CIRJE-F-983

Psychic vs. Economic Barriers to Vaccine Take-up: Evidence from a Field Experiment in Nigeria

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July 2015

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July 21, 2015

Abstract

This paper evaluates the relative importance of psychic costs of vaccination compared to monetary costs through a field experiment that randomizes several factors affecting tetanus vaccine take-up among women in rural Nigeria. Although conventional wisdom highlights the relevance of psychic costs, we find no evidence that psychic costs limit vaccine take-up. Of the women who were incentivized just to show up at a clinic unconditional on vaccine take-up, 95.7 percent chose to get vaccinated anyway. Priming about disease severity increases the perceived severity of disease, but not vaccine take-up. Rather than psychic costs, monetary costs are major barriers to vaccination.

JEL: O12, D83, I12

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1 Introduction

Every year, vaccinations avert two to three million deaths from diphtheria, tetanus, pertussis, and measles worldwide (WHO, 2014). Vaccination is an extremely cost-effective way to improve people's health. For example, treating one case of measles costs 23 times the cost of one vaccination, and $24 are saved for every $1 spent on the diphtheria-tetanus-pertussis (DTP) vaccine (Ehreth, 2003). Despite these benefits, 22.6 million infants are not sufficiently vaccinated every year, and most of them live in developing countries (WHO, 2014). Given the huge benefits of preventing diseases at low cost, the persistent low vaccine take-up remains a puzzle. This paper reports results of a field experiment explicitly designed to evaluate various potential barriers to vaccine take-up in Nigeria, which is home to 12.8 percent of the world's unvaccinated infants (WHO, 2014).

Observational studies suggest various reasons for low vaccine take-up, including monetary costs to visit health clinics, such as transportation costs and opportunity costs (Thysen et al., 2014; Uzochukwu et al., 2004); limited information about diseases and vaccinations (Orimadegun et al., 2014); and supply-side constraints, such as vaccine shortages (Santibanez et al., 2012). Furthermore, psychic costs of vaccination, which we define as residuals that cannot be explained by monetary factors, such as beliefs and perceptions about vaccines, could influence vaccination decisions (Pebley et al., 1996; Steele et al., 1996).[1] Most extant studies examine barriers to vaccine take-up using qualitative methods, typically by asking respondents their reasons for non-vaccination (DHS 2008; Jheeta and Newell, 2008; Nichter, 1995; UNICEF, 2001). Such observational studies, however, cannot identify the causal effects of potential barriers to vaccination.[2] This paper presents a causal examination and compares the behavioral effects of psychic costs and monetary costs on vaccine take-up.

The relevance of psychic costs as barriers to vaccination has been commonly documented in Africa. In northern Nigeria, a polio vaccination campaign was famously boycotted by Islamic leaders due to a false rumor that polio vaccines make women infertile or causes them

[1] Examples of beliefs and perceptions about vaccines as psychic costs of vaccination include fear of needles; fear of vaccine safety, such as side effects; misperceptions about vaccines, such as the belief that vaccines might give a person HIV or other diseases; and religious beliefs against vaccines.

[2] Currie (2006) reviews the literature that examines the effects of stigma on the take-ups of social benefits in developed countries, where stigma is defined as disutility arising from participating a welfare program (Moffitt, 1983). Currie (2006) concludes that stigma is not a large barrier to participating in social benefits programs. Although this provides suggestive evidence that stigmas has a small effect on benefit uptake, none of the studies reviewed provide causal evidence.

to contract HIV (Jegede, 2007). This distrust of vaccine efficacy led to a widespread refusal to receive polio vaccinations among the general population. Similar incidents opposed tetanus vaccination campaigns in Cameroon in 1990 (Feldman-Savlesberg, 2008) and polio vaccination campaigns in Kenya, Uganda, and Tanzania (UNICEF, 1997). These episodes have led to a presumption commonly held by researchers that psychic costs of vaccination are large barriers to vaccine take-up (Rainey, 2010). No causal studies, however, have systematically examined this conventional wisdom. If psychic costs of vaccination actually hinder vaccine take-up, then policy interventions can potentially promote vaccine take-up by reducing these psychic costs. An option would be to increase the perceived costs of disease by emphasizing its severity (i.e., priming). In contrast, if psychic costs of vaccination are not major barriers to vaccine take-up, such priming interventions would be ineffective. Thus, it is of critical importance to identify the psychic costs of vaccination.

Our randomized experiment conducted among women in rural Nigeria captures monetary costs and psychic costs separately as potential barriers to their tetanus vaccine take-up. To capture monetary costs as potential barriers to vaccination, we randomized the amount of cash transfers provided to women conditional on their clinic attendance. To capture psychic costs of vaccination, a group of women received their cash transfers further conditional on receiving a vaccine. Because the only difference between these two conditions is whether or not one is required to receive a vaccine for cash rewards, the difference in clinic attendance between these two conditions captures the psychic costs of vaccination. To examine the effect of priming on vaccination, we also randomized a disease message: either a "scared-straight" message, which emphasizes the severity of tetanus, or a control message, which provides the same information on tetanus without the emphasis of the disease severity.[3]

We find that psychic costs of vaccination are not large barriers to vaccination, which is contrary to the conventional wisdom derived from observational studies. The clinic attendance of women who were offered cash compensation for clinic visit but not required to receive a vaccine did not differ from that of women who were required to get vaccinated at a clinic in order to receive the same compensation. Furthermore, almost all women (95.7 percent)

[3] "Scared straight" originally referred to a program that intended to deter juveniles from future crimes by showing them the severity of life in prison to emphasize the consequence of bad behaviors (Petrosino et al., 2014). We call a message that emphasizes the severity of a disease as "scared straight," because the purpose of this message is to emphasize the consequence of non-vaccination, "bad behavior."

actually received a vaccine upon their arrival at clinics, even when it was not necessary to receive cash rewards. Our strong finding highlights the critical importance of conducting experimental studies to identify the causal relationship between psychic costs and vaccine take-up.

Consistent with the nonsignificant psychic costs of vaccination, priming about disease severity did not alter vaccine take-up. The priming, however, did increase the perceived severity of disease, as indicated by a broad range of perception measures.[4] Furthermore, priming increased respondents' heart rate. The paper contributes to the literature on priming by measuring actual vaccination behaviors instead of hypothetical behaviors, which are commonly examined in extant studies (e.g., Nyhan et al., 2014), as well as heart rate, an objective measure of emotional response, as outcomes for the first time in Africa.

In contrast to psychic costs, we find that monetary costs of clinic visits greatly influence vaccine take-up. Conditional cash incentives strongly increase vaccine take-up by compensating for transportation costs and opportunity costs of clinic visits: Giving two dollars in incentives increased vaccine take-up by 19.4 percentage points from the control level, 55.8 percent.[5] The paper contributes to the literature on conditional cash transfers (CCT), because our study is the first to use vaccination as the sole conditionality for CCT in developing countries (Barham and Maluccio, 2009).[6]

The remaining of the paper is organized as follows. The next section provides an overview of the literature on potential barriers to vaccination. Section II discusses the experimental design. Section III discusses the survey design and provides a description of the data. Section IV conducts empirical analyses on monetary costs, psychic costs, and priming. The last section concludes.

[4]Our finding is consistent with some recent works on framing and fear appeals in developed countries; Nyhan et al. (2014), for example, show that priming alters perceptions, but not behaviors.

[5]Two dollars is equivalent to about two days of earnings per person, and a little more than the average transportation costs (both ways) for a clinic visit among those who needed to pay for transportation in our sample.

[6]Sutherland et al. (2008) review the effects of cash incentives on vaccination rates in developed countries, concluding that cash incentives are effective in promoting vaccine take-ups. Weaver (2014), for example, shows that cash incentives of 10 euros increase vaccine take-up by 27 percentage points.

2 Background

This section provides an overview of potential barriers to vaccination, namely, monetary costs and psychic costs. We focus on CCT as an intervention to compensate for monetary costs associated with vaccination. We review extant works on psychic costs of vaccination, as well as priming interventions to augment vaccine take-ups, and also provide a description of the tetanus toxoid vaccine.

2.1 Conditional Cash Transfer (CCT)

Although CCTs have been shown to promote health service utilization (Lagarde 2009), to the authors' knowledge, no CCT programs have focused exclusively on vaccine take-up as the sole conditionality for receiving cash incentives in developing countries (Barham and Maluccio, 2009). Rather, existing CCT programs include vaccination as one of multiple conditionalities, along with other behaviors, such as regular health check-ups and school attendance (Gertler 2004, Barham and Maluccio 2009, Robertson et al. 2013). Such CCT programs preclude researchers from examining how cost-effective they are in increasing vaccinations per se. Although many studies show that the effects of CCT on vaccination are small and limited in developing countries (Morris et al., 2004; Robertson et al., 2013; Barham and Maluccio, 2009; Salinas-Rodrguez and Manrique-Espinoza, 2013), they may fail to capture true incentive effects on vaccine take-up because of multiple conditionalities.

Distinct from such previous studies, Banerjee et al. (2010) use children's vaccination as sole conditionality for in-kind transfers, finding a large incentive effect: Small in-kind transfers (equivalent to $2.85) increase children's vaccination rates by 20 percentage points. Their study boosts vaccine take-ups, however, through supply-side intervention, as well by establishing an immunization camp in each village.

2.2 Psychic Costs of Vaccination

Conventional wisdom suggests that psychic costs, such as the fear of needles or the concern for vaccine safety, are large barriers to vaccination. Researchers, however, have not yet demonstrated a causal link regarding the significance of such psychic costs.

To highlight observational evidence for the psychic costs of vaccination, we provide two

sets of qualitative evidence. First, the Nigeria Demographic and Health Survey (NDHS, 2008) shows that more than one third of women who did not take their children for vaccination indicated the psychic costs of vaccination as reasons for non-vaccination (36.8 percent). These psychic costs included fear of side effects, fear that their children might get diseases from the vaccine, and a belief that vaccines did not work. Other common reasons included lack of information (27.2 percent) and distance to a health clinic (13.4 percent). The significance of the psychic costs of vaccination as a major reason for non-vaccination is not limited to Nigeria. Rainey et al.'s (2010) systematic review shows that psychic costs account for 17.2 percent of reasons for non-vaccination in 51 low- and middle-income countries.

Second, the Nigerian vaccination boycott campaign demonstrates the high psychic costs of vaccination in the form of distrust of vaccines. In 2003, in three northern states in Nigeria, polio immunization campaigns were boycotted due to a suspicion about the vaccine's safety. Islamic leaders propagated a suspicion to the public that polio vaccines could make women infertile or lead them to contract HIV (Jegede 2007), which resulted in the refusal of polio vaccine take-up within the general population. The boycott caused a decreased take-up of the polio vaccine in northern Nigeria, increased polio-virus transmission throughout the country (Centers for Disease Control and Prevention, 2005), and the spread of polio into 20 countries (Kaufmann and Feldbaum 2009). Similar refusals to participate in vaccination campaigns for polio and tetanus due to distrust have been observed across Africa.

2.3 Priming about Disease Severity

The potential effect of priming about disease severity can be considered in the context of behavior change communication. The effect is based on the individual's utility maximization: Information about the true effect of a health input increases allocative efficiency by changing the perceived benefit (Grossman, 2000). If one invests in vaccination at a level that is less than optimal, then providing accurate information should increase the perceived benefit of vaccination and thus increase the demand for vaccination. In other words, emphasizing the negative side of non-vaccination has a potential to induce vaccine take-up by making the vaccine comparatively beneficial by increasing the perceived costs of disease.

Findings on the effectiveness of priming, however, are inconclusive. On one hand, some experimental studies show that priming the negative consequence of non-vaccination is more

persuasive for promoting vaccination than priming the positive side of vaccination (Abhyankar et al., 2008; Gerend and Sheperd, 2007). On the other hand, others find no comparative advantage of priming (O'Keefe and Nan, 2012; Nyhan et al., 2014). Framing theory suggests that priming the negative side of non-vaccination would be less effective in promoting vaccination than emphasizing the positive consequences of vaccination, postulating from prospect theory, which states that the disutility from losses is much greater than the utility gained from the same amount of benefits (Kahneman and Tversky, 1979; Rothman and Salovey, 1997).[7][8]

The literature on priming suggests that priming about disease might affect not only the overall decision to vaccinate, but also the decision process, although the direction of the effect is ambiguous. On one hand, if the increased perception of disease severity makes one feel the need to eliminate the risk of contracting the disease, it might hasten the timing of vaccination. On the other hand, the literature on fear appeal shows that a fearful event has an adverse effect on information processing that can lead to a delay in vaccine take-up (Jepson and Chaiken 1990). We can think of the relationship between the fear and the decision to vaccinate over time in the framework of anticipated dread: People might behave according to the fear that they expect to perceive in the future. Harris (2010) argues that people often choose to undergo unpleasant events sooner rather than later, but the result can be reversed if such a fearful event does not involve monetary compensation (Myerson and Green 1995; Rachlin et al., 1991). Thus, priming intervention may delay people's vaccine take-up without cash incentives and may hasten their vaccination decision with a higher amount of CCT offered.

2.4 Tetanus-toxoid Vaccine

We study tetanus toxoid vaccines that are life-saving and free, but do not attain high take-up. Nigeria is one of 25 countries where tetanus is still a major public health problem (WHO, 2013). In Nigeria, tetanus contributes to a high neonatal mortality rate, which is up to 20 percent (Oruamabo, 2007). Fatality from neonatal tetanus reaches almost 100 percent without

[7]Priming the negative consequence of vaccination could be less effective under the assumption that vaccination behavior involves no risk. This is because prospect theory shows that people prefer taking risks when considering loss but avoid risk when considering gains (Rothman et al., 1993). It is possible that people see vaccination as risky, however, if perceived vaccine safety and efficacy are the problem.

[8]A method that emphasizes the salience of disease severity to promote vaccine take-up also fits with the idea of fear appeal, which intends to promote a particular behavior by arousing fear (Witte and Allen, 2000). Similar to findings on the effectiveness of framing, however, results on the persuasiveness of fear appeals have been inconclusive (Dillard and Anderson 2004; Job 1988; Jepson and Chaiken 1990).

medical treatment, which is difficult to obtain in rural Africa (Blencowe et al, 2010). Tetanus is also extremely painful. Its symptoms include a series of muscle spasms, accompanied by severe pain.[9]

Providing tetanus toxoid vaccines to mothers most effectively protects both mothers and newborn babies from tetanus.[10] Tetanus toxoid vaccine prevents neonatal tetanus with efficacy of over 80 percent with five years of protection if one follows the correct vaccination schedule.[11]

Despite the huge benefits of tetanus toxoid vaccination, vaccine take-up is low in Nigeria as compared to other countries. While 82 percent of newborn babies are protected from neonatal tetanus through tetanus toxoid vaccination to mothers worldwide (WHO, 2011), only 52.8 percent of births are protected in Nigeria (DHS, 2013). To improve maternal and newborn health, the local government of the state where we conducted our field experiment has been providing free antenatal care services, including tetanus toxoid vaccination, to pregnant women. Despite this government effort, the vaccination rate remains low: Only 66.5 percent of pregnant women are sufficiently vaccinated against tetanus with at least 2 doses (DHS, 2013).

3 Experiment Design

To evaluate potential barriers to vaccine take-up, our field experiment randomized three factors–the amount of cash incentives, the condition for cash incentives, and the type of disease message–at the individual level within villages. The overall research design is depicted in Figure 1. This section explains each of these three factors and describes the randomization process and implementation.

[9] Although tetanus toxoid vaccination can have side effects like any other vaccinations, symptoms are rarely severe (Middaugh, 1979). Common adverse responses to tetanus toxoid vaccination include a sore arm, swelling, and itching, all of which are considered mild.

[10] Because neonatal tetanus is typically contracted at the time of delivery when the umbilical cord is cut with a non-sterile instrument, hygienic delivery is also critical to prevent tetanus infection.

[11] Following vaccine instructions is crucial for its efficacy. The World Health Organization (WHO, 2006) recommends that women at childbearing age and pregnant women receive multiple doses of tetanus toxoid vaccine. A single dose can prevent only 43 percent of neonatal tetanus deaths (Ogunlesi, 2011). It is also important to follow the vaccination schedule. The first dose should be taken at first contact or as soon as possible in pregnancy, followed by a second dose at least four weeks after the first dose and a third dose six months after the second dose (WHO, 2006).

3.1 Conditional Cash Transfer (CCT)

To examine monetary costs as barriers to vaccination, we randomly varied the amount of CCT offered to each respondent; the possible amounts included 5 naira (CCT5; approximately 3.3 US cents), 300 naira (CCT300; 2 US dollars), or 800 naira (CCT800; 5.3 US dollars). The mean daily earnings per household for the sample was approximately 1,000 naira (144 naira per person), and the mean transportation cost to the nearby health clinic was about 250 naira both ways among those who needed to pay for the transportation (50 percent of the sample). CCT5 can be considered as a control group.[12] Distinct from extant studies on CCT, we employed sole conditionality on vaccination behaviors to accurately capture CCT effects on vaccine take-up, as discussed next.

3.2 Psychic Costs of Vaccination

To identify the psychic costs of vaccination, we randomly varied the condition of CCT under which each respondent could receive the cash compensation. The conditionality was either clinic attendance (Clinic CCT) or clinic attendance and vaccination (Vaccine CCT). Respondents under Clinic CCT could receive the assigned amount of CCT (5, 300, or 800) if they visited an assigned clinic regardless of vaccine take-up, while respondents under Vaccine CCT were entitled to the assigned amount of money if they visited an assigned clinic and received a tetanus toxoid vaccine at the clinic.

The difference in clinic attendance between respondents under the Clinic CCT and Vaccine CCT conditions reveals the effect of psychic costs of vaccination on vaccine take-up. This is because the additional action was required under Vaccine CCT, vaccine take-up upon clinic visit, in order to obtain the same amount of cash compensation as Clinic CCT. On one hand, the clinic visit by a respondent under Clinic CCT indicates that she had overcome the monetary costs of clinic visit, such as transportation costs and opportunity costs, with a certain amount of cash incentives. On the other hand, the clinic visit by a respondent under Vaccine CCT indicates that she had overcome not only the monetary costs of clinic visit, but also the psychic costs of vaccination with the same amount of money. Then, if the clinic attendance under Vaccine CCT is shown to be lower than that under Clinic CCT, this difference results

[12]The purpose of providing the positive but the minimum amount of cash to the control group was to track respondents who visited clinics by using the voucher with the amount of CCT indicated.

from the existence of psychic costs of vaccination. This design does not allow us to capture psychic costs of vaccination among women who would never attend the clinic even with the highest amount of CCT. To minimize this possibility, we set the highest amount of CCT (800 naira) so high that most respondents would be willing to attend clinics. By comparing CCT300 and CCT800, we can see whether and how psychic costs are compensated at different amounts.

Although the Clinic CCT condition did not require respondents to receive the tetanus toxoid vaccine, they had an option to receive it if they wished to do so. This option does not invalidate the measurement of the psychic costs of vaccination through clinic attendance. How commonly respondents received a vaccine under Clinic CCT, even though it was not required to receive cash rewards, can provide additional evidence for the psychic costs of vaccination: the lower psychic costs of vaccination, the higher the rate of vaccine take-up.

3.3 Priming about Disease Severity

To measure the effect of priming (salient information about disease severity) on vaccine take-up, we randomly varied the type of message about the severity of tetanus: either the "scared straight" message or the control message. The message was conveyed to each respondent through a flipchart. We prepared two different flipcharts: one with fearful pictures of tetanus patients (i.e., the "scared straight" flipchart) and another without such graphical information (i.e., control flipchart). The "scared straight" flipchart contains 15 slides in total, and 7 slides out of 15 show pictures of various tetanus patients to repeatedly emphasize the severity of tetanus symptoms. The remaining 8 slides provide information about the symptoms of tetanus (severe pain and muscle spasms) and the effectiveness of the tetanus toxoid vaccination, written in the local language, Hausa. The control flipchart contains only the latter 8 slides with written information and without any pictorial images of tetanus patients.

The difference between the two types of flipcharts was intended to capture the effect of the priming about disease severity on vaccination behavior. To differentiate only the salience of the messages and not the information in the messages, both flipcharts contain identical written information on tetanus and tetanus vaccination. To capture the priming effect, we compared respondents under Vaccine CCT who were shown the control flipchart and were required to receive a vaccine to obtain cash rewards with those who were offered cash incentives with the vaccination condition plus the "scared straight" flipchart (Vaccine CCT & Fear). For the

comparison between Clinic CCT and Vaccine CCT to be valid in capturing the psychic costs of vaccination, all respondents under Clinic CCT also received the control message.

3.4 Randomization Process

Randomization was done via the following procedure. In each village, every day, interviewers brought 20 sets of questionnaires. Each questionnaire indicated one of the three amounts (CCT5, CCT300, or CCT800), as well as one of the three treatment types (Clinic CCT, Vaccine CCT, or Vaccine CCT & Fear), in the middle page. While the proportions of each amount of CCT in the 20 sets were equal to each other in each village, we randomly varied the proportion of Vaccine CCT & Fear in the 20 sets (from 20% through 70%) across villages. This was to evaluate the potential spillover effects of the priming intervention on vaccine take-up.[13] The remaining questionnaires, other than those with Vaccine CCT & Fear, were equally divided into Clinic CCT and Vaccine CCT.

When starting the interview with each respondent, the interviewer randomly picked one questionnaire out of the 20 sets. In this way, the assignment of the amount of CCT and the assignment of the treatment type are random within villages.[14] Overall, the combination of the three amounts of CCT and the three treatment types generated 9 treatment groups in total, and each respondent in the sample was randomly assigned to one of them within villages.

3.5 Implementation

Interviews and the priming intervention were conducted by 10 female interviewers. First, interviewers conducted a baseline survey at each respondent's house. Second, right after the baseline interview, the respondent was shown either the "scared straight" flipchart or the control flipchart to provide information about tetanus and tetanus toxoid vaccination. The intervention took place in a closed environment, where only an interviewer and a respondent were present to avoid information spillover that is independent of respondents' will.

[13] As the direct priming effects on vaccine take-up are shown to be insignificant below, its spillover effects are unlikely to be significant. And we have found the results as we expected.

[14] Although the assignment ratios of the amounts of CCT vary across villages, the proportions of the three amounts are largely the same as each other in the whole sample. Similarly, although the assignment ratios of the treatment types vary across villages, the proportions of each of the three treatment types are almost the same in the whole sample.

Third, at the end of the flipchart session, each respondent was told about the cash compensation she could obtain and the criteria under which she would be eligible to receive it: clinic attendance or vaccination at the clinic. Respondents were instructed to attend an assigned health clinic within one week after the intervention, with a voucher (discussed in section III.C). Respondents were informed that the clinic would be open Monday through Saturday, 8 a.m. to 5 p.m.

Whereas uncertainty of the vaccine supply is often considered to be a barrier to vaccination, we eliminated this concern by informing each respondent that the clinic had sufficient vaccine supply so that she would be able to receive the vaccine if she wished to do so.

4 Data

We collected three pieces of data: baseline individual data, post-intervention individual data, and post-intervention clinic data. The baseline and post-intervention interviews took place at each respondent's house, and the health clinic interviews were carried out at health clinics only among respondents who visited the clinics.

4.1 Study Area

Our study was conducted in the Jada local government area of Adamawa state in the north-eastern region of Nigeria. The rate of tetanus toxoid vaccination in Jada is the lowest in Adamawa: In 2008, only 16.3 percent of women received tetanus toxoid vaccine during their pregnancy, and almost none of them received the vaccine prior to their pregnancy (DHS, 2008). The experiment was implemented in March-May 2013.

4.2 Sampling

We employed the following three-stage sampling for health clinics, villages, and women. First, 10 health clinics that were geographically spread across the Jada local government area were selected. Among the 11 wards in Jada, we focused on all 9 rural wards, each of which has 1 to 5 public health clinics. We selected the main health clinic from each ward, with an exception of one large ward, where we selected 2 clinics. Thus, in total, we selected 10 clinics in the sample.

Second, we selected a total of 80 villages which are situated within one of the catchment areas of the 10 health clinics in the sample. Catchment areas are defined by the primary healthcare development agency that is responsible for national immunization campaigns. None of the catchment areas of the 10 clinics in the sample overlap with each other. All villages with more than 10 households located within the catchment area of each health clinic were selected, unless the total number of villages in the same catchment area was more than 15; if it exceeded 15, villages farthest from the health clinic were sampled.

Third, in each of the 80 villages in the sample, we selected one eligible woman, who was aged 15 to 35, from each household. Our survey team visited households to find out if they had any eligible women. A woman was ineligible if she had received a tetanus vaccine less than six months prior to the baseline survey, to avoid overdose. In the case where there was more than one eligible woman in the household, the first priority was given to a pregnant woman. If there was no eligible pregnant woman in the household, then the second priority was given to a non-pregnant woman who had never received tetanus vaccine. If we still did not find any eligible women with a priority, then non-pregnant women who had not received the tetanus vaccine in the past six months were invited to participate. If more than one woman with the same priority was eligible, then we randomly selected the first one in the alphabetical order of their first name.

The sample covers 2,530 women in 80 villages in total. On average, a health clinic covers 305 women (range: 80-439) in 9.6 villages (range: 6-22), and a village covers 50.1 women (range: 9-189).[15]

4.3 Baseline, Intervention, and Post-Intervention

The baseline questionnaire was administered to all women in the sample to capture their prior knowledge, beliefs, and attitudes about tetanus and tetanus vaccination, as well as their own and their household's baseline characteristics, such as demographics, health, and economic status. Global Positioning System (GPS) coordinates of respondents' dwellings were measured. At the end of the baseline survey, each respondent's heart rate was measured using a heart

[15]Since we did not conduct a household census in the village, it is likely that we did not reach some households with an eligible woman. At the same time, because the survey team spent more time in larger villages, the number of eligible women in the sample should be positively correlated with the total number of eligible women in the population across villages.

rate monitor. This captured the baseline emotional state of each respondent.

Immediately after completing the baseline questionnaire, the intervention took place if respondents agreed to participate in the intervention (all agreed). After the flipchart session, respondents were provided a voucher that they could redeem at the assigned health clinic. The assignment of health clinic for each respondent was determined based on the village where she resided. The voucher indicated the respondent's name, her unique ID assigned in the project, date of the intervention, name of the health clinic assigned to attend, conditionality (Clinic CCT or Vaccine CCT), and the amount of cash compensation to be provided (5, 300, or 800 naira) if she satisfied the assigned conditionality.

After the intervention, a short questionnaire was administered to all respondents. It asked about respondents' understanding about tetanus and tetanus toxoid vaccine. If a respondent fully understood the information provided in the flipcharts, she would have been able to correctly answer all the questions. Respondents were asked if the intervention caused an emotional arousal. The survey also asked questions about knowledge, beliefs, and attitudes about tetanus and tetanus vaccination that were identical to those asked in the baseline survey. Thus, we can capture whether the flipchart intervention triggered any changes in understanding, beliefs, and perceptions about tetanus and tetanus vaccine. The heart rate was measured immediately after the intervention once again in the same way as at the end of the baseline survey to measure the emotional response to the flipcharts.

4.4 Health Clinic

Upon arriving the assigned health clinic, all women were asked to form a line to wait to be served regardless which intervention they received.[16] In each clinic, an interviewer (who was a different interviewer than the ones who had conducted the baseline surveys) administered a brief questionnaire to each attendee when she was served. At the beginning of the questionnaire, the conditionality to which each attendee was assigned (Clinic CCT or Vaccine CCT) was confirmed through the voucher she brought. If the conditionality was vaccination and she agreed to receive a vaccine, she was provided the vaccine by the health staff right then; no respondents refused the vaccination in our study. Then, the interviewer recorded that she

[16]Since there is no significant difference in waiting time according to treatment status, waiting time should not cause any difference in vaccine take-ups across treatment groups.

received the vaccine in the survey. If the conditionality was clinic visit, then the attendee was asked if she would like to receive the vaccine. If she agreed, the health staff gave her the vaccine right then; if she refused, she did not receive a vaccine and the interview continued. Then, the interviewer recorded her vaccination decision in the survey. Our measure of vaccine take-up is based on this clinic survey. Although receiving multiple doses of tetanus toxoid vaccine is crucial for its efficacy, our experiment focused on a single-dose take-up.[17]

The questionnaire at health clinics recorded the date and time of the attendee's visit, the means of transport from her house to the clinic, transportation costs paid, and perceptions about tetanus toxoid vaccination. It also asked about other services she would like to utilize, as well as other household members she had brought along, if any. At the end of the interview, monetary compensation was made in exchange for the voucher indicating the assigned amount. Later, each redeemed voucher was matched with the baseline data. Our measure of clinic attendance is based on these administrative data.[18]

4.5 Descriptive Statistics and Balancing Tests

The analysis is based on 2,482 women aged 15 to 35 years old for whom information of basic baseline characteristics and GPS coordinates are available. The proportions of respondents who were offered each of the three amounts of CCT are very similar across Clinic CCT, Vaccine CCT, and Vaccine CCT & Fear; the proportions of these three treatment types are also very similar for each amount of CCT (Figure 1). The means of baseline characteristics, health behaviors, and perceptions in each of the nine treatment groups are reported in Table 1.

On average, respondents are 25 years old. About half of the sample are Muslim, almost half (48.3 percent) have never received any education, 15.3 percent have never gotten married, 18.0 percent are pregnant, and 76.5 percent have at least one child. Many respondents (43.5 percent) engage in paid work, including selling agricultural produce, and the average amount of household earnings per capita in the past month is about 5,000 naira (approximately 33.3 US dollars). On average, the distance to the assigned health clinic measured by GPS coordinates

[17]The process of receiving a vaccine did not waste any time, because the interviewer was filling out the administrative information in the questionnaire, such as the date of the interview, and copying the unique ID from the voucher to the survey form while the health staff was giving the attendee a vaccine right at the same place.

[18]All of the women who visited the health clinics showed up at the ones they had been assigned to attend. If some women who attended the clinic failed to be interviewed for operational reasons, clinic attendance would be underestimated. We believe that such attrition is extremely rare.

is 1.7 kilometers, while the one-way transportation costs to the clinic are around 125 naira and the opportunity costs of clinic visit are about 4 naira.[19] Overall, the majority of respondents (72.2 percent) have ever visited the assigned health clinic before, and 39.8 percent have received tetanus toxoid vaccination at least once. These characteristics and health behaviors of women in the sample are comparable to those of the nationally representative sample (DHS, 2008).[20]

In the whole sample, more than one third of respondents (37.8 percent) thought that they were likely to contract tetanus; on average, respondents though that 30 people out of 100 would die of tetanus; and substantial proportions of respondents (35 to 50 percent) felt worried about tetanus, thought that tetanus is bad, and felt that it is important to get protected from tetanus. On average, respondents thought that 22 people could be saved from tetanus with vaccines. The mean baseline heart rate was 86.8 beats per minute.[21]

The balance of baseline characteristics, health behaviors, and perceptions is checked in Table 1. The results indicate that the randomization in our experiment performed well. The equality of means across the nine treatment groups is not statistically rejected at conventional levels for most variables.[22] Exceptions are being Muslim, paid work, transportation costs to the clinic, previous clinic visit, and some of the perception measures related to tetanus; their mean difference, however, is small. Of particular importance are the two baseline outcomes: previous clinic visit and previous tetanus vaccine take-up. Although the joint significance test for previous clinic visit is statistically significant, the mean difference is very small (7 percent of the control group at most). The equality of means is not rejected for previous tetanus vaccine take-up. In the regression analyses for post-intervention behaviors and perceptions in

[19]Transportation costs are self-reported costs to visit the assigned health clinic using the mode of transport the respondent would typically use. Opportunity costs are calculated as the amount of money the respondent would have earned if she had not attended the clinic, based on the daily income of the household to which she belongs, her contribution to the household income, and the time it takes for her to visit the clinic.

[20]While the Nigerian DHS sampled women aged 15 to 49, we restricted the DHS sample to women aged 15 to 35 to compare with our sample. In the DHS sample, over half of women are Muslim (57.3 percent), about half (49.6 percent) have never received any education, 14 percent are pregnant, and 62 percent engage in paid work. Distinct from our sample, only a very small proportion of women in the DHS sample are single (2 percent), and most of them (96.3 percent) have at least one child. In the DHS sample, 31.8 percent of women have ever received a tetanus vaccination. The means of most variables in the DHS sample are not statistically different from those in our sample (results not shown).

[21]The baseline survey also asked questions regarding beliefs about vaccination in general. In the whole sample, while more than 90 percent of respondents thought that vaccines protect one from diseases, more than 60 percent felt that needles of injections are scary and that vaccines have side effects. Around 25 percent of respondents thought that vaccines give diseases, and around 18 percent believed that vaccines give HIV.

[22]Specifically, we regressed each variable on eight treatment dummies (Clinic CCT and CCT5 as a base), controlling for village fixed effects, and test a null hypothesis that the estimated eight coefficients are all zero with standard errors clustered by village.

the next section, we control for these baseline behaviors and perceptions, as well as baseline characteristics.

5 Three Barriers to Vaccine Take-up

This section conducts empirical analyses on potential barriers to vaccination. First, we show that monetary costs, such as transportation costs, are significant barriers to vaccination and that cash incentives can relax them. Second, we reveal that contrary to the conventional wisdom based on observational studies, psychic costs are not significant barriers to vaccination. Third, because of this, priming about disease severity does not alter vaccination behavior, even though it does increase perceived severity of disease.

Overall, clinic attendance and vaccine take-up were high: 73.7 percent of women attended a clinic and 72.6 percent received the vaccine (Figure 1). Even among women who were offered the lowest amount of CCT (5 naira), over half of them (54.8 percent) received the vaccine. This high take-up might have been because of the basic information about tetanus and tetanus vaccination provided to all respondents.

5.1 Conditional Cash Transfer (CCT)

We first examine the effects of cash incentives on vaccine take-up to see if they can compensate for monetary costs of a clinic visit. We show that cash incentives have strong positive effects on vaccine take-up and the incentive effects are stronger among women with higher monetary costs. Results for the CCT effects on clinic attendance (not shown) are very similar.

5.1.1 Specification

To identify the effects of cash incentives on vaccine take-up in a regression framework, we estimate:

$$Y_{ij} = \alpha + \beta_1 CCT300_{ij} + \beta_2 CCT800_{ij} + X_{ij}'\mu + v_j + \epsilon_{ij} \tag{1}$$

where Y_{ij} is a dummy variable that takes 1 if a woman i in village j receives a vaccine; $CCT300(800)$ is a dummy variable that takes 1 if the amount of the cash transfer is 300 (800) naira. CCT5 is the comparison group. The condition for cash incentives (clinic attendance or

vaccination) and the information type ("scared straight" or control flipchart) are controlled for. Other covariates included in X are respondent's age, age squared, religion (Muslim or not), highest education attained (no education or any education), marital status (single or married), pregnancy status, whether she has a child, whether she engages in paid work, distance to the health clinic, past utilization of the assigned health clinic, and past tetanus-vaccine experience.[23] Because treatment assignments are random within villages, all the specifications employed in this paper control for village fixed effects (v) and cluster standard errors by village (80 villages in total). Village fixed effects also control for village heterogeneity. As all respondents in the same village are assigned to the same health clinic, village fixed effects also control for clinic heterogeneity, such as supply-side factors.

5.1.2 Strong Effect of CCT

Vaccine take-up is highly responsive to cash incentives: The effect of CCT300 on vaccine take-up is 19.2 percentage points and the effect of CCT800 is 27.8 percentage points, as compared to vaccine take-up under CCT5, which is 55.8 percent (Table 2 column 1).

These CCT effects are comparable with the effect of an in-kind transfer found by Banerjee et al. (2010): The conditional in-kind transfer (equivalent to about $2.9 or around 435 naira in Nigerian currency) increases the rate of full immunization by 21 percentage points in rural India. Distinct from our experiment on demand-side interventions in natural settings, this very large treatment effect can be also attributed to the supply-side intervention (immunization camp set inside villages), as well as the extremely low vaccination rate at the baseline (6 percent).

To see whether the CCT compensates for monetary costs of clinic visit, we examine the differential effects of CCT by transportation costs measured in the baseline survey. With distance to the health clinic and village fixed effects controlled for, variations in transportation costs are those within villages, which are largely determined by the specific location of women's houses in villages and the mode of transportation to the clinic that women typically chose. First of all, the relationship between the transportation costs and vaccine take-up (and clinic attendance) is negative. Specifically, among women under CCT5, positive transportation

[23] In all the empirical analyses in the paper, we also consider specifications without these covariates. All the results are similar to those with the covariates reported below.

costs less than 200 naira reduced vaccine take-up by 10.9 percentage points compared to no transportation costs (Table 2 column 2; CCT5 with 0 transportation costs is the comparison group); transportation costs between 200 and 300 naira reduced the take-up by 12.1 percentage points.

The effect of CCT is stronger among respondents with non-zero but not-large transportation costs. In particular, if transportation costs are positive and less than 200 naira, then the effect of CCT300 is 9.8 percentage points larger than that with zero transportation costs. Similarly, the effect of CCT800 is 11.5 percentage points larger if the transportation costs are positive and less than 200 naira, and it is 12.6 percentage points larger if transportation costs are between 200 and 300 naira. These results suggest that transportation costs are one of the barriers that obstruct women from receiving vaccination at clinics, and CCT compensates for transportation costs unless such costs are large.[24]

In contrast, the effects of CCT are not differentiated by the distance to the clinic (results not shown).[25] This contrast between transportation costs and the distance to clinics suggests that CCT alters the mode of transportation to the clinic that women chose after the intervention. Indeed, estimating equation (1) with the mode of transportation as a dummy dependent variable among respondents who attended the clinic reveals that women choose a more expensive mode of transport when they are offered a higher amount of CCT (see Appendix 1; the corresponding outcome measure at the baseline is also controlled for). Specifically, CCT800 is negatively associated with clinic visit on foot (albeit statistically insignificant at conventional levels), while it is positively associated with clinic visit by motorcycle and transportation costs actually paid. Although this analysis based on the self-selected attendee sample does not identify any causality, these results provide suggestive evidence that even if women attend the clinic, they are constrained to do so using an undesirable mode of transport due to high costs of an alternative mode.

[24] A similar and stronger pattern is found for transportation costs plus opportunity costs of clinic visits (results not shown).

[25] The relationship between the distance to the clinic and vaccine take-up is negative. On average, an additional 1 kilometer to the health clinic reduces the likelihood of vaccine take-up by 5.3 percentage points.

5.2 Psychic Costs of Vaccination

This sub-section examines whether the psychic costs of vaccination, such as fear of needles or concern for the safety of vaccines, reduce vaccine take-up. Contrary to the conventional wisdom in the literature, we find that psychic costs are not the main barriers to vaccination.

5.2.1 Specification

To measure the effects of psychic costs of receiving a vaccine, we examine whether the rate of clinic attendance is different between respondents under Clinic CCT and Vaccine CCT. Note that under Vaccine CCT, the clinic attendance rate and the vaccination rate are identical, because all respondents who attended the clinic received the vaccine. To identify whether psychic costs reduce vaccine take-up in a regression framework, we estimate:

$$Y_{ij} = \alpha + \beta_1 VaccineCCT_{ij} + X_{ij}'\mu + v_j + \epsilon_{ij} \tag{2}$$

where Y_{ij} is a dummy variable that takes 1 if a woman i in village j attends her assigned clinic; $VaccineCCT$=1 if the conditionality of cash transfer is vaccination as opposed to clinic attendance (Clinic CCT is the comparison group; Vaccine CCT & Fear is controlled for).[26]

The difference in clinic attendance between Clinic CCT and Vaccine CCT may depend on the amount of cash incentives. On one hand, respondents who decide to attend the clinic under Clinic CCT with the low amount of CCT might not have gone to the clinic under Vaccine CCT if psychic costs could not be overcome with the small cash incentives. On the other hand, if respondents are offered the high amount of CCT under Vaccine CCT, the cash incentive might compensate for psychic costs to receive a vaccine. To measure the psychic costs of vaccination at different amounts of CCT offered, we estimate:

$$\begin{aligned} Y_{ij} = \alpha + \beta_1 VaccineCCT_{ij} + \sum_{d=300,800} \gamma_d CCTd_{ij} \\ + \sum_{d=300,800} \delta_d (VaccineCCT_{ij} \times CCTd_{ij}) + X_{ij}'\mu + v_j + \epsilon_{ij} \end{aligned} \tag{3}$$

Here, the comparison group is women under Clinic CCT and CCT5.

[26] Excluding women under Vaccine CCT & Fear yields results similar to those reported here.

5.2.2 Ruling out Psychic Costs as Barriers

Clinic attendance is virtually the same between respondents under Clinic CCT and Vaccine CCT: 74.3 percent vs. 74.8 percent (Figure 2). Table 3 (column 1) presents the effect of the vaccination condition on clinic attendance as compared to the clinic attendance condition. On average, the attendance rate at health clinics under Vaccine CCT is not significantly different from the one under Clinic CCT in both statistical and economic senses.[27][28] The effects of Vaccine CCT on clinic attendance are insignificant regardless of the amount of CCT (Table 3 column 3). Among those with the highest amount of CCT (CCT800), 13.4 percent did not attend the clinic. These results thus indicate that psychic costs of vaccination are not large barriers for the remaining majority of women.

5.2.3 Psychic Costs of Clinic Attendance

A potential limitation of our research design is that even if psychic costs of vaccination are significant, clinic attendance could be the same for Clinic CCT and Vaccine CCT if respondents do not differentiate the psychic costs of vaccination from the psychic costs of clinic attendance, such as the distrust of health services in general. To illustrate this possibility, we introduce a simple model of clinic attendance and vaccine take-up.

A respondent makes one choice from her choice set. Under Clinic CCT, the choice set and the net benefit from each choice are:

Do not attend clinic: 0

Attend clinic but refuse vaccine: $B_h + \tau$

Attend clinic and receive vaccine: $B_h + \tau + B_v$

where B_h is net psychic benefits of clinic visit (= psychic benefits of clinic visit - psychic costs of clinic visit), B_v is the net psychic benefits of vaccination (= psychic benefits of vaccination - psychic costs of vaccination), and τ is cash incentives. Under Vaccine CCT, the choice set and the net benefit from each choice are:

Do not attend clinic: 0

[27]The standardized minimum detectable effect size of Vaccine CCT is 0.1 with a 90% significance level, with a power of 0.8. Because the standard deviation of the outcome variable (vaccine take-up) is 0.45, the unstandardized minimum detectable effect size is 0.045, and the effect below this level is considered economically insignificant.

[28]The baseline characteristics of women who attended the health clinic under Clinic CCT and under Vaccine CCT are not significantly different from each other (Online Appendix 1).

Attend clinic and receive vaccine: $B_h + \tau + B_v$

The choice set under Vaccine CCT does not include "Attend clinic but refuse vaccine," because the experimental design is set up so that it is extremely unlikely for a respondent under Vaccine CCT to visit the clinic without receiving a vaccine. Indeed, there were none in our sample.

Then, a respondent under Clinic CCT decides to attend the clinic and receive the vaccine if

$$B_h + \tau + B_v > 0 \; and \; B_h + \tau + B_v > B_h + \tau \tag{4}$$

A respondent under Vaccine CCT decides to attend the clinic and receive the vaccine if

$$B_h + \tau + B_v > 0 \tag{5}$$

A respondent under Clinic CCT decides to attend the clinic but refuses to receive the vaccine if

$$B_h + \tau > 0 \; and \; B_h + \tau > B_h + \tau + B_v \tag{6}$$

Thus, this model shows how the psychic costs of clinic attendance and the psychic costs of vaccination interact with each other to affect the respondent's decision to attend the clinic and receive the vaccine, as depicted in Figure 3. Under Clinic CCT, a woman chooses not to attend the clinic if both B_h and B_v are small (area L). She chooses to attend the clinic but refuses the vaccine if B_h is larger than $-\tau$ and B_v is less than zero (area M). She chooses to attend the clinic and receive the vaccine if B_h and B_v are large (area N). Under Vaccine CCT, a woman chooses not to attend the clinic if both B_h and B_v are below the dotted line, while she chooses to attend the clinic and receive the vaccine if both B_h and B_v are above the dotted line.

Thus, clinic attendance under Clinic CCT and under Vaccine CCT is different if a respondent is in area Q, and the vaccine take-up at the clinic under Clinic CCT and under Vaccine CCT is different if a respondent is in area R. Because the amount of CCT ranges from very low (5 naira) to relatively high (800 naira), the type of respondents who can be captured in area Q or R varies depending on the amount of CCT. On one hand, only with a higher amount of CCT (the line $B_h = -\tau$ shifts downwards) can areas Q and R capture women with higher psychic costs of clinic attendance. On the other hand, with any amount of CCT, areas Q and

R can capture women with any psychic costs of vaccination, because the vertical line $B_v = 0$ is fixed no matter what τ is.

Our empirical findings suggest the following possible distribution of respondents. First of all, because the higher amount of CCT attracts more respondents for clinic attendance and vaccine take-up and the different amounts of CCT shift the $-\tau$ slope line that separates areas N and L, respondents should be in both areas N and L. Second, because clinic attendance is virtually not differentiated by the condition for cash incentives at any amount of CCT offered, few respondents should be in area Q. Third, because refusal of vaccination at the clinic is virtually nonexistent under Clinic CCT at any amount of CCT, as discussed below, few respondents should be in area R. Hence, most women are distributed in areas N and L, but not in areas Q and R. We cannot rule out the case where women with high psychic costs of clinic attendance are distributed in area L no matter what the amount of CCT is, but they also have high psychic costs of vaccination. In other words, psychic costs of vaccination and psychic costs of clinic attendance may be positively correlated with each other, and if respondents do not differentiate them, their clinic attendance can be similar between Clinic CCT and Vaccine CCT.

To minimize this possibility, we lowered the potential psychic costs of clinic attendance in three ways. First, when respondents under Clinic CCT decided whether to attend the health clinic, they knew that they did not need to utilize any services at the clinic. Second, we eliminated a concern about uncertainty about the vaccine supply as a source of distrust of health services, as discussed above. Third, at the clinic, respondents interacted with health staff only after they agreed to receive the vaccine; thus, respondents did not need to interact with health staff at the clinic if they wished. It is noted that the greater psychic costs of clinic attendance, the more likely it is that respondents would never attend the clinic, even with CCT800. Thus, the potential positive correlation of two psychic costs is unlikely to be a major concern among the majority (86.6 percent) of respondents for whom we address psychic costs of vaccination.

5.2.4 Vaccine take-up

Among 822 respondents under Clinic CCT, 611 attended clinics and 585 (95.7 percent) of them received a vaccine, even though it was not required for cash rewards. Estimating equation (2)

with a dummy for vaccine take-up as a dependent variable shows that the estimated effect of Vaccine CCT on vaccine take-up, 3.4 percentage points, is economically insignificant, though it is statistically significant (Table 3 column 2).[29] These results reinforce our finding that the psychic costs of vaccination are not significant, because women did not need additional incentives to receive a vaccine once they attended the clinic.[30]

It is noted that our experimental design induces self-selection, which leads to the high vaccine take-up among women under Clinic CCT: Women with higher net psychic benefits of vaccination (B_v) are more likely to decide to attend the clinic than those with lower net psychic benefits of vaccination (see equation 4). Furthermore, the opportunity costs of not receiving the vaccine once women are at the clinic (after paying costs to visit) is high, especially among those with high net psychic benefits of vaccination. Over 95 percent take-up among respondents under Clinic CCT, however, cannot be explained solely by self-selection. This selection problem does not invalidate the measurement of psychic costs of vaccination through clinic attendance.

Our baseline survey collected data on self-reported reasons for non-vaccination among women who had never received any vaccination before, as well as reasons why respondents had never taken their children for any vaccination if they had not previously done so, among women with any children, as commonly done in observational studies (Appendix 2). Although lack of awareness is the most common reason for women's non-vaccination (36.9 percent), psychic costs, such as fear of side effects and fear of injection, are the second main reason (17.4 percent). Similarly, psychic costs are the main reason for children's non-vaccination together with supply-side problems, such as insufficient supply of vaccines. These patterns certainly can mislead us to conclude that psychic costs of vaccination are significant barriers to vaccination.

[29] According to equation (3), the estimated effect of Vaccine CCT among women under CCT300 (6.6 percentage points) is both statistically and economically significant (column 4).

[30] Alternatively, respondents under Clinic CCT may have misunderstood that they had to receive the vaccine to receive the cash compensation (as under Vaccine CCT). We show two pieces of counterevidence against this. First, the proportion of respondents under Clinic CCT who declined to receive the vaccine was higher on the first day after the intervention than on successive days (2.8 percent vs. 0.8 percent). If respondents did not understand the condition, the refusal rate on the first day should have been lower than that on successive days, because respondents could learn the correct conditionality from others over time. Second, each interviewer was trained very carefully, with particular attention to the importance of clearly explaining the conditionality to respondents. Indeed, each interviewer had at least one respondent who refused the vaccine under Clinic CCT (Online Appendix 2), providing evidence that respondents generally understood the conditionality. That all respondents under Vaccine CCT who attended the clinic actually received the vaccine provides clear evidence for their understanding of the conditionality.

Behavioral experiments thus are crucial to evaluate the causal effect of psychic costs.

5.3 Priming about Disease Severity

If psychic costs of vaccination are major barriers to vaccination, the priming intervention could potentially increase vaccine take-up by increasing the perceived costs of disease. Because the psychic costs of vaccination are not influential in our sample, however, the priming should not affect vaccine take-up, even if it increases the perceived severity of disease. This is exactly what we have found.

5.3.1 Specification

To identify the effect of priming about disease severity on vaccine take-up in a regression framework, we estimate:

$$Y_{ij} = \alpha + \beta_1 VaccineCCT\&Fear_{ij} + X_{ij}{}'\mu + v_j + \epsilon_{ij} \tag{7}$$

where Y_{ij} is a dummy variable that takes 1 if a woman i in village j receives a vaccine; $VaccineCCT\&Fear$=1 if a woman i is shown the "scared straight" flipchart, rather than the control flipchart. Clinic CCT is controlled for; thus, Vaccine CCT is the comparison group.[31] Recall that all respondents shown the "scared straight" flipchart were offered cash incentives under Vaccine CCT.

We also examine the potentially differential effects of priming by the amount of CCT offered:

$$\begin{aligned} Y_{ij} = \alpha + \beta_2 VaccineCCT\&Fear_{ij} + \sum_{d=300,800} \gamma_d CCT_{ij} \\ + \sum_{d=300,800} \phi_d (VaccineCCT\&Fear_{ij} \times CCTd_{ij}) + X_{ij}{}'\mu + v_j + \epsilon_{ij} \end{aligned} \tag{8}$$

Here, the comparison group is Vaccine CCT and CCT5. This specification enables us to examine potential complementarity or substitution between cash incentives and priming intervention.

[31] The analysis excluding women under Clinic CCT yields results very similar to those reported here.

5.3.2 No Priming Effect on Vaccine Take-up

Priming does not significantly influence vaccination. The point estimate for the effect of the priming about disease severity (Vaccine CCT & Fear) is somewhat negative with no economic or statistical significance (Table 4 column 1). The interaction terms between the priming intervention and any amount of CCT also yield insignificant point estimates (column 3). These results indicate that the priming intervention does not influence vaccination at any amount of cash incentives.

Is this because the psychic costs of vaccination are not major barriers to vaccination, or because our priming intervention does not increase women's perceived severity of disease? We can address this question by examining self-reported perception measures of the severity of disease (tetanus) and the objective measure, heart rate.[32] Estimating equation (7) with perceived severity of tetanus as a dependent variable, with the same perception measure at the baseline as an additional covariate controlled for, reveals that the priming does increase respondents' perceived severity (Table 5). Specifically, respondents who were shown the "scared straight" flipchart were likely to believe that 2.54 more people would die from tetanus out of hypothetical 100 people than respondents who were shown the control flipchart. The "scared straight" flipchart also increased the probability that respondents felt very worried about tetanus, felt that tetanus is very bad, and felt that it is very important to be protected from tetanus by 14.4, 13.8, and 10.4 percentage points, respectively. Women under Vaccine CCT & Fear were also more likely to feel frightened, tense, nervous, and uncomfortable than others (Appendix 3). The priming also induced women's emotional response according to the objective measure: Those who viewed the "scared straight" flipchart had a higher heart rate, by 6.22 beats per minute, than those who viewed the control flipchart (Table 5 column 7). These results provide evidence that the priming is salient enough to increase perceived severity of disease. Hence, the priming is ineffective in promoting vaccine take-up because psychic costs of vaccination are not major barriers to vaccination.[33]

[32]Both perception and objective measures increased, on average, after the intervention among women under Clinic CCT, Vaccine CCT, and Vaccine CCT & Fear. This may be because of the basic information about tetanus and tetanus vaccination provided to all respondents.

[33]There are several other potential reasons why the priming intervention did not alter women's vaccination behavior. First, the "scared straight" message may have increased the perceived severity of disease only among respondents who would have received the vaccine even without that message. A piece of counterevidence against this is that the priming increased perceived severity of disease especially among women with low perceived severity of disease at the baseline, and the perceived severity of disease at the baseline was positively correlated

5.3.3 Timing of Clinic Visit

This sub-section examines whether the priming about disease severity affects the timing of clinic visit. The priming can potentially affect the decision process for receiving the vaccine, even though it does not alter the decision about whether to vaccinate. We examine if the priming hastens or delays the respondents' visit to the clinic by increasing the perceived severity of disease.

We estimate the following Cox proportional hazard model:

$$\gamma_c(t|z_i(t)) = \gamma_0(t)exp(z_i(t)'\beta) \tag{9}$$

where $\gamma_c(t|z_i(t))$ is the individual hazard rate, $\gamma_0(t)$ is the baseline hazard rate, t is the time when a respondent i visits a clinic, and $z_i(t)$ is the same set of explanatory variables as those in equations (7) and (8).

The results show that the "scared straight" flipchart neither hastened nor delayed women's attendance at clinics, regardless of the amount of cash incentives (Table 4 columns 2 and 4). Hence, the priming intervention had no effect on behavioral change, neither on the decision nor on the process through which one reached the decision.

6 Conclusion

This paper conducted a unique field experiment in rural northern Nigeria to examine the relative importance of psychic costs compared to monetary costs as potential barriers to tetanus vaccine take-up. We found that psychic costs of vaccination are not major barriers to vaccination, which is contrary to the conventional wisdom based on observational studies. Accordingly, priming about disease severity does not alter vaccination behavior, even though it increases the perceived severity of disease. Rather, cash incentives strongly increase vaccine take-up by relaxing monetary constraints, such as transportation costs to visit health clinics.

Our first causal analysis on psychic costs of vaccination revealed strong evidence for their

with the likelihood of receiving the vaccine. The second possible reason is the time effect of the intervention. For example, it is possible that the intervention only has a temporary effect on risk perceptions; it vanishes quickly over time, without affecting vaccination behavior. The interval from the time when a woman receives the priming intervention to the time when she makes a take-up decision may be too short. As this interval is uniformly set at one week, we cannot investigate this potential reason.

nonsignificance. Although whether this finding on the tetanus vaccine among women in rural Nigeria is generalizable is an empirical question, our study highlights the critical importance of behavioral experiments in studying psychic costs. The conventional wisdom that psychic costs are major barriers to vaccination, especially in Africa, may not be substantiated. Then, the success of using policy interventions to promote vaccine take-up by reducing the psychic costs of vaccination is a long shot, as exemplified by our priming intervention.

This paper also contributes to the literature on priming and CCT. We used improved measures of outcomes to examine priming effects in Africa for the first time: actual vaccine take-up and heart rate, the objective measure of perceptions. Distinct from extant studies on CCT that use multiple conditionalities and commonly find weak incentive effects on vaccine take-up, we accurately measured the CCT effects with a single conditionality, finding its strong impact.

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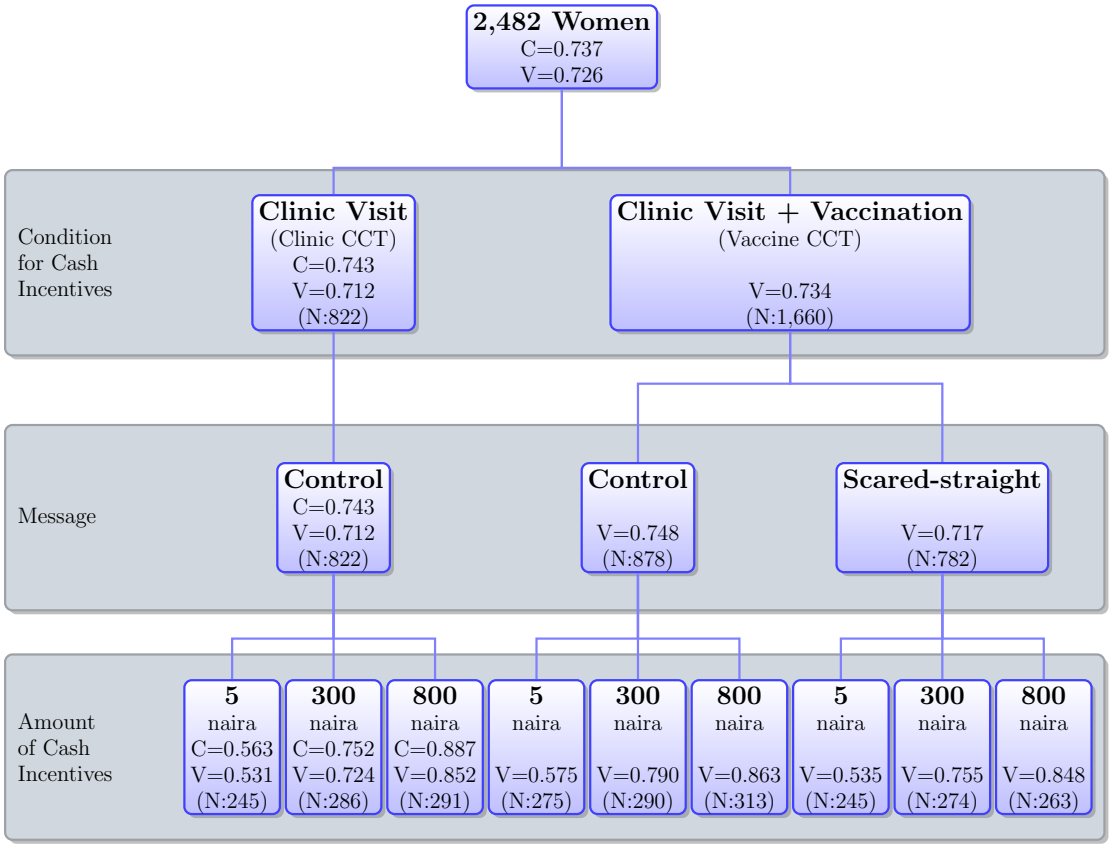
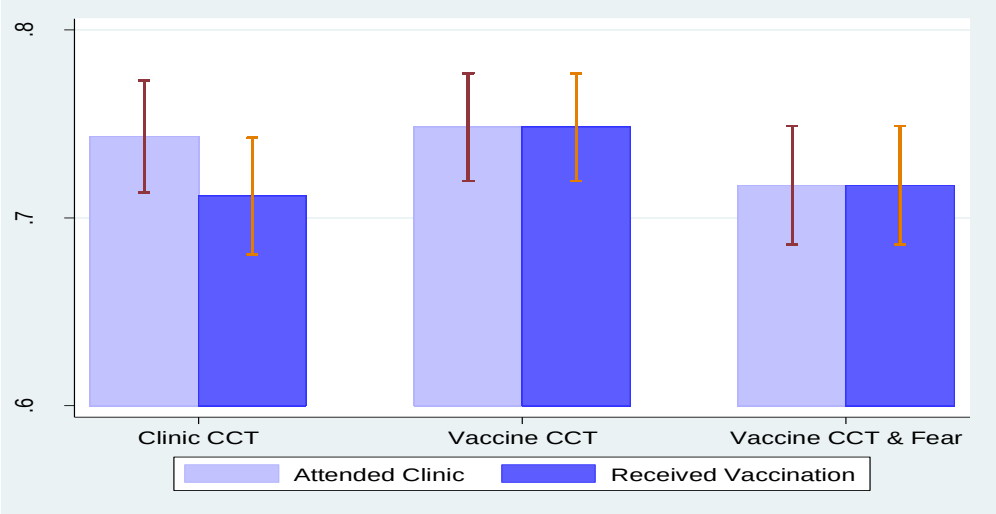
Figure 1: Research Design



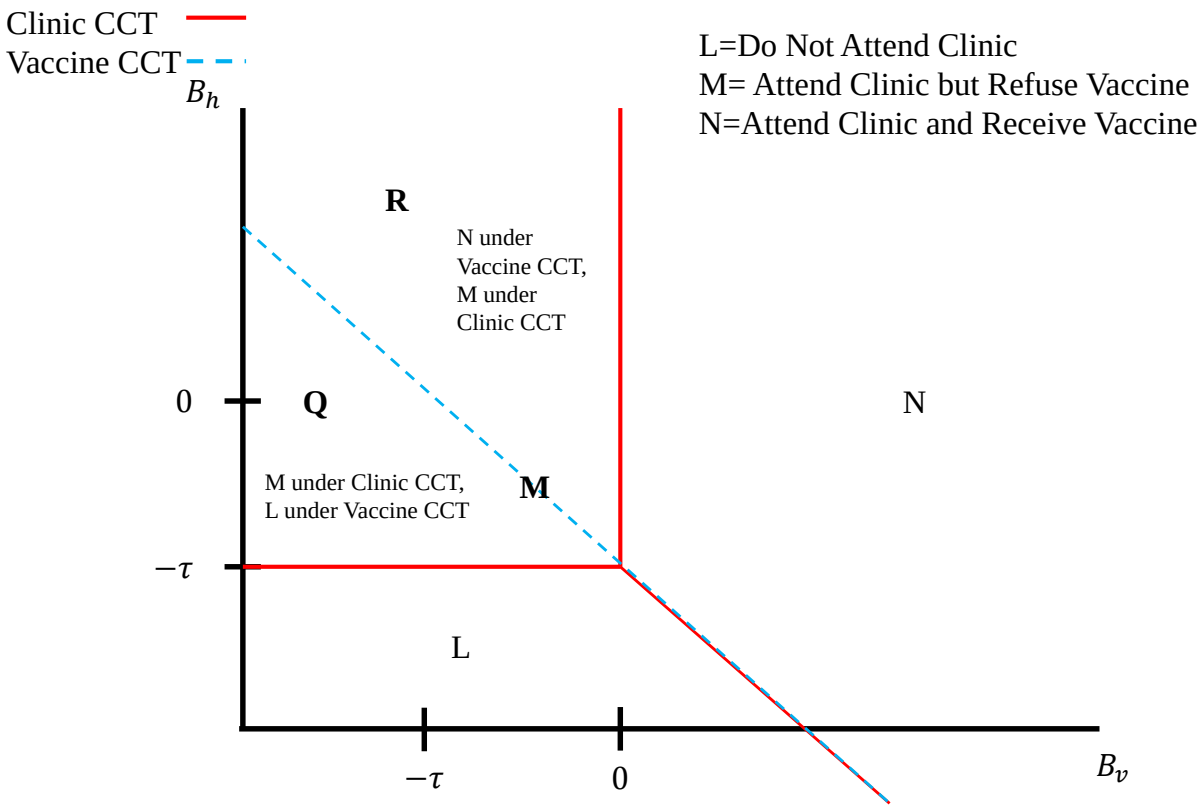
Notes: These are based on the analysis sample of 2,482 women. 150 naira = $1 approximately. C is clinic attendance rate, V is vaccin take-up rate, and N is the number of observations..

Figure 2: Clinic Attendance and Vaccine Uptake



Notes: These are based on the analysis sample of 2,482 women. The rates of clinic attendance and vaccination take-up under three treatment types are depicted along with their 95% confidence intervals.

Figure 3: Model of Psychic Costs of Vaccination



Notes: Women in area L do not attend clinic; women in area M attend clinic but refuse a vaccine; women in area N attend clinic and receive a vaccine. Area M = area Q + area R. B_v is the net psychic benefits of vaccination, B_h is the net psychic benefits of clinic visit, and τ is the amount of CCT.

Table 1: Balancing and Summary Statistics

	Clinic CCT & CCT5	Clinic CCT & CCT300	Clinic CCT & CCT800	Vaccine CCT & CCT5	Vaccine CCT & CCT300	Vaccine CCT & CCT800	Vaccine CCT& Fear & CCT5	Vaccine CCT& Fear & CCT300	Vaccine CCT& Fear & CCT800	Joint signifi-cance (p-value)
	(1)	(2)	(3)	(4)	(5)	(6)	(7)	(8)	(9)	(10)
Sample size	245	286	291	275	290	313	245	274	263	
Baseline Characteristics:										
Age	24.32	24.58	25.34	25.28	24.83	25.62	25.02	25.35	25.52	0.177
Muslim	0.500	0.508	0.497	0.496	0.480	0.468	0.473	0.514	0.525	0.047
Highest education = no education	0.475	0.481	0.479	0.499	0.460	0.480	0.498	0.501	0.477	0.946
Marital status = Single	0.156	0.151	0.166	0.145	0.172	0.141	0.156	0.149	0.141	0.887
Currently pregnant	0.172	0.177	0.193	0.170	0.146	0.178	0.153	0.203	0.226	0.208
Have children	0.718	0.760	0.788	0.809	0.765	0.779	0.762	0.761	0.736	0.652
Has paid work	0.421	0.400	0.443	0.438	0.517	0.387	0.405	0.452	0.457	0.028
Monthly household earning per capita (naira)	5858.3	5935.0	6108.9	5556.3	5645.0	5603.7	5124.3	6358.4	6676.8	0.327
Distance to clinic (km)	1.727	1.740	1.703	1.717	1.704	1.766	1.712	1.707	1.681	0.163
Transport to clinic (naira)	115.89	105.48	136.51	142.13	108.68	138.08	114.60	116.07	132.00	0.046
Opportunity costs to clinic (naira)	4.385	3.302	3.852	4.205	4.352	4.006	4.289	3.880	4.460	0.965
Baseline behaviors:										
Ever used clinic	0.697	0.696	0.726	0.749	0.761	0.690	0.702	0.731	0.745	0.070
Received tetanus vaccine before	0.385	0.380	0.396	0.399	0.424	0.393	0.377	0.408	0.417	0.832
Baseline perceptions:										
Likely to contract tetanus	0.374	0.363	0.387	0.368	0.368	0.359	0.441	0.400	0.351	0.214
Number of people who die of tetanus	31.26	30.02	29.87	29.94	31.32	30.64	26.36	31.19	30.36	0.070
Very worried about Tetanus	0.327	0.369	0.374	0.325	0.364	0.303	0.373	0.369	0.399	0.106
Tetanus is very bad	0.398	0.416	0.473	0.454	0.364	0.450	0.389	0.478	0.475	0.011
Very important to be protected from tetanus	0.468	0.522	0.509	0.471	0.466	0.485	0.470	0.539	0.527	0.239
Vaccine efficacy	23.02	21.19	22.78	23.07	22.33	23.05	19.77	22.79	21.99	0.546
Vaccines protect from disease	0.904	0.921	0.911	0.902	0.914	0.917	0.921	0.909	0.908	0.992
Needles are scary	0.597	0.593	0.586	0.631	0.628	0.631	0.666	0.602	0.612	0.255
Vaccines have side effects	0.660	0.682	0.622	0.70	0.658	0.681	0.662	0.656	0.622	0.189
Vaccines give diseases	0.282	0.240	0.249	0.268	0.283	0.287	0.291	0.276	0.259	0.308
Vaccines give HIV	0.198	0.195	0.168	0.197	0.189	0.176	0.199	0.180	0.157	0.548
Heart rate (beat/min)	86.14	87.27	86.14	85.26	87.46	86.28	89.04	85.96	88.27	0.020

Notes: These are based on the analysis sample of 2,482 women. Transportion and opportunity costs to clinic are the costs for one-way. Transportation costs for 66 observations are missing. "Likely to contract tetanus" is a binary variable; "Number of people who die of tetanus" is the number of people out of 100; "Very worried about tetanus", "Tetanus is very bad", and "Very important to be protected from tetanus" are binary variables. "Vaccine efficacy" is the difference between the hypothetical number of unvaccinated people whom each respondent thinks get tetanus and the number of vaccinated people who get tetanus (range: -100 to 100). 150 naira = $1 approximately. Sample means among women in each of 9 treatment groups are reported in columns (1)-(9); column (10) reports the p-value for the joint significance test for the equality of the means between Clinic CCT & CCT5 and the remaining 8 treatment groups. Specifically, we regress each variable on eight treatment dummies (Clinic CCT & CCT5 as a base) controlling for village fixed effects and test a null hypothesis that the estimated eight coefficients are all zero (F test) with standard errors clustered by village (80 villages).

Table 2: Effect of CCT and Transportation Costs

Dependent variable:	Received vaccine	
	(1)	(2)
CCT300	0.192***	0.177***
	(0.022)	(0.024)
CCT800	0.278***	0.241***
	(0.026)	(0.030)
Transport 1		-0.109**
		(0.044)
Transport 2		-0.121**
		(0.051)
Transport 3		-0.020
		(0.060)
CCT300 * Transport 1		0.098*
		(0.050)
CCT300 * Transport 2		0.067
		(0.058)
CCT300 * Transport 3		-0.046
		(0.064)
CCT800 * Transport 1		0.115**
		(0.053)
CCT800 * Transport 2		0.126*
		(0.071)
CCT800 * Transport 3		0.004
		(0.067)
Observations	2482	2416
R-squared	0.112	0.117
Control mean of dependent variable	0.558	0.615
Covariates	X	X
Fixed effects by village (80 villages)	X	X

Notes: These are based on the analysis sample of 2,482 women. 66 observations with missing transportation costs are dropped in column (2). Transport is the self-reported transportation costs to visit the clinic (both ways). Transport 0 = 0 transportation cost, Transport 1 = 1-199 naira of transportation costs, Transpot 2 = 200-299 naira of transporation costs, and Transport 3 =300 naira or more of transporation costs. Robust standard errors clustered by village (80 villages) are in parentheses. Covariates are Vaccine CCT, Vaccine CCT & Fear, woman's age, age squared, religion (Muslim or not), highest education attained, marital status, pregnancy status, whether she has a child, whether she has a paid work, distance to the health clinic, past utilization of the assigned health clinic, and past tetanus-vaccine experience. Control mean of dependent variable is the mean under CCT5 in column (1) and under CCT5 and transportation costs=0 in column (2). * significant at 10%; ** significant at 5%; *** significant at 1%

Table 3: Psychic Costs of Vaccination

Dependent variables:	Attended clinic	Received vaccine	Attended clinic	Received vaccine
	(1)	(2)	(3)	(4)
Vaccine CCT	0.003	0.034*	-0.011	0.021
	(0.016)	(0.018)	(0.032)	(0.036)
CCT300			0.168***	0.171***
			(0.039)	(0.041)
CCT800			0.283***	0.281***
			(0.038)	(0.039)
Vaccine CCT * CCT300			0.048	0.045
			(0.042)	(0.046)
Vaccine CCT * CCT800			0.001	0.001
			(0.038)	(0.042)
Observations	2482	2482	2482	2482
R-squared	0.023	0.023	0.114	0.111
Control mean of dependent variable	0.743	0.712	0.563	0.531
Covariates	X	X	X	X
Fixed effects by village (80 villages)	X	X	X	X
p-values of F test:				
Vaccine CCT + Vaccine CCT * CCT300 = 0			0.150	0.015
Vaccine CCT + Vaccine CCT * CCT800 = 0			0.670	0.452

Notes: These are based on the analysis sample of 2,482 women. Robust standard errors clustered by village (80 villages) are in parentheses. Covariates are Vaccine CCT & Fear, woman's age, age squared, religion (Muslim or not), highest education attained, marital status, pregnancy status, whether she has a child, whether she has a paid work, distance to the health clinic, past utilization of the assigned health clinic, and past tetanus-vaccine experience. Control mean of dependent variable is the mean under Clinic CCT in columns (1) and (2) and under Clinic CCT and CCT5 in columns (3) and (4). * significant at 10%; ** significant at 5%; *** significant at 1%

Table 4: Effects of Priming on Vaccine Take-up

Dependent variable:	Received vaccine			
Specification:		Hazard model		Hazard model
	(1)	(2)	(3)	(4)
Vaccine CCT & Fear	-0.026	-0.032	-0.010	-0.115
	(0.018)	(0.059)	(0.033)	(0.111)
CCT300			0.216***	0.524***
			(0.030)	(0.095)
CCT800			0.282***	0.705***
			(0.035)	(0.097)
Vaccine CCT & Fear * CCT300			-0.025	0.096
			(0.043)	(0.141)
Vaccine CCT & Fear * CCT800			-0.019	0.164
			(0.043)	(0.122)
Observations	2482	2458	2482	2458
R-squared	0.023		0.111	
Control mean of dependent variable	0.748	0.748	0.575	0.575
Covariates	X	X	X	X
Fixed effects by village (80 villages)	X	X	X	X
p-values of F test:				
Vaccine CCT & Fear + Vaccine CCT & Fear * CCT300 = 0			0.222	0.841
Vaccine CCT & Fear + Vaccine CCT & Fear * CCT800 = 0			0.324	0.545

Notes: These are based on the analysis sample of 2,482 women. 24 observations with missing timing of clinic attendace are dropped in columns (2) and (4). Robust standard errors clustered by village (80 villages) are in parentheses. Covariates are Clinic CCT, woman's age, age squared, religion (Muslim or not), highest education attained, marital status, pregnancy status, whether she has a child, whether she has a paid work, distance to the health clinic, past utilization of the assigned health clinic, and past tetanus-vaccine experience. Control mean of dependent variable is the mean under Vaccine CCT in (1) and (2) and under Vaccine CCT and CCT5 in (3) and (4). * significant at 10%; ** significant at 5%; *** significant at 1%

Table 5: Effects of Priming on Perceptions (Endline)

Dependent variables:	Likely to contract tetanus (0/1)	Number of people who die of tetanus (0-100)	Very worried about Tetanus (0/1)	Tetanus is very bad (0/1)	Very important to be protected from tetanus (0/1)	Vaccine efficacy (0/1)	Heart rate (beat/min)
	(1)	(2)	(3)	(4)	(5)	(6)	(7)
Vaccine CCT & Fear	0.015	2.544**	0.144***	0.138***	0.104***	-0.905	6.221***
	(0.018)	(1.181)	(0.028)	(0.026)	(0.026)	(1.354)	(0.697)
Observations	2283	2280	2283	2283	2283	2278	2091
R-squared	0.094	0.091	0.147	0.111	0.119	0.111	0.408
Control mean of dependent variable	0.459	37.41	0.566	0.649	0.746	43.57	87.74
Covariates	X	X	X	X	X	X	X
Fixed effects by village (80 villages)	X	X	X	X	X	X	X

Notes: These are based on the analysis sample of 2,482 women. Missing obeservations in each column is due to missing values and invalid numbers in the dependent variable. Robust standard errors clustered by villages (80 villages) are in parentheses. All the dependent variables indicate the measurement after the flipcharts intervention. "Likely to get tetanus" is a binary variable which takes 1 if a respondent answers " high likelihood" to the question "what is the likelihood that you get tetanus?". "Number of people who die of tetanus" is the number of people out of 100 a respondent provides to a question "Once they have tetanus, how many people do you think would die because of tetanus?". "Very worried about tetanus" is a binary variable which takes 1 if a respondent answers "very worried" to the question "How worried are you that you might get tetanus? Very worried, worried, not too worried, not worried at all?". "Tetanus is very bad" is a binary variable which takes 1 if a respondent answers "very bad" to the question "How bad would it be if you get tetanus? Very bad, bad, not too bad, not bad at all?". "Very important to be protected from tetanus" is a binary variable which takes 1 if a respondent answers "very important" to the question "How important is it for you to make sure that you are protected from tetanus? Very important, important, not too important, not important at all?". "Vaccine Efficacy" is the difference between the hypothetical number of unvaccinated people whom the respondent thinks get tetanus and the number of vaccinated people who get tetanus. "Heart rate" indicates the heart rate of a respondent measured. Covariates are Clinic CCT, woman's age, age squared, religion (Muslim or not), highest education attained, marital status, pregnancy status, whether she has a child, whether she has a paid work, distance to the health clinic, past utilization of the assigned health clinic, past tetanus-vaccine experience, and the same outcome measured at the baseline. Control mean of dependent variable is the mean under Vaccine CCT. * significant at 10%; ** significant at 5%; *** significant at 1%

Appendix 1: Effects of CCT on Mode of Transport (Endline)

Dependent variables:	Walk	Bicycle	Motorcycle	Car	Transport minutes	Transport costs
	(1)	(2)	(3)	(4)	(5)	(6)
CCT300	-0.015	0.003	0.023	0.001	-0.952	8.545
	(0.023)	(0.003)	(0.024)	(0.007)	(1.999)	(5.542)
CCT800	-0.029	0.008*	0.040*	-0.006	-0.445	13.383**
	(0.021)	(0.004)	(0.022)	(0.006)	(2.079)	(6.291)
Observations	1829	1829	1829	1829	1829	1775
R-squared	0.017	0.010	0.015	0.010	0.005	0.014
Control mean of dependent variable	0.815	0.000	0.169	0.014	43.20	33.01
Covariates	X	X	X	X	X	X
Fixed effects by village (80 villages)	X	X	X	X	X	X

Notes: These are based on the sample of 1,829 women who attended the assinged clinic within a week after the intervention. 54 observations with missing transportation costs are dropped in column (6). Robust standard errors clustered by village (80 villages) are in parentheses. Covariates are woman's age, age squared, religion (Muslim or not), highest education attained, marital status, pregnancy status, whether she has a child, whether she has a paid work, distance to the health clinic, past utilization of the assigned health clinic, past tetanus-vaccine experience, and the same outcome measured at the baseline. Control mean of dependent variable is the mean under CCT5. * significant at 10%; ** significant at 5%; *** significant at 1%

Appendix 2: Reasons for Non Vaccination (Baseline)

	Main reasons respondents have not received any vaccination (N=195)	Main reasons respondents' children have not received any vaccination (N=233)
	(1)	(2)
Lack of information	0.369	0.120
Psychic costs of vaccination	0.174	0.180
Too far health clinic	0.169	0.150
Supply-side problem	0.046	0.180
Not enough money	0.031	0.077
Misconception of vaccination	0.021	0.120
No particular reason	0.169	0.133
Other	0.021	0.030

Notes: These are based on the sample of 195 women who have never received vaccination for herself in column (1) and 233 women who have never taken their children for vaccination in column (2). Psychic costs of vaccination include fear of injection, fear of side effect, dislike of vaccination, and tradition not allowing vaccination. Supply-side problem includes lack of vaccine stocks at the clinic and health workers not visiting their villages. Misconception of vaccination includes the belief that vaccination does not have to be given to healthy people and that infants should not receive vaccination in the first 40 days of their life.

Appendix 3: Effects of Priming on Feeling

Dependent variables:	Feel frightened	Feel tensed	Feel nervous	Feel uncomfortable
	(1)	(2)	(3)	(4)
Vaccine CCT & Fear	0.356***	0.365***	0.396***	0.312***
	(0.029)	(0.028)	(0.032)	(0.031)
Observations	2467	2467	2465	2466
R-squared	0.125	0.141	0.143	0.104
Control mean of dependent variable	0.292	0.242	0.280	0.289
Covariates	X	X	X	X
Fixed effects by village (80 villages)	X	X	X	X

Notes: These are based on the analysis sample of 2,482 women. Missing observations are due to missing values in dependent variables. Robust standard errors clustered by village (80 villages) are in parentheses. All the dependent variables are dummy variables which take 1 if a respondent answers "very much" or "much" to the question: "How did you feel about the flipchart you were just shown? Feel frightened, feel tensed, feel nervous, feel uncomfortable?" after the flipcharts intervention. Covariates are Clinic CCT, woman's age, age squared, religion (Muslim or not), highest education attained, marital status, pregnancy status, whether she has a child, whether she has a paid work, distance to the health clinic, past utilization of the assigned health clinic, and past tetanus-vaccine experience. Control mean of dependent variable is mean under Vaccine CCT. * significant at 10%; ** significant at 5%; *** significant at 1%

NOT FOR PUBLICATION

Online Appendix 1: Selection to Attend Clinic

	Clinic CCT (1)	Vaccine CCT (2)	Difference (3)
Age	25.200	25.498	-0.298 (0.341)
Muslim	0.466	0.452	0.014 (0.028)
Highest education = no education	0.456	0.464	-0.008 (0.028)
Marital status = Single	0.163	0.152	0.011 (0.020)
Currently pregnant	0.183	0.164	0.019 (0.023)
Have children	0.771	0.796	-0.025 (0.023)
Has paid work	0.447	0.463	-0.016 (0.028)
Monthly household earning per capita (naira)	5920.8	5603.1	317.7 (435.5)
Distance to clinic (km)	1.598	1.569	0.029 (0.066)
Transport to clinic (naira)	115.79	116.70	-0.907 (11.03)
Opportunity costs to clinic (naira)	22.094	19.288	2.807 (2.383)
Ever used clinic	0.687	0.726	-0.039 (0.026)
Received tetanus vaccine before	0.387	0.387	-0.000 (0.027)

Notes: These are based on the sample of 1,268 women who visited the assigned clinic under Clinic CCT (N=611) or under Vaccine CCT (N=657). Transportation costs for 66 observations are missing. Columns (1) and (2) report the means of each variable among women under Clinic CCT and Vaccine CCT, respectively, and column (3) reports their difference. Standard errors are in parentheses. * significant at 10%; ** significant at 5%; *** significant at 1%.

Online Appendix 2: Did Respondents Understand Clinic Conditionality?

Interviewer	Number of respondents who:		Total
	Rejected vaccination	Accepted vaccination	
A	5	66	71
B	1	66	67
C	3	57	60
D	4	73	77
E	2	53	55
F	2	49	51
G	2	55	57
H	1	55	56
I	2	53	55
J	4	58	62
Total	26	585	611

Notes: These are based on the sample of 611 respondents who visited the clinic under Clinic CCT.