002	-0.012	-0.031	0.010	-0.009
	(0.377)	(0.368)	(0.349)	(0.387)	(0.378)	(0.033)	(0.037)	(0.033)	(0.038)	(0.026)
Middle School	0.129	0.130	0.105	0.125	0.110	0.019	0.019	-0.006	0.014	0.012
	(0.336)	(0.337)	(0.307)	(0.331)	(0.314)	(0.030)	(0.031)	(0.026)	(0.026)	(0.021)
> Middle School	0.369	0.363	0.359	0.315	0.345	0.025	0.018	0.014	-0.029	0.008
	(0.484)	(0.482)	(0.481)	(0.466)	(0.476)	(0.048)	(0.053)	(0.051)	(0.047)	(0.037)
Age in years	25.926	26.453	26.500	26.555	26.393	-0.467	0.060	0.107	0.162	-0.049
	(5.186)	(5.147)	(5.178)	(5.432)	(5.074)	(0.470)	(0.438)	(0.458)	(0.501)	(0.361)
Age in Years Squared	698.973	726.166	728.955	734.563	722.275	-23.302	3.890	6.679	12.288	-0.894
	(300.624)	(297.246)	(294.455)	(305.488)	(289.510)	(26.822)	(24.774)	(25.596)	(27.984)	(20.271)
Multiple Parity	0.591	0.550	0.500	0.575	0.554	0.037	-0.004	-0.054	0.021	0.001
	(0.493)	(0.498)	(0.501)	(0.495)	(0.498)	(0.046)	(0.044)	(0.049)	(0.047)	(0.038)
Owns the Home	0.830	0.873	0.851	0.820	0.805	0.025	0.069*	0.046	0.016	0.039
	(0.376)	(0.333)	(0.357)	(0.385)	(0.397)	(0.044)	(0.038)	(0.042)	(0.050)	(0.034)
Has Access to a Phone	0.860	0.879	0.887	0.839	0.851	0.009	0.027	0.035	-0.012	0.015
	(0.348)	(0.327)	(0.318)	(0.368)	(0.357)	(0.039)	(0.039)	(0.038)	(0.042)	(0.033)
Given a Free Mobile Phone	0.265	0.241	0.242	0.217	0.000	--	--	--	--	--
	(0.442)	(0.429)	(0.429)	(0.413)	(0.000)	--	--	--	--	--
Has Electricity	0.982	0.973	0.963	0.966	0.947	0.035*	0.026	0.016	0.019	0.025
	(0.134)	(0.164)	(0.190)	(0.181)	(0.225)	(0.019)	(0.024)	(0.023)	(0.024)	(0.018)
Has Refrigerator	0.756	0.688	0.709	0.696	0.697	0.059	-0.009	0.012	-0.001	0.016
	(0.431)	(0.464)	(0.455)	(0.461)	(0.460)	(0.046)	(0.050)	(0.049)	(0.050)	(0.038)
Distance to Closest Local Clinic	2.839	2.825	4.043	3.455	3.741	-0.902	-0.916	0.302	-0.286	-0.472
	(3.159)	(2.954)	(5.704)	(4.478)	(3.440)	(0.566)	(0.579)	(1.199)	(0.748)	(0.554)
Distance to Closest Hospital	16.550	18.010	19.642	20.339	19.086	-2.535	-1.076	0.557	1.253	-0.539
	(11.984)	(13.214)	(13.908)	(12.488)	(14.781)	(2.676)	(2.677)	(2.799)	(2.622)	(2.247)
Observations	298	278	264	254	305	603	583	569	559	1399

Notes: Arm A received one message per week but in random order, not timed to gestation age; Arm B received one message per week timed to gestational age; Arm C received two messages per week timed to gestational age; Arm D received one message per week with a subset of 20 messages provided the option to access additional information for a phone balance transfer of Rs. 20 per message. Robust standard errors, clustered on the village, are in parentheses. *** p<0.01, ** p<0.05, * p<0.1. Columns (1) to (5) present the mean values for Arms A, B, C, C, and the control group. Columns (6) to (9) present the differences between A and the control group, B and the control group, C and the control group, and D and the control group. Column (10) compares all the treatment arms to the control group.

Table 3. The Impact on Maternal Healthcare Literacy

	(1)	(2)	(3)	(4)	(5)	(6)	(7)	(8)	(9)
	Maternal Health Literacy Index	Deliver Under SBA	Avoid Delivery Under TBA	Pregnancy Complications Requires Hospital Delivery	High Blood Pressure Requires Hospital Delivery	Consult SHP for Malposition	Breastmilk or Any Milk for the Newborn	Consult SHP for Diet	Take Iron Pills Daily
Panel I. No Control Variables									
Weekly Random Order Info. Nudge	0.792***	0.456***	0.352***	0.411***	0.273***	0.457***	0.007	0.394***	0.248***
	(0.081)	(0.040)	(0.033)	(0.038)	(0.043)	(0.038)	(0.041)	(0.041)	(0.034)
Weekly Timed Info. Nudge	0.899***	0.384***	0.476***	0.408***	0.309***	0.421***	0.002	0.374***	0.306***
	(0.081)	(0.042)	(0.033)	(0.036)	(0.040)	(0.038)	(0.041)	(0.040)	(0.037)
High-Frequency Timed Info. Nudge	0.851***	0.444***	0.565***	0.448***	0.221***	0.451***	-0.051	0.404***	0.267***
	(0.078)	(0.045)	(0.037)	(0.038)	(0.040)	(0.042)	(0.040)	(0.046)	(0.034)
Weekly Timed Info. Nudge + Small$ for Extra Info	0.614***	0.381***	0.219***	0.299***	0.225***	0.353***	-0.021	0.360***	0.215***
	(0.083)	(0.042)	(0.036)	(0.041)	(0.038)	(0.039)	(0.044)	(0.040)	(0.036)
Panel II. Full Set of Control Variables									
Weekly Random Order Info. Nudge (A)	0.812***	0.455***	0.366***	0.420***	0.270***	0.465***	0.009	0.397***	0.263***
	(0.084)	(0.041)	(0.036)	(0.038)	(0.043)	(0.040)	(0.044)	(0.043)	(0.035)
Weekly Timed Info. Nudge (B)	0.912***	0.379***	0.483***	0.412***	0.316***	0.424***	-0.002	0.370***	0.324***
	(0.079)	(0.043)	(0.034)	(0.036)	(0.041)	(0.039)	(0.041)	(0.041)	(0.038)
High-Frequency Timed Info. Nudge (C)	0.865***	0.443***	0.577***	0.454***	0.229***	0.458***	-0.055	0.410***	0.271***
	(0.082)	(0.043)	(0.038)	(0.039)	(0.040)	(0.040)	(0.040)	(0.046)	(0.035)
Weekly Timed Info. Nudge + Small$ for Extra Info (D)	0.640***	0.377***	0.236***	0.304***	0.232***	0.356***	-0.017	0.360***	0.229***
	(0.082)	(0.042)	(0.034)	(0.040)	(0.039)	(0.039)	(0.043)	(0.040)	(0.036)
Observations	1,399	1,399	1,399	1,399	1,399	1,399	1,399	1,399	1,399
P-value (A - B = 0)	0.26	0.08	0.00	0.80	0.34	0.32	0.78	0.57	0.15
P-value (A - C = 0)	0.57	0.78	0.00	0.35	0.40	0.89	0.12	0.79	0.84
P-value (A - D = 0)	0.08	0.07	0.00	0.00	0.42	0.01	0.55	0.43	0.40
P-value (B - C = 0)	0.61	0.17	0.03	0.22	0.06	0.44	0.19	0.44	0.20
P-value (B - D = 0)	0.00	0.96	0.00	0.00	0.07	0.12	0.74	0.82	0.03
P-value (C - D = 0)	0.02	0.15	0.00	0.00	0.95	0.02	0.36	0.32	0.30

Notes: Arm A received one message per week but in random order, not timed to gestation age; Arm B received one message per week timed to gestational age; Arm C received two messages per week timed to gestational age; Arm D received one message per week with a subset of 20 messages provided the option to access additional information for a phone balance transfer of Rs. 20 per message. Robust standard errors, clustered on the village, are in parentheses. *** p<0.01, ** p<0.05, * p<0.1. In Panel II, the control variables include education indicators, age, age squared, multiple parity status, home ownership, phone ownership, household electricity status, refrigeration ownership, distance to the nearest local clinic, distance to the nearest hospital, and tehsil (town) fixed effects. In Panel II, we control for missing variable dummies for each control variable with missing information to retain the sample size and replace the missing values with zero.

Table 4. The Impact on Maternal Medical Care Use

VARIABLES	(1) Maternal Healthcare Utilization Index	(2) Four + Skilled Antenatal Visits	(3) Facility Delivery	(4) Postpartum Checkup	(5) Four + Skilled Postnatal Visit
Panel I. No Control Variables					
Weekly Random Order Info. Nudge	0.376***	0.193***	0.019	0.310***	0.097**
	(0.082)	(0.030)	(0.046)	(0.038)	(0.043)
Weekly Timed Info. Nudge	0.350***	0.301***	0.038	0.298***	0.088**
	(0.083)	(0.035)	(0.049)	(0.036)	(0.044)
High-Frequency Timed Info. Nudge	0.738***	0.411***	0.091*	0.332***	0.235***
	(0.097)	(0.034)	(0.049)	(0.040)	(0.046)
Weekly Timed Info. Nudge + Small$ for Extra Info	0.209**	0.119***	0.017	0.183***	0.055
	(0.085)	(0.029)	(0.051)	(0.037)	(0.042)
Panel II. Full Set of Control Variables					
Weekly Random Order Info. Nudge (A)	0.364***	0.206***	0.001	0.318***	0.110**
	(0.082)	(0.032)	(0.043)	(0.039)	(0.044)
Weekly Timed Info. Nudge (B)	0.362***	0.305***	0.011	0.306***	0.107**
	(0.084)	(0.036)	(0.044)	(0.038)	(0.045)
High-Frequency Timed Info. Nudge (C)	0.741***	0.424***	0.080*	0.341***	0.248***
	(0.091)	(0.036)	(0.044)	(0.039)	(0.044)
Weekly Timed Info. Nudge + Small$ for Extra Info (D)	0.195**	0.127***	0.013	0.189***	0.063
	(0.083)	(0.030)	(0.045)	(0.035)	(0.043)
Observations	1,399	1,399	1,399	1,399	1,399
P-value (A - B = 0)	0.97	0.02	0.80	0.77	0.93
P-value (A - C = 0)	0.00	0.00	0.06	0.61	0.00
P-value (A - D = 0)	0.05	0.03	0.78	0.00	0.26
P-value (B - C = 0)	0.00	0.01	0.12	0.43	0.00
P-value (B - D = 0)	0.07	0.00	0.98	0.00	0.30
P-value (C - D = 0)	0.00	0.00	0.14	0.00	0.00

Notes: Arm A received one message per week but in random order, not timed to gestation age; Arm B received one message per week timed to gestational age; Arm C received two messages per week timed to gestational age; Arm D received one message per week with a subset of 20 messages provided the option to access additional information for a phone balance transfer of Rs. 20 per message. Robust standard errors, clustered on the village, are in parentheses. *** $p<0.01$, ** $p<0.05$, * $p<0.1$. In Panel II, the full set of control variables includes education indicators, age, age squared, multiple parity status, home ownership, phone ownership, household electricity status, refrigeration ownership, distance nearest local clinic, distance nearest hospital, and tehsil (town) fixed effects. In Panel II, we control for missing variable dummies for each control variable with missing information to retain the sample size and replace the missing values with zero.

Table 5. The Impact on Normalized Maternal Health Literacy Index, Heterogeneity Analysis by Subsample

VARIABLES	(1) At most Primary School	(2) At Least Middle School	(3) > Median Distance to Nearest Hospital	(4) <= Median Distance to Nearest Hospital	(5) Older Age >25 Women	(6) Younger Age <=25 Women	(7) Multiple Parity	(8) First Time Mother	(9) Chakwal of Punjab	(10) Swabi of Khyber Pakhtunkhwa
Weekly Random Order Info. Nudge (A)	0.726***	0.939***	0.779***	0.838***	0.774***	0.866***	0.907***	0.727***	0.825***	0.846***
	(0.115)	(0.113)	(0.111)	(0.124)	(0.107)	(0.109)	(0.109)	(0.117)	(0.098)	(0.144)
Weekly Timed Info. Nudge (B)	0.935***	0.904***	0.947***	0.890***	0.904***	0.926***	1.029***	0.812***	0.979***	0.854***
	(0.113)	(0.107)	(0.104)	(0.119)	(0.120)	(0.107)	(0.107)	(0.111)	(0.089)	(0.146)
High-Frequency Timed Info. Nudge (C)	0.748***	0.998***	1.005***	0.712***	0.809***	0.930***	0.872***	0.864***	1.052***	0.629***
	(0.114)	(0.130)	(0.096)	(0.134)	(0.110)	(0.118)	(0.113)	(0.108)	(0.091)	(0.141)
Weekly Timed Info. Nudge + Small$ for Extra Info (D)	0.495***	0.830***	0.727***	0.539***	0.600***	0.687***	0.695***	0.574***	0.752***	0.514***
	(0.114)	(0.107)	(0.106)	(0.124)	(0.116)	(0.112)	(0.110)	(0.123)	(0.109)	(0.124)
Observations	703	625	696	703	628	771	776	623	794	605
P-value (A - B = 0)	0.08	0.78	0.21	0.67	0.32	0.59	0.28	0.48	0.17	0.96
P-value (A - C = 0)	0.86	0.69	0.07	0.36	0.78	0.61	0.77	0.27	0.04	0.14
P-value (A - D = 0)	0.06	0.40	0.69	0.03	0.18	0.15	0.08	0.27	0.57	0.02
P-value (B - C = 0)	0.13	0.51	0.63	0.20	0.49	0.98	0.20	0.63	0.49	0.14
P-value (B - D = 0)	0.00	0.55	0.08	0.01	0.03	0.05	0.01	0.07	0.06	0.02
P-value (C - D = 0)	0.05	0.22	0.02	0.25	0.11	0.06	0.16	0.03	0.01	0.41

Notes: Arm A received one message per week but in random order, not timed to gestation age; Arm B received one message per week timed to gestational age; Arm C received two messages per week timed to gestational age; Arm D received one message per week with a subset of 20 messages provided the option to access additional information for a phone balance transfer of Rs. 20 per message. Robust standard errors, clustered on the village, are in parentheses. *** $p<0.01$, ** $p<0.05$, * $p<0.1$. All models control for the full set of control variables, including education indicators, age, age squared, multiple parity status, home ownership, phone ownership, household electricity status, refrigeration ownership, distance nearest local clinic, distance nearest hospital, and tehsil (town) fixed effects. To retain the sample size, we control for missing variable dummies for each control variable with missing information and replace the missing values with zero.

Table 6. The Impact on Maternal Healthcare Utilization Index, Heterogeneity Analysis by Subsample

VARIABLES	(1) At most Primary School	(2) At Least Middle School	(3) > Median Distance to Nearest Hospital	(4) <= Median Distance to Nearest Hospital	(5) Older Age >25 Women	(6) Younger Age <=25 Women	(7) Multiple Parity	(8) First Time Mother	(9) Chakwal of Punjab	(10) Swabi of Khyber Pakhtunkhwa
Weekly Random Order Info. Nudge (A)	0.434***	0.300**	0.277**	0.467***	0.256**	0.412***	0.497***	0.188	0.216**	0.604***
	(0.122)	(0.117)	(0.107)	(0.124)	(0.121)	(0.103)	(0.111)	(0.118)	(0.092)	(0.141)
Weekly Timed Info. Nudge (B)	0.469***	0.271**	0.298***	0.463***	0.455***	0.299***	0.457***	0.196	0.250***	0.555***
	(0.131)	(0.112)	(0.098)	(0.133)	(0.116)	(0.111)	(0.107)	(0.123)	(0.095)	(0.148)
High-Frequency Timed Info. Nudge (C)	0.859***	0.604***	0.715***	0.805***	0.707***	0.760***	0.826***	0.636***	0.700***	0.786***
	(0.132)	(0.129)	(0.124)	(0.131)	(0.122)	(0.126)	(0.133)	(0.118)	(0.119)	(0.131)
Weekly Timed Info. Nudge + Small$ for Extra Info (D)	0.180	0.181	0.152	0.234*	0.194*	0.189	0.295**	0.014	0.147	0.245**
	(0.116)	(0.122)	(0.111)	(0.120)	(0.115)	(0.116)	(0.117)	(0.112)	(0.110)	(0.124)
Observations	703	625	696	703	628	771	776	623	794	605
P-value (A - B = 0)	0.77	0.81	0.86	0.98	0.11	0.29	0.72	0.95	0.74	0.74
P-value (A - C = 0)	0.00	0.02	0.00	0.01	0.00	0.01	0.02	0.00	0.00	0.20
P-value (A - D = 0)	0.03	0.38	0.32	0.06	0.62	0.07	0.11	0.17	0.56	0.01
P-value (B - C = 0)	0.01	0.01	0.00	0.02	0.05	0.00	0.01	0.00	0.00	0.13
P-value (B - D = 0)	0.02	0.49	0.23	0.08	0.03	0.39	0.18	0.17	0.40	0.03
P-value (C - D = 0)	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00

Notes: Arm A received one message per week but in random order, not timed to gestation age; Arm B received one message per week timed to gestational age; Arm C received two messages per week timed to gestational age; Arm D received one message per week with a subset of 20 messages provided the option to access additional information for a phone balance transfer of Rs. 20 per message. Robust standard errors, clustered on the village, are in parentheses. *** p<0.01, ** p<0.05, * p<0.1. All models control for the full set of control variables, including education indicators, age, age squared, multiple parity status, home ownership, phone ownership, household electricity status, refrigeration ownership, distance nearest local clinic, distance nearest hospital, and tehsil (town) fixed effects. To retain the sample size, we control for missing variable dummies for each control variable with missing information and replace the missing values with zero.

Appendix Table 1. Maternal Health(care) Literacy, Estimated Coefficients for Control Variables

	(1) Maternal Healthcare Utilization Index	(2) Deliver Under SBA	(3) Avoid Delivery Under TBA	(4) Pregnancy Complications Requires Hospital Delivery	(5) High Blood Pressure Requires Hospital Delivery	(6) Consult SHP for Malposition	(7) Breastmilk or Any Milk for the Newborn	(8) Consult SHP for Diet	(9) Take Iron Pills Daily
Weekly Random Order Info. Nudge	0.812***	0.455***	0.366***	0.420***	0.270***	0.465***	0.009	0.397***	0.263***
	(0.084)	(0.041)	(0.036)	(0.038)	(0.043)	(0.040)	(0.044)	(0.043)	(0.035)
Weekly Timed Info. Nudge	0.912***	0.379***	0.483***	0.412***	0.316***	0.424***	-0.002	0.370***	0.324***
	(0.079)	(0.043)	(0.034)	(0.036)	(0.041)	(0.039)	(0.041)	(0.041)	(0.038)
High-Frequency Timed Info. Nudge	0.865***	0.443***	0.577***	0.454***	0.229***	0.458***	-0.055	0.410***	0.271***
	(0.082)	(0.043)	(0.038)	(0.039)	(0.040)	(0.040)	(0.040)	(0.046)	(0.035)
Weekly Timed Info. Nudge + Small$ for Extra Info	0.640***	0.377***	0.236***	0.304***	0.232***	0.356***	-0.017	0.360***	0.229***
	(0.082)	(0.042)	(0.034)	(0.040)	(0.039)	(0.039)	(0.043)	(0.040)	(0.036)
Primary School	-0.042	0.014	-0.001	-0.030	-0.037	0.024	-0.018	0.047	-0.006
	(0.079)	(0.041)	(0.038)	(0.039)	(0.040)	(0.039)	(0.047)	(0.041)	(0.039)
Middle School	0.022	0.015	0.027	-0.083*	-0.013	0.007	0.068	0.052	-0.018
	(0.097)	(0.043)	(0.042)	(0.043)	(0.046)	(0.042)	(0.049)	(0.044)	(0.042)
> Middle School	0.092	0.061*	0.059*	-0.032	-0.005	0.070**	0.044	0.081**	0.066**
	(0.070)	(0.033)	(0.030)	(0.031)	(0.034)	(0.034)	(0.036)	(0.035)	(0.033)
Age in years	0.009	0.002	0.011	0.004	-0.014	-0.009	0.019	-0.009	-0.009
	(0.036)	(0.016)	(0.016)	(0.018)	(0.017)	(0.017)	(0.018)	(0.017)	(0.016)
Age in Years Squared	-0.000	-0.000	-0.000	-0.000	0.000	0.000	-0.000	0.000	0.000
	(0.001)	(0.000)	(0.000)	(0.000)	(0.000)	(0.000)	(0.000)	(0.000)	(0.000)
Multiple Parity	0.132***	0.038	0.016	0.036	0.049*	0.027	0.040	0.027	0.056**
	(0.051)	(0.027)	(0.026)	(0.026)	(0.027)	(0.025)	(0.029)	(0.027)	(0.025)
Owns the Home	-0.094	-0.014	-0.096***	-0.039	0.003	-0.020	-0.038	0.013	-0.025
	(0.077)	(0.032)	(0.036)	(0.035)	(0.039)	(0.033)	(0.041)	(0.037)	(0.037)
Has a Phone	-0.061	-0.035	-0.032	-0.022	-0.015	-0.041	0.031	-0.107***	0.011
	(0.076)	(0.036)	(0.038)	(0.035)	(0.041)	(0.038)	(0.043)	(0.038)	(0.039)
Given a Free Mobile Phone	-0.079	0.000	-0.051	-0.034	-0.001	-0.028	-0.015	-0.010	-0.046
	(0.067)	(0.032)	(0.036)	(0.030)	(0.034)	(0.035)	(0.034)	(0.032)	(0.034)
Has Electricity	0.178	0.077	-0.034	0.134*	0.113**	0.134**	0.029	0.109	-0.012
	(0.145)	(0.085)	(0.072)	(0.079)	(0.057)	(0.068)	(0.084)	(0.068)	(0.061)
Has Refrigerator	0.051	-0.018	-0.001	0.026	0.004	-0.028	0.032	-0.046	0.036
	(0.069)	(0.032)	(0.030)	(0.030)	(0.033)	(0.032)	(0.033)	(0.034)	(0.031)
Distance to Closest Local Clinic	0.010*	0.005*	0.002	0.005	0.003	0.005*	0.003	0.001	0.006**
	(0.006)	(0.003)	(0.003)	(0.003)	(0.003)	(0.003)	(0.003)	(0.004)	(0.003)
Distance to Closest Hospital	-0.002	0.001	-0.001	-0.000	-0.003	0.001	0.000	-0.000	0.001
	(0.003)	(0.002)	(0.001)	(0.001)	(0.002)	(0.001)	(0.001)	(0.001)	(0.001)
Observations	1,399	1,399	1,399	1,399	1,399	1,399	1,399	1,399	1,399

Notes: *** p<0.01, ** p<0.05, * p<0.1. Robust standard errors, clustered on the village, are in parentheses. Starting with column (2), each model also controls for tehsil (town) fixed effects. To retain the sample size, we control for missing variable dummies for each control variable with missing information and replace the missing values with zero.

Appendix Table 2. Maternal Medical Care Use, Coefficients for Control Variables

VARIABLES	(1) Maternal Healthcare Utilization Index	(5) Four + Skilled Antenatal Visits	(6) Facility Delivery	(7) Postpartum Checkup	(8) Four + Skilled Postnatal Visit
Weekly Random Order Info. Nudge	0.364***	0.206***	0.001	0.318***	0.110**
	(0.082)	(0.032)	(0.043)	(0.039)	(0.044)
Weekly Timed Info. Nudge	0.362***	0.305***	0.011	0.306***	0.107**
	(0.084)	(0.036)	(0.044)	(0.038)	(0.045)
High-Frequency Timed Info. Nudge	0.741***	0.424***	0.080*	0.341***	0.248***
	(0.091)	(0.036)	(0.044)	(0.039)	(0.044)
Weekly Timed Info. Nudge + Small$ for Extra Info	0.195**	0.127***	0.013	0.189***	0.063
	(0.083)	(0.030)	(0.045)	(0.035)	(0.043)
Primary School	-0.007	-0.003	0.017	-0.003	-0.029
	(0.085)	(0.036)	(0.041)	(0.041)	(0.040)
Middle School	0.022	-0.026	0.076	0.053	-0.028
	(0.094)	(0.038)	(0.047)	(0.044)	(0.044)
> Middle School	0.049	-0.004	0.095***	0.086**	-0.002
	(0.068)	(0.029)	(0.036)	(0.033)	(0.034)
Age in years	0.017	0.005	-0.003	0.015	0.003
	(0.034)	(0.014)	(0.019)	(0.016)	(0.018)
Age in Years Squared	-0.000	-0.000	0.000	-0.000	0.000
	(0.001)	(0.000)	(0.000)	(0.000)	(0.000)
Multiple Parity	0.032	-0.079**	0.003	-0.021	0.006
	(0.081)	(0.034)	(0.041)	(0.037)	(0.039)
Owns the Home	-0.039	-0.001	0.059	-0.045	-0.036
	(0.085)	(0.037)	(0.043)	(0.040)	(0.038)
Has a Phone	0.040	-0.041	0.027	-0.031	-0.011
	(0.078)	(0.036)	(0.035)	(0.037)	(0.032)
Given a Free Mobile Phone	-0.073	0.006	0.046	-0.003	-0.199***
	(0.161)	(0.062)	(0.080)	(0.078)	(0.075)
Has Electricity	-0.006	-0.011	0.006	-0.028	-0.019
	(0.069)	(0.029)	(0.033)	(0.033)	(0.032)
Has Refrigerator	0.013	0.001	0.001	0.003	-0.003
	(0.011)	(0.003)	(0.004)	(0.003)	(0.003)
Distance to Closest Local Clinic	-0.001	-0.000	-0.000	0.001	-0.001
	(0.003)	(0.001)	(0.001)	(0.001)	(0.002)
Distance to Closest Hospital	0.737***	0.424***	0.079*	0.338***	0.248***
	(0.091)	(0.036)	(0.044)	(0.039)	(0.044)
Observations	1,399	1,399	1,399	1,399	1,399

Notes: *** p<0.01, ** p<0.05, * p<0.1. Robust standard errors, clustered on the village, are in parentheses. Each model also controls for tehsil (town) fixed effects. To retain the sample size, we control for missing variable dummies for each control variable with missing information and replace the missing values with zero.

Appendix Table 3. Maternal Health(care) Literacy, Robustness to Multiple Hypothesis Testing

	(1) Maternal Healthcare Utilization Index	(2) Deliver Under SBA	(3) Avoid Delivery Under TBA	(4) Pregnancy Complications Requires Hospital Delivery	(5) High Blood Pressure Requires Hospital Delivery	(6) Consult SHP for Malposition	(7) Breastmilk or Any Milk for the Newborn	(8) Consult SHP for Diet	(9) Take Iron Pills Daily
Weekly Random Order Info. Nudge	0.812***	0.455***	0.366***	0.420***	0.270***	0.465***	0.009	0.397***	0.263***
	(0.084)	(0.041)	(0.036)	(0.038)	(0.043)	(0.040)	(0.044)	(0.043)	(0.035)
	{0.003}	{0.003}	{0.006}	{0.004}	{0.002}	{0.002}	{1.000}	{0.004}	{0.006}
Weekly Timed Info. Nudge	0.912***	0.379***	0.483***	0.412***	0.316***	0.424***	-0.002	0.370***	0.324***
	(0.079)	(0.043)	(0.034)	(0.036)	(0.041)	(0.039)	(0.041)	(0.041)	(0.038)
	{0.007}	{0.006}	{0.006}	{0.002}	{0.005}	{0.001}	{0.968}	{0.004}	{0.003}
High-Frequency Timed Info. Nudge	0.865***	0.443***	0.577***	0.454***	0.229***	0.458***	-0.055	0.410***	0.271***
	(0.082)	(0.043)	(0.038)	(0.039)	(0.040)	(0.040)	(0.040)	(0.046)	(0.035)
	{0.007}	{0.001}	{0.005}	{0.002}	{0.002}	{0.002}	{0.682}	{0.004}	{0.003}
Weekly Timed Info. Nudge + Small$ for Extra Info	0.640***	0.377***	0.236***	0.304***	0.232***	0.356***	-0.017	0.360***	0.229***
	(0.082)	(0.042)	(0.034)	(0.040)	(0.039)	(0.039)	(0.043)	(0.040)	(0.036)
	{0.004}	{0.004}	{0.001}	{0.005}	{0.007}	{0.006}	{1.000}	{0.005}	{0.007}
Observations	1,399	1,399	1,399	1,399	1,399	1,399	1,399	1,399	1,399

Notes: *** p<0.01, ** p<0.05, * p<0.1. Robust standard errors, clustered on the village, are in parentheses. P-values in square brackets pertain to Holm's correction. Arm A received one message per week but in random order, not timed to gestation age; Arm B received one message per week timed to gestational age; Arm C received two messages per week timed to gestational age; Arm D received one message per week with a subset of 20 messages provided the option to access additional information for a phone balance transfer of Rs. 20 per message. In Panel II, the control variables include education indicators, age, age squared, multiple parity status, home ownership, phone ownership, household electricity status, refrigeration ownership, distance to the nearest local clinic, distance to the nearest hospital, and tehsil (town) fixed effects. In Panel II, we control for missing variable dummies for each control variable with missing information to retain the sample size and replace the missing values with zero.

Appendix Table 4. Maternal Medical Care Use, Robustness to Multiple Hypothesis Testing

VARIABLES	(1) Maternal Healthcare Utilization Index	(5) Four + Skilled Antenatal Visits	(6) Facility Delivery	(7) Postpartum Checkup	(8) Four + Skilled Postnatal Visit
Weekly Random Order Info. Nudge	0.364***	0.206***	0.001	0.318***	0.110**
	(0.082)	(0.032)	(0.043)	(0.039)	(0.044)
	{0.0022}	{0.0026}	{0.9608}	{0.0036}	{0.1376}
Weekly Timed Info. Nudge	0.362***	0.305***	0.011	0.306***	0.107**
	(0.084)	(0.036)	(0.044)	(0.038)	(0.045)
	{0.002}	{0.0018}	{1.000}	{0.0032}	{0.1296}
High-Frequency Timed Info. Nudge	0.741***	0.424***	0.080*	0.341***	0.248***
	(0.091)	(0.036)	(0.044)	(0.039)	(0.044)
	{0.0034}	{0.003}	{0.397}	{0.0028}	{0.0038}
Weekly Timed Info. Nudge + Small$ for Extra Info	0.195**	0.127***	0.013	0.189***	0.063
	(0.083)	(0.030)	(0.045)	(0.035)	(0.043)
	{0.1316}	{0.0024}	{1.000}	{0.004}	{0.5936}
Observations	1,399	1,399	1,399	1,399	1,399

Notes: *** p<0.01, ** p<0.05, * p<0.1. Robust standard errors, clustered on the village, are in parentheses. P-values in square brackets pertain to Holm's (1979) correction. Arm A received one message per week but in random order, not timed to gestation age; Arm B received one message per week timed to gestational age; Arm C received two messages per week timed to gestational age; Arm D received one message per week with a subset of 20 messages provided the option to access additional information for a phone balance transfer of Rs. 20 per message. In Panel II, the control variables include education indicators, age, age squared, multiple parity status, home ownership, phone ownership, household electricity status, refrigeration ownership, distance to the nearest local clinic, distance to the nearest hospital, and tehsil (town) fixed effects. In Panel II, we control for missing variable dummies for each control variable with missing information to retain the sample size and replace the missing values with zero.

Message Content Appendix A: Maternal Healthcare Literacy Messages

Message # 1 (Third Month of Pregnancy): Regular clinic visits during pregnancy help detect problems before they happen. Find out where your nearest clinic is. Even though you are perfectly healthy, you should have at least four clinic visits during pregnancy to make sure you and your baby are well. You can get iron and folic acid tablets there. Take these every day for your and your baby's health. You can get them for free at the clinic. You will need at least four check-ups during your pregnancy. Regular check-ups at the clinic will reassure you that your baby is growing well. At the clinic, your health worker will take some blood for testing. These tests will help to keep both you and your baby safe. One test will be to measure the amount of iron in your blood. Your body needs plenty of iron. It keeps you strong and helps your baby grow inside you. If you have low iron levels, you may feel weak and breathless. You will need to take an iron pill every day. You can get them from the clinic.

Message #2 (Second Month of Pregnancy):   You may find that you are constantly feeling sick and may even vomit. This situation is very common. An empty stomach can make the sickness worse. Try to have small but frequent meals. Try to eat nourishing food. It is important that you drink lots of water. Friends and family might offer remedies or tonics. A good rule is to check with your health worker before taking any medicines. She will be able to tell you which medicine is safe for you and your growing baby. Many women begin to feel less sick now and get hungry instead. Eat fruit, vegetables, and meat or lentils, peas, and beans. Ask your family if you can buy more of these foods. You need an extra mouthful of food with each meal. You may also need a small snack between meals. Many pregnant women crave non-foods such as soil. It is a common symptom of pregnancy. Eating soil or other non-foods can be harmful to you and your baby. Soil can cause constipation or give you worms. Try not to eat these non-foods. Talk to your health worker. She may be able to help. There is no need to feel ashamed or embarrassed. Craving non-foods may mean you need iron. Take the iron and folic acid pills your health worker gave you.

Message # 3 (Third Month of Pregnancy): Have you made your first visit to the clinic? Go this week if you haven't, even if you are feeling well. At the clinic, your health worker will give you iron and folic acid tablets to take every day. These will help keep you and your baby well. You may also be given a dose of the Tetanus vaccine. Tetanus is a serious disease that can kill. Giving birth puts you and your baby at risk of getting tetanus. It can be prevented by the Tetanus vaccine. Your health worker may recommend a second vaccination at your next visit for more complete protection. Vaccines don't work as a cure, but they do protect you from disease. So, make sure you get your tetanus vaccine. Here are three simple ways that will keep both you and your baby healthy. One: eat well. Try to make each meal contain some fruits and vegetables. You should also get some protein from meat or fish, or lentils, peas or beans. Ask your family if you can buy these things from the market. Explain that they will help you grow your baby. Also drink lots of clean water and avoid alcohol. Two: go to the clinic. Regular check-ups with a health worker will help spot any problems early. You will then be able to get treatment and keep your baby safe. If you haven't made your first clinic visit yet, go this week.

Message #4 (Fourth Month of Pregnancy): Regular check-ups with a skilled health worker will help spot any problems early. You will then be able to get treatment and keep your baby safe.

Exposure to cigarette smoke whilst carrying your baby is harmful. It can cause your baby to be born weak and unhealthy. You can help prevent this. Household smoke(burning wood, coal, or animal dung) can also be harmful. If your house is smoky, let in as much fresh air as possible. Open lots of windows and doors. This will help. Explain to other people what effect their smoking will have on your baby. Mosquitoes can cause illnesses like malaria and dengue fever. They can make you very ill. You may become anemic, which makes you short of breath and weak. It can also cause problems for your baby inside you. Protect yourself from mosquitoes by sleeping under an insecticide-treated bed net. If there's a hole in the net, stitch a small piece over it. Keep a spare net, just in case one gets damaged. If it's hot and stuffy, open the windows to let the air in. The net will keep you protected from mosquitoes.

Message #5 (Fourth Month of Pregnancy): Protect yourself from mosquito bites. Mosquitoes live in stagnant water, rotting leaves and damp areas. Check there are none of these around your home. Ask your family to get rid of any of the places where mosquitoes live. Mosquitoes are attracted to dark colors. Wear light-colored clothing, especially if you go out in the evening. Stop mosquitoes getting to your skin by wearing long sleeves and full-length clothes. A mosquito repellent on your skin will help keep mosquitoes away. Use an indoor spray in the house as well. Constipation is common in pregnancy. It affects many pregnant women. Your growing womb presses on your belly, and can slow the food going down. It's usually just uncomfortable. Constipation can sometimes lead to piles. Piles are small swellings that develop around the anus. They may itch and bleed when you go to the toilet. There are several things you can do to prevent constipation and piles: Drink plenty of clean water every day. Eat cereal foods and plenty of fruit and vegetables. If you need to go to the toilet, go! Not going when you need to can make piles feel worse. If nothing seems to help, or if you notice bleeding, speak to your health worker.

Message #6 (Fifth Month of Pregnancy): Dizziness is common during pregnancy. You might get dizzy if you haven't eaten for a while, or if you get hot. Standing up quickly could make you dizzy, too. If you feel dizzy, sit or lie down. If you're in a stuffy room, go outside. The fresh air will help. Take some snacks with you when you go out. Always carry a bottle of clean water and wear a sun hat. Try to stay indoors if it's hot. Dizziness can be a sign of anemia, caused by not having enough iron in your blood. Anemia can make you feel weak and tired, too. You can get iron by eating red meat and green leafy vegetables. Make sure to take your Iron pills. They will help you feel less tired. Take them every day. Always keep a good stock of pills. Get more at the clinic before they run out. During your pregnancy, you will have various tests at the clinic. Some tests check for infection. Others will check your blood levels. Your health worker will also check that your body has enough iron. Make sure you have these tests done. They will help protect your baby. It will soon be time to go to the clinic for these tests. Sometimes there are complications during birth. Some women lose a lot of blood and need a blood transfusion. That's why it's important to know your blood group. Once you know your blood group, talk to your relatives and friends. Ask them to find out their blood group at the clinic. If they have the same blood group as you, ask them if they can donate blood if you need it. Get their names and contact information. This may be useful in the future.

Message #7 (Fifth Month of Pregnancy): You are halfway through your pregnancy! It's exciting when you first feel your baby move! If this is your first pregnancy, you may not be sure what the movements are at first. They feel like gentle butterflies fluttering in your belly.
In the next few weeks, your baby's movements will get stronger and more regular. Your baby won't move all the time. Like you, sometimes he'll just want to rest and sleep. You can get used to recognizing the movements. Remember his daily routine, when he is awake and when he goes to sleep. Tell your health worker if you notice a change in his routine. If you haven't felt your baby move yet, speak to your health worker. She will be able to check that everything is well. Make sure to have lots of calcium-rich foods like milk, yoghurt, dark green leafy vegetables. Calcium helps to prevent problems later on in pregnancy. You may need to start taking calcium pills daily to prevent problems later on in pregnancy. Take one every day, but don't take them together with your iron pills. For example, if you take your iron pill in the morning, take the calcium pill in the evening.

Message #8 (Fifth Month of Pregnancy): Here are some signs you and your family should look out for during pregnancy. If you see any of these signs, go to the clinic. A sharp pain in your tummy: this could be a stomach bug or food poisoning. A high fever: you may have an infection. Any bleeding: it may be a sign of a pregnancy that hasn't developed properly or of a miscarriage If you're suddenly thirsty and have not been passing water: it could be a sign of dehydration or diabetes. If it hurts or burns when you pass urine: it could be a urine infection. If you feel breathless all the time: it could be that you are short of iron. Vomiting could also mean you are ill. If you vomit several times a day, you may get dehydrated and weak. As your baby grows inside you, he will need more food. Slowly increase the amount of food you eat as your stomach grows. Have an extra mouthful of food with each meal. As your baby grows, she will start to press on your bladder. This will make you want to pass urine more often, perhaps disturbing your sleep. Try not to drink anything for an hour before you go to bed. This may help. Drink plenty of water throughout the day, though.

Message #9 (Sixth Month of Pregnancy): You may also have leg cramps. Your leg muscles are carrying the increasing weight of your baby. This can make your legs ache or feel very tired. If you're woken by a cramp, try to stretch the muscle. Straighten your leg and flex your ankles and toes. You can also try massaging the cramped muscle. Try not to stand for long periods or sit with your legs crossed. This may help. Sleeping on your left side, with a cushion between your knees, can help you get comfortable at night. Your baby now has definite times of sleeping and waking. He may wake you with his kicks. Go to the clinic if the kicks slow down or stop. The weight of your growing baby makes you need to pass urine more often. If you find that it is painful when you pass urine, you might have an infection. This can give you a high temperature, or make you suddenly feel hot and cold. Other signs of infection are blood in your urine, feeling nauseous, and shaking. Sex might be painful, too. Getting treated is very important. If left untreated, the germs can give you a kidney infection. You can also help prevent urine infections. After going to the toilet, always wipe from 'front' to 'back'. If you need to pass urine, go! Don't hold it in. Always pass urine after sex, if you can, to get rid of any germs. Drink lots of clean, boiled water. This will help wash out infections.

Message #10 (Sixth Month of Pregnancy): It is not too early to start thinking about breastfeeding. Breastfeeding is the best thing you can do for your baby, as it helps protect her from illness.

Your baby needs only breastmilk and nothing else, not even water for the first six months. Your breastmilk will make your baby grow strong. It doesn't cost anything, and is a lovely way to bond with your baby. Talk to your family now to make a breastfeeding plan. Let your partner and family know that you want to put your baby to the breast in the first hour. Talk to your family about the importance of visiting the clinic regularly during your pregnancy. Each visit, the health worker will check to make sure you and your baby are well. Continue taking your iron and folic acid pills every day. They will keep you and your baby strong. The iron pills may make your stools a darker color than normal. This isn't a problem.

Message #11 (Sixth Month of Pregnancy): Your baby is getting heavier because he is gaining fat that helps keep him warm when he is born. With your baby growing fast, you need to make sure that you are eating enough. Try eating a couple of extra mouthfuls at every meal. Explain to your family that you need to make sure that you get enough to eat to feed your growing baby. Eating a variety of foods will help your baby grow strong. Eat foods that will help your baby grow, like fish, meat, lentils, beans and peas. You will also need to eat plenty of iron to keep you and your baby strong. You can get iron from meat, fish, lentils, peas, beans and dark, leafy vegetables. A burning sensation at the top of your stomach is heartburn. Spicy and oily foods can make it worse. A glass of milk may help soothe it. If you feel breathless, tired or dizzy, you may be short of iron. Pale hands, eyelids or tongue are signs of severe anemia. If you notice these symptoms, go to the clinic.

Message #12 (Sixth Month of Pregnancy): You may be thinking about where to have your baby. Here are three reasons why it's best to choose a clinic or a hospital birth or a birth with a skilled birth attendant. First: a clinic is a clean place to have your baby. When you go into labor, you become open to infection, and so does your baby. If you can't have your baby at a clinic, have a skilled birth attendant with you. Second: having your baby in a clinic or a hospital or with an attendant will help if problems occur. They can be spotted early and treated. Finally: being in a clinic or with a skilled attendant means that if something does go wrong, there will be someone there to keep you and your baby safe. If you want to do one good thing for your baby this week, go for your second clinic visit, even if you feel well. You may be able to tell when your baby is awake or asleep by his movements. If he's not as active as he usually is, tell your health worker. You may be having some discomforts now. Heartburn is caused by your baby pressing on your stomach. Your family may suggest an herbal remedy, but herbs can harm your baby. Try drinking some cool boiled milk to soothe the burning. Slightly swollen hands and feet are caused by the extra blood in your body. Try to rest with your feet raised. If you have sudden swelling and headaches, go to the clinic. You may have very high blood pressure which is dangerous for you and your baby. You can help prevent this by drinking boiled milk and eating figs, beans and vegetables.

Message #13 (Seventh Month of Pregnancy): Nosebleeds are common in pregnancy. If you have a nosebleed, pinch your nostrils and lean forward slightly. Keep pinching until the bleed has stopped. If any of these discomforts continue, or if you get bleeding, headaches or a pain down one side of your stomach, go to the clinic. During pregnancy, some women get diabetes, even if they haven't had it before. Diabetes means your body can't control its sugar levels. Signs of diabetes can be hard to spot, but you may feel more tired than usual and be very thirsty. You may have blurred vision and need to pass urine frequently. If you spot any of these signs, tell your

health worker. She may give you a test at your next clinic visit. You are more likely to get diabetes if you are overweight or other people in your family have diabetes. Eating well, exercising, and stopping smoking will help prevent it.

Message #14 (Seventh Month of Pregnancy): Your pelvis joints are opening up to make space for your baby to be born. Have you got swollen hands and feet? The weight of your baby presses on your blood vessels and pushes water down to your feet and ankles. This causes them to swell. The swelling will probably go after the birth. However, if you *suddenly* get swelling, with a headache or blurred vision, go to the clinic quickly. It may be that your blood pressure is very high, and you could have a fit. Your health worker will be able to measure your blood pressure and give treatment to prevent fits. Your baby's arrival is getting closer. It is time to make plans. The clinic is the safest place to have your baby. Talk with your family about out how long it will take to get there. Find out the fastest way to get there. Make sure you have ambulance and taxi numbers ready, and enough balance on your phone for an emergency. Decide who you will have with you when you give birth. Choose someone you trust.

Message #15 (Seventh Month of Pregnancy): If you are not having your baby at a clinic, it is vital to have a skilled birth attendant. Make sure your family knows how to contact the attendant. Your attendant may have a birth kit. It will contain a plastic sheet, gloves, clean string and tools for cutting your baby's cord. If you cannot get a birth kit, find a clean sheet to have your baby on and two cloths, one to dry your baby and one to wrap her in. Have a clean, sharp knife or a clean pair of scissors ready. Your attendant must wash her hands and you must wash between your legs. Get plenty of clean, boiled water and soap ready. You may be wondering how to know when you are in labor. When you start labor, you may see a jelly-like discharge. This can happen a day or two before labor, but you may not notice it. For most women, the main sign is contractions. Labor contractions are regular and painful. At first, they may feel like mild tummy cramps or low backache. As your labor goes on, the contractions will come faster and harder.

Message #16 (Seventh Month of Pregnancy): Sometimes the first sign of labor is the breaking of waters. Your baby has been sitting in a bag of fluid. If the bag breaks when labor starts, there could be a trickle or a gush. The water will be almost clear with a yellow tinge. It may be blood-stained. Once your waters have broken, you are open to infection. Fetch your attendant or head to the clinic. Your womb is warm and cozy. It is warmer than the weather outside, even if it is hot. This means your newborn can get cold easily. Your newborn will be wet when born, so dry him off and lay him on your bare chest. Your body will keep him warm. Hold him firmly. Lay a clean, warm blanket over both of you. Put a small hat or cloth on him. Babies lose lots of heat through their heads.

Message #17 (Eighth Month of Pregnancy): Holding your baby close to your body will make breastfeeding easy. The first thick and creamy milk is called colostrum. It is creamy with goodness. Feed this precious gift to him straight away to give him the best start in life. It is especially created as baby's first food. It is perfect for your newborn. Feeding him honey or ghee is not necessary and can harm your baby. Breastfeeding immediately will help you to deliver the afterbirth and reduce bleeding. It is best to put your baby to your breast within the first hour of life. If you want to do one good thing for your baby this week, go to your third clinic check-up. Your baby may settle head down now, the best position to be born! You may find it harder to

walk. It's time to slow down. Your baby is protected inside your womb in a bag of fluid. If the bag of waters your baby is in breaks, go to the clinic. Your baby is at risk of infection. The amount of fluid varies. It may be only a slight trickle, or it may be a large gush. If it's a small trickle, make sure it's not your urine leaking. Wear a sanitary pad or a clean cloth to absorb it. It can be quite a shock if it's a gush of fluid. You may need to use a towel to absorb the water.

Message #18 (Eighth Month of Pregnancy): Most babies are born in the ninth month. But some babies are born earlier, especially if they are twins. If your baby arrives early, she will need lots of breastmilk and warmth. The first milk you make is very thick, creamy and full of goodness. Give your baby this precious gift to help prevent illness. Some early babies may not be strong enough to feed at the breast. If this happens, feed her by expressing your milk into a sterilized cup instead. Hold her on your lap, and put a drop of milk on her tongue. Gently tilt the cup so that it touches her lower lip and a little milk enters her mouth. Your baby will learn to lap the milk. By now, you should have decided where you want to have your baby and have arranged transport. Make sure you know the fastest route. Most women give birth naturally, but sometimes it is safer if they have an operation. Some operations are needed because the baby's passage out of the womb becomes blocked. Others are needed because the baby is not lying head-down.

Message #19 (Eighth Month of Pregnancy): If you're having twins or more, you may also need an operation. Sometimes the labor is long and slow, or there is heavy bleeding and an operation becomes necessary. Whatever the reason, if you have been asked to have an operation, don't panic. There is a good reason why you need it. It is the safest option for both you and your baby at the time. Just make sure to go to a clinic where you trust the staff. If you want to do one good thing for your baby this week, choose a trusted clinic where you can give birth. Make sure you go to the clinic this week for another check-up. If you are having your baby in a clinic, the staff will have everything you need at the birth. But if you are having the baby at home, make sure you, or your skilled birth attendant, are prepared. Have at least two cloths ready. You will need one to dry your baby and a clean cloth to wrap him in to keep him warm. Try not to swaddle him too tightly or cover his face. This might suffocate him.

Message #20 (Nineth Month of Pregnancy): Have boiled water and soap ready. Whoever cuts the cord needs to wash their hands first. This will help prevent infection. Get a sharp tool such as a new razor blade, scissors or a knife. Cut two pieces of string about the length of your hand. If you want to do one good thing for your baby this week, get the things you need to cut the cord safely. Next, we will tell you how to cut the cord and care for it. It is very important to take care of the baby's cord and to keep it clean to prevent infections which can kill a new baby. The birth attendant should boil the sharp tool for ten minutes and the string for three minutes to clean them, just before you use them. Have water and soap so whoever cuts the cord can wash their hands very carefully.

Message #21 (Ninth Month of Pregnancy): Wait until the cord stops pulsing. Then, tie the two pieces of string round the cord. One tie should be about the length of your hand away from your baby's stomach. The other, about three fingers away from the first tie. Cut the cord in between the two ties. Keep the baby's cord stump clean and dry until it drops off. The cord will heal gradually and drop off in about a week. It will look quite black and odd but that is part of the

healing. If the cord stump is red, bleeding or smelly, take your baby to the clinic. For the first six hours of your baby's life, clean only the cord. The rest of your baby does not need to be bathed. Bathing your baby too soon could make her sick and cold. Try to keep your baby away from direct sunlight. The sun may be too strong for him. If you want to do one good thing for your baby this week, make sure whoever helps with the birth knows how to care for the cord.

Message #22 (Nineth Month of Pregnancy): Your baby will not be strong enough to fight illnesses by herself. She needs all the protection she can get. Vaccinations protect babies from illnesses that can kill. Vaccinations can fight germs if they enter your baby's body. Vaccinations do not cure her once she gets the illnesses. So, it's important to get your baby vaccinated at the right time. Getting protection sometimes requires several doses of vaccine. Your baby needs to take all the doses at the right times for the best protection. He will get some of his first vaccines straight after birth. We will remind you when to get these vaccines. A health worker will also tell you when your baby needs them.

Message #23 (Nineth Month of Pregnancy): The big day is almost here. It won't be long before you can cuddle your baby. The only food your baby needs is your breastmilk. Your milk is full of goodness and protects her from certain diseases. Your body knows exactly how to care for your new baby. As she grows, the milk you make will change to suit her. As long as you breastfeed your baby often enough, your body will also make the right amount of milk. This means that your baby will always have what she needs. Feed your baby with the first milk you make which is thick and creamy. It will give your baby protection and strength. Feeding her honey or ghee is bad for her and a waste of your special milk. Your baby will need nothing else apart from breastmilk for the first six months. Water can make your baby sick but your breastmilk is safe. Breastfeeding will also help you recover after the birth. It can help stop heavy bleeding. Feeding your baby only breastmilk will also stop you becoming pregnant too quickly. Your breastmilk contains all the water your baby needs. You don't need to give water separately. Water can make your baby sick. Your breastmilk is safe.

Message #24 (Nineth Month of Pregnancy): As soon as your baby is born, he needs to be examined by the health worker. The health worker will also give your baby his first vaccines. Take your baby to the clinic if you see yellow eyes, or yellow coloring on the palms of his hands or soles of his feet; Or if he is refusing to feed or sucking poorly; Or wheezing, grunting, or breathing quickly. Take your baby to the clinic if he is vomiting after every feed for more than a day; Or has a swollen stomach; Or if his cord stump is red or smelly; Or if the baby has a fit, or is lethargic, or has bluish skin or nails. A baby who suddenly feels cold or very hot to the touch may be ill. Place your hand on his tummy, hands and feet. They should all be warm, not too hot or cold. If they are, take him to the clinic. Also go to the clinic if he won't stop crying or if his cry sounds unusual.

Message #25 (Nineth Month of Pregnancy): Your baby is waiting for labor to start as well! Make sure you have everything ready. After birth, your womb will shrink back to its normal size. You might feel some cramping pains. You will also lose some blood. Breastfeeding your baby will help to shrink your womb and reduce blood flow. Having your baby with skilled birth attendants at a clinic will also help prevent heavy blood loss. The bleeding can last for a few weeks. It will look like a heavy period. It should reduce slowly. You might bleed a lot at the beginning, but it

will slowly get lighter. It will be a bright red color and then change to a browner or lighter color. Change the pads or rags you are using to soak up the blood every 4-6 hours or more frequently if bleeding is heavy. Remember to wash the used pads properly or dispose them safely.

Message #26 (Nineth Month of Pregnancy): Go to the clinic: if you soak more than 2-3 pads in 20-30 minutes, or if your bleeding increases rather than decreases; If your bleeding continues to be heavy for over four days; if your bleeding suddenly becomes very heavy, and you pass lots of large blood clots; if your bleeding has a bad smell; or if you feel faint or dizzy. After the birth, you will need to rest and recover. This will help to prevent heavy bleeding. The bleeding should stop in about a month. If you want to do one good thing for your baby this week, prepare for the days after your baby's arrival. If your baby is still not here by next week, visit the clinic. Being pregnant for too long can cause problems. After the birth, your body needs time to heal. You may feel tired and sore, but every day things will improve. As your body recovers, there are three things you can do to help speed up healing: One: rest. This is very important. Try not to do any physical labor. Ask family members to help with household chores. Two: breastfeed your baby as often as he wants and for as long as he wants. Breastfeeding will help your baby grow strong, and it will also help to reduce bleeding and make your womb shrink back to its normal size. Three: eat well. Try to have meals with lots of fruits, vegetables and meat or lentils. This will encourage healing and help you make plenty of milk for your baby. Make sure you drink plenty of clean water, too. Breastfeeding is thirsty work! You may need to continue taking iron pills for 3 months after the birth of your baby.

Message Content Appendix B: General Health Messages

Message #1: It is important to keep yourself and your family clean and healthy. Here are some simple tips to do this: Ensure your family washes their hands before cooking or eating, after using the toilet and after handling animals. Wash your hands and your baby's hands with soap. Clean wrists and nails, too. Air-dry hands, or use a clean towel, changed often. Second, wash beans, potatoes, vegetables and fruits, unless they are peeled, before cooking and eating. Dirt contains germs, which are harmful. Third, use only fresh food. Food that's been left out, or cooked some time ago, can be harmful. Food must be warm, but cool enough to eat. Check the temperature by putting some on your wrist. Fourth, check that food is well cooked. Meat shouldn't be pink in the middle and fish should be cooked so it flakes. Eggs should be firm.

Message #2: Iodine is a mineral essential for the mental and physical development of an individual. It is important that pregnant women consume foods rich in iodine for fetal growth and development. Children need to consume iodine rich foods for proper mental and physical growth and development. Severe iodine deficiency may result in dwarfism (short stature). This may affect the child's performance in school, sports and other activities. Iodine deficiency also leads to development of goiter and reduces productivity of an individual. In pregnancy, iodine deficiency may result in cretinism (severe mental retardation), miscarriages, stillbirths, or death of newborn child. Mother/Caretaker, ensure that all family food is cooked using iodized salt so that family members remain healthy. Iodized salt is not available everywhere but should be used when available. Pregnant women need to use iodized salt to ensure the health of their new baby. Add the iodized salt at the end of the cooking. When you store iodized salt, make sure that it is covered properly.

Message #3: Good hygiene (cleanliness) is important to avoid diarrhea and other illnesses. To avoid diarrhea and other illnesses the caregiver should: Use a clean spoon or cup to give foods or liquids to the child; Store the foods to be given to the child in a safe hygienic place; Wash hands with soap and clean running water before preparing foods and feeding the child; Wash the child's hands with soap and clean running water before eating; Wash hands with soap and clean running water after using the toilet and washing or cleaning the child's bottom.

Message #4: Your baby may like to play outside but, in some areas, worms are a problem. Worms are picked up from the mud and soil, and can cause stomach pain, coughing and fever. Intestinal parasites cause young children to become anemic, which will make them unwell and tired. Thick socks or shoes will help protect your baby. Wash his hands well with soap, and clean his nails regularly. This will prevent him from swallowing any worm eggs. Mother, when your child is one years old, he/she has to receive de-worming medicine every six months to maintain healthy growth.

Message #5: "*Safaai nisf Imaan hey*." It is important to take care of personnel hygiene. It will not only protect you from many diseases but also from transferring to or getting these diseases from others. These measures include: Washing hands, taking regular baths, combing hairs, cutting nails and wearing clean clothes; be careful, not to cough and sneeze on others, putting items such as tissues that may have germs, into a bin; it is also important to keep your personnel items like towels, bed linen, pillows, handkerchief, comb etc., clean.

Message #6: Most infections, especially colds and diarrhea, are caught when we put our unwashed hands having germs on them, to our mouth. Some infections are caught when other people dirty hands touched the food we eat. Hands and wrist should be washed with clean soap and water. Dry your hands with clean towel. You should always wash your hand; After using toilet; before making or eating food; after handling animals; if you have been around with someone having cold or cough; if you are taking care of someone ill.

Message #7: Water is the basic necessity of life. But using unsafe drinking water can be life threatening, because it can result in gastrointestinal diseases. To avoid these illness: One should use boiled water to drink; water should be boiled for ten minutes; put it in a clean vessel and cover it properly to avoid contamination.

Message #8: Take proper care of waste disposal inside and outside of the house to avoid breeding of flies. These flies can cause many illnesses like hepatitis, diarrhea, polio and typhoid. Similarly avoid stagnation of water in your surroundings. Stagnant water provides breeding sites for mosquitoes which can cause malaria and dengue. Human and animal waste should be disposed of properly as these can be the source of many diseases like diarrhea, typhoid, polio, hepatitis etc. All family members should use latrines. Animal dung should be properly disposed of. Hands should be washed properly after attending the toilet and disposing of animal dung.

Message #9: Growth Monitoring and Promotion sessions take place at health facilities, outreach clinics, and community level to monitor the child's growth, nutritional status and development. A healthy child who is growing well should gain weight every month. If your child is not gaining weight or is losing weight, there is a problem. Attending growth monitoring and promotion sessions can help identify nutrition problems the child may have, such as severe thinness or swelling. Nutrition problems may need urgent treatment with special (therapeutic) foods. Mothers and caregivers should: Take the baby monthly to growth monitoring and promotion sessions from birth to five years where the following will be done; Monitoring the child's growth and nutritional status; Monitoring the mother's nutritional status; Immunization for mother and child; Health and Nutrition education; Health and Nutrition counseling; Referral to the appropriate program in case any problem is identified; Receive Vitamin A supplements and de-worming tablets (every 6 months).

Message #10: Every year thousands of children die due to vaccine preventable diseases. It is therefore important to vaccinate children, times from birth till 15th month of life. These vaccines should be given; At birth; 6th week; 10th week; 14th week; 9th month; 15th month of life. These vaccines give protection against Tuberculosis, polio, measles, tetanus, whooping cough, diphtheria, pneumonia, meningitis, hepatitis B. It is also important to give all vaccines and according to given schedule. These vaccine are available at free of cost at all nearby health facilities and government hospitals.

Message #11: Illness in children is very dangerous. It can degenerate quickly and result in malnutrition and death. It is therefore critical to take sick children to a health facility at the onset of illness for expert attention. Mothers and caregivers should take the child to a health facility immediately if any of the following signs and symptoms are present: The baby is refusing to feed The baby is vomiting and cannot keep anything down; Diarrhea (passing loose stools 3 times a

day) and/or blood in the stool; Convulsions; Chest in-drawings; Fever; Lethargy (weak, not alert; Take the child for immunizations according to schedule; Take the child for de-worming and Vitamin A supplementation every six months until 5 years of age; Take the child for growth monitoring until the child is 5 years of age.

Message #12: Diarrhea is one of the main causes of death in small children. Diarrhea mainly results from the use of contaminated food and water and not practicing personal hygiene. The danger signs of diarrhea include excessive loose motion & vomiting, fever, sunken eyes, dry tongue, blood in stool, decrease in urine output, impaired consciousness. If the danger signs appear, child should be taken to the nearby health facility. Mother should continue breast feeding during diarrhea and give more food than routine to children older than six months of age.

Message #13: Most of those children with diarrhea actually die from dehydration. The most important way of managing diarrhea is to replace the fluid that the child is losing. ORS is the best rehydration drink for children suffering from diarrhea. It is available in the market but can be prepared at home using; 6 level teaspoon of sugar; Half level teaspoon of salt; I liter of boiled water; Solution can be used within 24 hours. Because preparing rehydration drink takes time, it is advised to mothers of children with diarrhea to give plan water at once and until the drink is prepared.

Message #14: Thousands of children die every year due to pneumonia, in Pakistan. The danger signs of pneumonia include fast/difficult breathing, chest indrawing, fever, vomiting, impaired consciousness. If the danger signs appear, child should be taken to the nearby health facility. If the child is diagnosed with Pneumonia, follow the prescription suggested by doctor and it is important to complete full course of antibiotic, otherwise your child can get pneumonia again. Mother should continue breast feeding during illness and give more food than routine to children older than six months of age. Also protect the child from smoke and dust. Keep the children warm during winter season.

Message #15: Tuberculosis can harm you and your baby. It spreads through the air when people cough and sneeze. Signs of TB include: a cough that won't go away; regular chest infections; slow weight gain or weight loss; fever; swollen glands; and breathing difficulties. If you or any of your family members have any these symptoms, go to the clinic and get yourself tested. TB is curable if it is found early, treated quickly, and if all the medicine is taken. It takes at least six months to kill TB. You may feel better sooner, but you need to finish all the medication. People with TB should cover their mouths and noses while coughing or sneezing, and wash their hands afterwards. After taking medication for two days, they will no longer give the disease to other people.

Message #16:   Babies can easily get sick. They can catch Tuberculosisor TB if an infected person coughs or sneezes near them. TB is dangerous for babies. If a family member has TB, take your baby to the clinic to get tested. He may also get medicine to prevent him from catching TB. Signs of TB include: *A cough that won't go away; regular chest infections; slow weight gain or weight loss; fever; swollen glands; and breathing difficulties.*

If you notice any of these signs, take your baby to the clinic. Staff will give you medication

which your baby needs for six to nine months, even if he seems better. Give it every day at the same time. Take him to the clinic regularly for a check-up.

Your baby won't be infectious after he's taken his medicine for a few weeks. TB doesn't spread through touching or bathing, so keep cuddling him. Breastfeeding is safe, too.

To prevent your baby getting TB, make sure your baby has had the TB vaccine. If he didn't have it at birth, make sure he has it now. Feed him healthy, fresh food, too. Keep your house clean and dry to keep germs away.

Message #17: Malaria is an acute febrile illness transmitted through the bite of infected female mosquitoes, which bite mainly between dusk and dawn. Symptoms of malaria include fever, headache, and vomiting, and usually appear between 10 and 15 days after the mosquito bite. Malaria also causes anemia, which will make family members of your family unwell and very tired. If not treated, malaria can quickly become life-threatening and cause death. Children under five years of age and Pregnant women are at high risk of dying from the complications of severe malaria. Family members with fever need to be taken to a health facility for immediate treatment. Malaria prophylaxis refers to daily or weekly administration of antimalarial drugs at a dose that is usually smaller than the therapeutic doses with a view to preventing clinical malaria. All members of the family, sleep under an insecticide treated mosquito net (ITN), especially pregnant women and young children to prevent getting malaria.

Message #18: Vitamin A is a fat-soluble vitamin critical for growth and development, good eyesight, and immunity. Vitamin A is also important during pregnancy for fetal development. Deficiency of Vitamin A in pregnancy may lead to poor development of the baby and birth defects. In children, deficiency of vitamin A may also lead to stunting and increased duration and severity of childhood illnesses such as measles, diarrhea, pneumonia, and common cold. Other deficiency disorders of vitamin A include night blindness, drying and damage of eyes, and increased incidence of illness and death.

Message #19: Pregnant women, lactating mothers, and children should eat foods rich in Vitamin A everyday such as yellow/orange fruits and vegetables like ripe mangoes, pumpkin, and carrots; dark green leafy vegetables or cooking oil; eggs, milk and milk products. Children from 6 months should get a Vitamin A supplement (as recommended) every 6 months from a health worker. Mothers who have just given birth should take a Vitamin A supplement within 8 weeks of delivery. Buy and consume centrally processed fortified foods such as cooking oil, sugar, maize and wheat flour. Fortified foods can be identified by the fortification logo for Pakistan.

Message #20: Iron is a mineral which is essential for red blood cells formation and is critical for body functions and immune system response. Iron deficiency is one of the major causes of anemia. Other causes of anemia include worm infestation and malaria. A person with anemia feels tired all the time, dizzy, and may have heart palpitations. Other signs of anemia include pale palms, gums, tongue. When a pregnant woman is anemia, it may lead to: premature birth, low birth weight, still birth, and potentially leading to death of mother. When a child is anemic, it may lead to permanent brain damage, poor class performance and frequent illnesses.

Message #21: Pregnant women, lactating mothers, and children should eat iron-rich foods such as meat, legumes and dark green leafy vegetables every day. Pregnant women, lactating mothers,

and children should eat foods rich in Vitamin C such as raw tomatoes in combination with foods rich in iron to make the body use the iron properly. Buy and eat foods fortified with iron such as maize meal, and wheat flour. A pregnant woman should get a supply of iron/folate tablets from a health worker to take daily during pregnancy. Children from one year of age should be given de-worming tablets every six months Pregnant women, lactating mothers and children should sleep under insecticide treated bed nets every day. Pregnant women should receive at least two doses of recommended prophylactic antimalarial drugs Seek immediate medical attention when a child has fever.

Message #22: Thousands of mothers and newborns die around the time of birth usually within first 24 hours after delivery. This is why trained skilled care at every birth is essential. These services should be delivered by skilled health personnel for example a lady doctor, a nurse, a trained midwife or a Lady Health Visitor or LHV who has skills needed to manage normal pregnancies, child birth and immediate post-natal period and in the identification, management and referral of complications in women and newborn.