Overcoming the Cost of Vaccination: Why Low Take-up and How to Improve it?
-Experiment in Northeastern Nigeria-

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Abstract

This paper examines whether the vaccination uptake is constrained by emotional cost and if it can be overcome by emotional message or cash incentives in rural Nigeria. In order to identify if women face emotional cost of vaccination, I first randomize the conditionality under which respondents can receive a cash transfer. Each respondent was randomly assigned a cash transfer conditioned either upon attendance at health clinic ("Just Show-up" conditionality) or upon receiving the vaccination at the health clinic ("Vaccination" conditionality). This difference in the conditionality was designed to exhibit the emotional cost of vaccination. Second, I randomize the type of information given to respondents to study whether emotional loss-framed information enhances the vaccination behavior. Each respondent was randomly shown either the flipcharts which primed the disease severity through pictorial images of disease patients or the flipcharts without such fearful images. I found that respondents were slightly less likely to receive the vaccination at the clinic under "Just Show-up" conditionality. Small cash incentives have strong positive effect on vaccination take-up but fearful information of disease did not improve the vaccination behavior among average women. It rather reduced the take-up among women who never received the tetanus vaccination before. Friends network also increased the vaccination take-up. These results indicate that the emotion prevents vaccination only to a small extent and the barrier to the vaccination can be easily overcome by cash incentives or social network but not by loss-framed emotional message.

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1. Introduction

Vaccination saves millions of lives every year. So far, it has eradicated deadly diseases such as smallpox from the world, is almost eradicating polio, and decreased the incidence of measles by 77 percent between 2000 and 2012 (WHO, 2014). Vaccination is one of the most cost-effective interventions as well. One study shows that vaccination could avert millions of deaths which could cost $151 to $231 billion while such programs cost a sum of $10 billion.

Despite of such high-efficacy of vaccines as well as worldwide immunization campaigns, however, the vaccination rate remains low especially in sub-Saharan Africa. For example, the vaccination coverage of the third dose of diphtheria-tetanus-pertussis (DTP) vaccine (DTP3) is 83 percent worldwide while it is 72 percent in African region. There is a significant variation within African countries as well. For example, the vaccination coverage of DTP3 in Nigeria is 41 percent and the country accounted for 17 percent of the unvaccinated children worldwide (Center for Disease Control and Prevention, 2013).

Although there has been a substantial amount of studies conducted on how to improve the vaccination coverage, the scope of each past study had been limited to examining one incentive scheme for vaccination. Very little is known about barriers that prevent people from vaccination. However, it is crucial to understand the barriers to examine what incentive can offset such barriers. At the same time, relatively little is known about incentives that increases the vaccine take-up and the relative effectiveness of one incentive as compared to other incentives.

In this paper, I address both barriers and various incentives for vaccination to capture the comprehensive picture of the low-vaccination problem in rural Nigeria by evaluating field experiments. In order to measure barriers to vaccination, I study if concerns on vaccination (or fear/emotional costs of vaccine) prevent people from receiving the vaccination because concerns on vaccination such as side effects and suspicion on vaccine efficacy are considered one of the major barriers to vaccination. For incentives for vaccination, I study if monetary and non-monetary incentives separately improve the vaccination take-up. There are two non-monetary incentives this study focuses on. One is the salient loss-framed information and another is the social network.

As I described, the vaccination rate remains low in African countries. There exists descriptive studies on the reasons why people do not receive vaccination (DHS 2008). For example, the main reason why Nigerian women do not take their children for immunization is the concerns on vaccine safety and efficacy followed by lack of information and distance to the health clinic (DHS 2008). Another descriptive evidence of distrusts against vaccines is the vaccination boycott. Nigeria observed that three northern states boycotted the polio immunization campaign in 2003 due to the suspicion of the vaccine efficacy. Although the distrust on vaccination in developing countries is considered common, whether such concerns on vaccine safety and efficacy affect the actual behaviors has never been empirically examined. Furthermore, recent interventions to enhance the vaccination behavior have not addressed if such concerns are overcome by incentives.

Another part of this study examines how to overcome the low vaccination take-up. There has been a substantial amount of researches conducted in order to improve the use of health services in developing countries. Cash transfers, information and social network have been found to be main motivators for

health behaviors. Especially the cost-effective interventions are paid much attention to. For example, Banerjee et al. (2010) found that small amount of in-kind incentives had large effects on vaccination take-up by children in India. Madajewicz et al. (2007) examined if the risk information about the water quality alternates water source and found the effect was positive and large. Godlonton and Thornton (2012) found that neighbors influence the decision to receive HIV test. However, little study has exclusively focused on the effect of incentives on vaccination behavior. Furthermore past studies have never compared the relative effectiveness of each intervention with alternative interventions. Below I explain what past studies have not addressed in the vaccination study.

Conditional cash transfer program (CCT) is said to be one of the most effective tools to enhance health behaviors. Although its effect on health behaviors has been well examined (for example, see Gertler 2004), researches on the effect of CCT on vaccination take-up have been limited (Barham and Maluccio, 2009). Furthermore, the target of CCT programs to enhance the vaccination behavior has been exclusively children or pregnant women. However, the vaccination among adults is no less important than child vaccination and the effectiveness of CCT program among general population is lacking. Thus this study explores the effect of CCT on the vaccination take-up among women.

If the information intervention has a large effect on vaccination behaviors, we can potential improve health outcomes in a very cost-effective way. However, we are yet to fully explore the potential of information. For example, what kind of information appeals more to drive more vaccination take-up? Should we prime the negative consequence of behaviors that do not console with recommendation, or should we prime the positive effect of vaccination? As Zwane and Kremer (2007) emphasized, there is not much study on the comparative usefulness of positive and negative messages to induce health behavioral changes.

Past studies revealed that social network matters not only in vaccination decision (Rao, Mobius and Rosenblat, 2007) but also in broad health behaviors (Muguel and Kremer 2004). However, the definition of social networks in each of past studies varies and is narrowly restricted and we do not know what kind of social network matters more than others.

In this paper, I explore a new possibility to explain and overcome the low vaccination take-up. First, in order to verify if people face the emotional cost (concerns on vaccination) when they receive vaccination, I randomly change the conditionality under which they receive financial incentives. Control respondents are eligible to receive cash only if they come to the assigned health clinic and receive vaccination ("Vaccination" conditionality). Treatment respondents, on the other hand, are eligible for cash as long as they come to the assigned clinic but not necessarily receive the vaccine ("Just Show-up" conditionality). The difference between these two groups indicates any psychological cost (or benefit) of vaccination because respondents in both groups face the transportation and opportunity costs which are on average identical. Second, I randomly distribute the salient loss-framed information of disease to examine if such information can improve the vaccination take-up. Additionally, I randomly vary the amount of cash incentives that each respondent is offered (3.3 cents, 2 U.S. dollars, or 5.3 U.S. dollars). This study also tests if friends network affect one's vaccination behavior with using the random variation of treatment status distributed to friends.

My study has four main findings. First, women face emotional barriers to vaccination only when they visit the health clinic but such perceived costs of vaccine were small and easy to be overcome by small cash incentives. The results show that the clinic attendance of women under "Just Show-up" conditionality was no different from the attendance under "Vaccination" conditionality. However, the vaccination take-up at the clinic was lower by 3.4 percentage points under "Just Show-up" conditionality than under "Vaccination" conditionality and the difference was enlarged to 4.2 percentage points among respondents who visited the clinic.

Second, the vaccination take-up was highly responsive to financial incentives but the monetary effect was heterogeneous by pregnancy status. The take-up rate was 54.69 percent without cash incentive while the average take-up rate under any cash incentive was 72.61 percent. The vaccination rate increased by 23 percentage points if the amount of CCT increased from none to the medium and it increased by 28 percentage points if the cash incentives increased from none to the highest. However, pregnant women were less responsive to the medium cash incentive. If pregnant women were offered the medium amount of money, the vaccine take-up was not significantly different from that under no cash incentive while the take-up under the highest amount of money is as high as that among non-pregnant women. This implies that targeting non-pregnant women can achieve higher take-up rate under limited budget.

Third, the fearful loss-framed information did not have any effect on the vaccination take-up on average even though it induced the higher perceived risk of disease among respondents. However, it had an adverse effect on vaccination behavior among women who never received tetanus vaccine before. Fearful flipcharts decreased the vaccine take-up on average by 2.3 percentage points but the effect was very small and insignificant. Although the fearful flipcharts did not induce behavioral change, it increased the heart rate by 6.4 beats per minute as well as the perceived risk of disease such as the perceived likelihood that respondents feel very worried about contracting tetanus. Among women who never received the tetanus vaccine before, however, the loss-framed information significantly reduced the take-up by 3.7 percentage points while its effect on perceived risk was no different from that among women who have received the vaccine before.

Finally, social networks were found to be important factors to induce the vaccination behavior within village, among neighbors and among friends. If the percentage of women who received the highest amount of cash incentives (vaccination) in a village increased by 1 percentage, the probability of a respondent in the village receiving the vaccination increased by 1.29 (0.79) percentage points. The percentage of women who received the fearful information, on the other hand, did not change the behavior of peers. This is consistent with the result that the fearful information did not induce the behavioral change. Even if I change the definition of social network to neighbors and friends, the main results were consistent. Cash incentives to and actual vaccine take-up of peers positively affect the vaccination behavior while loss-framed information given to peers did not induce the behavior.

Overall, this study revealed that cash incentives can easily overcome the emotional barriers of vaccine. Social network is also an important motivator for vaccination behavior while low-framed information has disappointing effect. The past vaccine experience influences the effect of incentives in a very crucial way.

This paper makes several contributions. First, this paper is the first to rigorously examine the emotional aspect of health behaviors in order to explain the low vaccination rate. I found that concerns on vaccine

explain the low vaccination rate only to the small extent and it contradicts with common belief in sub-Saharan Africa that they are the main barriers to vaccination. Second, this study uniquely tries several incentive schemes to see what can overcome the barriers to vaccination. Fearful information does not remove the barrier to vaccination but small cash incentives and social network are the efficient ways to overcome the emotional cost of vaccination. Third unlike the past studies, this paper exclusively examines the effect CCT on vaccination take-up to find a large effect. Moreover, I found that it is more cost-effective to focus on general women not just pregnant women to improve maternal and infant health. Fourth, this study is the first to rigorously examine the effect of loss-framed message on actual vaccination behavior in sub-Saharan Africa. Consistent with some of the past studies, I found that the loss-framed message had no effect on vaccination behavior on average. However, the study revealed the new evidence that it has an adverse effect on women who never received tetanus vaccine before. This population is the one that we should priotize the most, thus it implies that the loss-framed message is rather harm. This paper highlights the importance of the past experience. Fifth, this paper uniquely examines the effect of various social networks on vaccination take-up while past studies only looked at the specific social network. I found that all of social networks; village, neighbors, and friends have positive effect on vaccination but depending on the past experience of vaccine, relative importance of these social networks greatly differ.

There are several limitations in my study. First, the sample is restricted to women at childbearing age or pregnant women. This paper does not generalize the findings on vaccination behavior by other groups of people such as males, children and elders. Second, the study only looked at the effect of intervention on one-time vaccination take-up. Tetanus-toxoid vaccine as well as other recommended vaccines such as OPV and DPT are required to be taken multiple times to have the sufficient protective effect. However, this study did not examine the persistent effect of intervention on take-up of multiple doses.

The next section provides the overview of the project design. I describe the situation around health in northern Nigeria and explain about the sample selection to the study as well as experimental design. Section 3 describes the structure of the data. I test the validity of randomization through balancing test. I present results on the relationship between emotional cost and vaccination and the effect of the loss-framed information on vaccination as well as the effect of cash incentives and social networks in Section 4. Section 5 concludes.

2. Project Design

A. Setting

Child mortality in sub-Saharan Africa remains high. One of the main reasons for high maternal and child mortality is considered to be the limited use of health services such as antenatal care, professional assistance at delivery, and vaccination. Even among African countries, Nigeria, especially the north, lags far behind of the rest of Africa in terms of health service utilization. Adamawa state, which is the field site of the project, is no exception. The full vaccination coverage rate among children under 2 years old in Adamawa state is 19 percent while the national average is 23 percent; the percentage of women who received delivery care in Adamawa state is 15 percent while the national average is 39 percent (DHS, 2008).

Vaccination is said to be one of the cheapest with highest-impact interventions to save millions of lives. This project focuses on tetanus which is one of the major causes of neonatal mortality (WHO, 2005). The disease is caused by the bacteria which grow in the absence of oxygen, such as in dirty wounds or in the umbilical cord if it is cut with a non-sterile instrument. If women at childbearing age receive the tetanus-toxoid vaccine at least twice, they can protect both themselves and their newborn babies highly effectively. However, the study site (Jada local government, Adamawa state) is experiencing low vaccine coverage just like other northern Nigerian areas. Only 16.3 percent of women received tetanus toxoid during their pregnancy and almost none of them received the vaccine before the pregnancy (DHS, 2008).

B. Sample Selection and Eligibility

This project was conducted in March to April, 2013 in Jada local government, Adamawa state, which is located in northeastern Nigeria. It involved 2,530 women from 80 villages. In each village, we selected one woman from each household who was aged 15 – 35 or who was pregnant. A woman was ineligible if she had received tetanus vaccination in the 6 months prior to the time of baseline interview. This is because the second dose of the tetanus vaccine should be given to individuals at least 6 months from the first dose. The project eliminated the possibility of overdose to minimize adverse effects. In case where there was more than one eligible woman in one household, the first priority was given to pregnant women. If there was no pregnant woman in the household, then the second priority was given to women who had never received tetanus vaccination before. If we still did not find any eligible women, then women who did not receive tetanus vaccine in the past 6 months were invited to participate in the survey. If there were more than one woman who were eligible under the same priority, then we randomly picked one of the eligible women.

C. Timeline

After informing and obtaining the permission from each village head for the project implementation, the project team (the project coordinator, and interviewers, and I) visited villages. In each village, interviewers visited households independently to first check if there were any eligible household members. If there were, then the interviewer selected one respondent who had the highest priority and started the baseline interview immediately upon her consent of survey participation. At the end of baseline interview, respondents were asked if they agreed to participate in the intervention. If they agreed, then interviewers proceeded to show flipcharts as a part of interventions and explained about the cash incentives as well as the condition under which each respondent was eligible to win the cash. The detail description of the intervention is drawn in the next section. After the intervention, interviewers continued to the final stage of the interview to ask questions identical to those posed to respondents before the intervention about perceived risk of getting tetanus, perceived severity of tetanus and perceived efficacy of tetanus vaccine in order to later analyze if the respondent changed the way she perceived about the disease due to the exposure to information interventions. This was the end of the interview at each household. Respondents were given one week from the end point of the interview to visit the health clinic in order to be eligible for receiving cash compensation. When the respondent visited the health clinic, a short list of questions was asked to her such as means of transport, other health services she was to utilize and if other family members were brought with her and then she was provided the vaccination upon her consensus as well as the cash compensation.

D. Experimental Design

The experimental design involved offering conditional cash transfer (CCT) to encourage respondents for the clinic attendance or the tetanus vaccination. The amount of money offered was randomly assigned from the range of 5 Naira (approximately 3.3 US. cents), 300 Naira (2 US. dollars) to 800 Naira (5.3 US. dollars) to each respondent. In this study, I assume that the minimum cash transfer is equivalent to zero cash incentive. Minimum amount of cash was provided for administrative purpose; that is to be able to record their information at the health clinic when they come to redeem their voucher. Conditionality was either the health clinic attendance ("Just show-up" conditionality) or tetanus vaccination ("Vaccination" conditionality) at the same clinic and one of two conditionalities was randomly assigned to each respondent. Respondents were instructed to go to assigned health clinics within one week from the baseline interview in order to be eligible CCT recipients. The CCT program was explained with educational flipcharts along with the information on tetanus and its vaccine. The project prepared two different education flipcharts; one with fearful pictures of tetanus patients (fear flipcharts) and another without such pictorial information (no-fear flipcharts). Fear flipcharts have 15 slides and 7 slides out of 15 show pictures of various tetanus patients to repeatedly emphasize the severity of tetanus symptoms. The rest of 8 slides demonstrate the symptom of tetanus with written Hausa language and introduce the tetanus-toxoid vaccination. No-fear flipcharts have 8 slides with identical information with fear flipcharts except pictures of tetanus patients. Either one of the flipcharts was randomly picked to be shown to each respondent. Both types of flipcharts contain the same verbal information on tetanus symptoms and causes as well as efficacy of vaccination and timeframe of the program. In order to assure that the quality of randomization, the indication of the amount of CCT, conditionality (either Just show-up or Vaccine) and type of flipcharts (fear or no-fear) was randomly attached to each baseline questionnaire and interviewers randomly pick questionnaire at the start of each interview. Because the page that indicated the intervention type was inserted in the middle of the questionnaire, it is less likely that the interviewers intentionally select specification intervention to respondents. Appendix 1 describes the design and reports the sample size of the study. In addition to individual-level randomization I described above, the percentage of respondents who were shown fearful flipcharts was intentionally varied by village. This is to measure the spillover effect of the flipchart intervention by village.

3. Data

In March and April 2013, I generated the sample and conducted a survey. In total, 2,530 eligible women participated in the survey from 80 villages. Each village fell within the catchment areas of one of 10 health clinics.

3.1 Baseline survey

A baseline questionnaire was administered to all respondents containing questions related to demographic, social, health and economic characteristics of their household, and their social networks as well as attitudes, beliefs and knowledge about vaccination against tetanus. They were also asked whether they have ever received vaccination against any disease. If never vaccinated, reasons for non-vaccination was

identified with open-ended question. Heart rate was measured to capture the emotional state of each respondent at the baseline level.

3.2 Intervention and Post-Intervention Data

Immediately after the administration of baseline questionnaire, the intervention has taken place. Each respondent was shown the flipcharts (either fear or no-fear flipcharts) and was explained about the cash compensation and the criteria under which the respondent was eligible to receive the compensation (either "Just show-up" conditionality or "Vaccination" conditionality"). Respondents were assigned specific health clinics to attend based on villages they resided. There were 10 health clinics in total. On average, each health clinic covered 249 respondents from 9.6 villages. The intervention was made to each respondent privately to try minimizing the information spillover at the time of intervention. After the intervention, a short questionnaire was administered. It asked about respondents' understanding level about tetanus and its vaccine. If a respondent fully understood the contents explained in flipcharts, she should be able to answer all the questions correctly as all information asked in the questionnaire was provided during the intervention. Women were also asked if the intervention caused emotional arouse as well as changes in attitudes and beliefs about vaccination against tetanus. Questions in regard to knowledge, attitudes and beliefs were identical in baseline survey and post-intervention survey to make it comparable. This is to capture if flipcharts intervention triggered changes in each category. Heart rate was measure once again immediately after the intervention to measure the change in emotional state before and after the intervention.

3.2 Health-Clinic level data

Health clinics were open for the duration of one week after the intervention was carried out to each respondent whose households were within the catchment area of each clinic. Upon attendance at assigned clinic, respondents were provided the tetanus-toxoid vaccination upon their consent. Monetary compensation was made at this time as well. Right before the provision of vaccination and monetary compensation, a brief questionnaire was administered to each attendee. Questionnaire recorded the date and time of visits, whether they accepted the tetanus-toxoid vaccine, whether they received the monetary compensation. In this questionnaire, attendees were also asked about transportation means to health facility, other services they came to utilize for, and other household members they brought along with them if there is any.

3.3 Descriptive Statistics and Balancing Tests

My analysis is based on 2,482 women aged 15 to 35 years old or being pregnant at the time of baseline survey who did not receive tetanus-toxoid vaccine in the past 6 months. Table 1 presents the summary statistics of the full sample. On average respondents are 25 years old and just about half of the sample is Muslim. For the family status of respondents, 15.3 percent was single and 76.5 percent had at least one child. Almost half of the women, 48.3 percent, did not receive any form of education (not shown) and 24 percent completed primary education as the highest education level. Many respondents (43.5 percent) have paid work. Majority of respondents, 72.2 percent, have previously visited the health clinic which was assigned to each respondent under this study and the distance to the clinic was on average 1.7 kilometers. The average transportation time to the clinic was 30 minutes (not shown). Overall, 39.8

percent of women have ever received tetanus-toxoid vaccine at least once. Although vaccination seems to be a common health behavior among them, more than half of respondents (61.6 percent) report that needles of injection is scary.

For most of the variables listed above, I reject the joint equality of means between each treatment group as well as the joint F-test for whether all the covariates are jointly equal in predicting each assigned treatment status. Although there are some variables that I failed to reject the joint equality such as the variable to indicate if the respondent has a paid work, the overall randomization seems to work well.

4. Main Results

A. Reason for Low Vaccine Uptake

Nigeria Demographic and Health Survey (2008) revealed that concerns on vaccines are one of the major reasons why women did not have their children receive vaccination. More than one-thirds of women who did not take their children for vaccination listed the reasons of non-vaccination as fear of side effects, fear that child may get disease, or because they thought vaccines do not work (36.8 percent). Other reasons include the lack of information (27.2 percent) and the far distance to the health clinic (13.4 percent). However, this reflects the perceived cost of vaccine that women have for their children but not for themselves thus this study investigates if women have concerns on vaccines for themselves.

(1) Emotional Barriers to Vaccination: "Just Show-up" conditionality vs. "Vaccination" conditionality

The difference in conditionality of cash transfer between "Just show-up" and "Vaccination" under no-fear flipcharts reveals the emotional barriers to vaccination. Women under both conditionalities are required to attend the same health clinic to be eligible to receive the cash, thus the transportation cost and the opportunity cost should be identical on average across two groups. The only difference between two conditionalities is the additional cost of receiving the vaccination under "Vaccination" conditionality upon arrival at the health clinic. If women face the fear of vaccine, they should overcome such emotional cost in order to attend the clinic and to receive the vaccination. Among women who were shown no-fear flipcharts, 74.18 percent attended assigned health clinics under "Just show-up" conditionality while 74.71 percent attended under "Vaccination" conditionality.

To measure the emotional barriers to vaccination in a regression framework, I estimate

$$(1) \qquad Attendance_{ij} = \propto + \beta_1 Just\ Show-up_{ij} + X'_{ij}\mu + \varepsilon_{ij}$$

Attendance at assigned health clinic is indicated by *Attendance* = 1 for woman *i* in village *j*. *Just Show-up* indicates if the conditionality of cash transfer is "Just show-up" as opposed to "Vaccination" conditionality. A vector of controls X includes covariates of age, highest education attained, marital status, religion (Muslim or not), past tetanus-vaccination experience, whether the respondent has a paid work, access to health clinic, and whether she has a child. In this analysis, the sample was restricted to those who were shown no-fear flipcharts.

On average, the attendance rate at health clinic under "Just show-up" conditionality was no different from the one under "Vaccination" conditionality at any amount of cash incentives (Table 2 column 1). Thus women perceived no emotional cost of vaccination at home.

Here I would like to examine the possible interpretations of the result that there was no difference in the clinic attendance between the two conditionalities. The first possibility is that respondents did not understand "Just show-up" conditionality. Although there is no way to directly examine whether respondents understood the conditonality correctly, I claim this possibility is unlikely as each interviewer was trained carefully to explain about the conditionality in a very clear way to respondents. The second possibility is that respondents did not differentiate the fear of vaccine from the distrust of the health facility. This possibility is also less likely as respondents under "Just show-up" conditionality does not have to do anything at the health clinic if they wish to. Even if the distrust to the clinic makes the cash transfer program less credible, that level of distrust should be identical on average across these two groups due to the randomization. The third possibility is that respondents actually perceived no emotional cost of the vaccine at least when they were introduced about the vaccine at their house. After I eliminated the first two possibilities, this seems the most plausible interpretation. I address the fear of needle from the different angle as a next step.

Another way to examine the emotional cost of vaccine is to compare the vaccination take-up, instead of the clinic attendance between women under "Just show-up" conditionality and under "Vaccination" conditionality. "Just Show-up" conditionality allows respondents to receive the vaccination if they wish to but it is not a necessary condition in order to receive cash incentives. If women perceive the emotional barrier to vaccination at the health clinic, they might refuse to receive vaccination under "Just show-up" conditionality while they still attend the clinic to receive the cash compensation. Among 825 respondents who were offered cash incentives under "Just show-up" conditionality, there were 25 women who refused to receive the vaccination upon their attendance at the assigned health clinic. Table 2 (column 2) shows that the vaccine take-up is significantly lower under "Just show-up" conditionality by 3.4 percentage points than that of women under "Vaccination" conditionality. If the sample is restricted only to those women who attended the clinic, "Just show-up" conditionality reduced the vaccine take-up by 4.2 percentage points (Table 2 column 3). It implies that women perceived the emotional cost to vaccination at the health clinic.

Overall, results exhibit that women face the emotional cost of receiving the vaccination especially when the fear comes within a very short timeframe. However, the perceived cost is relatively small. The emotional cost of vaccine does not seem to be the major problem that prevents women from vaccination.

Subgroup Analysis by the Past Vaccine Experience

Experiences can form a belief. I examined the difference in the perceived cost of vaccination by the past experience of the tetanus vaccine. Table 3 column 2 shows that if a woman has never received a tetanus vaccine before (I will call her as a non-experienced woman), then she is 4.7 percentage points more likely to refuse vaccination under "Just Show-up" conditionality while the vaccination take-up is not different between conditionalilty among experienced women. If the sample is restricted to those who visited the clinic, on the other hand, both experienced and non-experienced women refused to receive vaccination by 3.8 to 5 percentage points if they have a choice (Table 3 column 3). Results indicate that non-experienced

women have fear or perceived costs of vaccines when they are at their house while both experienced and non-experienced women face such costs when they come to the clinic. It is more difficult to have non-experienced women come to the clinic for vaccination due to the perceived costs.

(2) Other Reasons why the Vaccine Take-up is Low

As Nigeria DHS (2008) described, lack of information and distance to the clinic are other two major reasons for not receiving the vaccination. Because all the respondents received flipcharts intervention, the effect of information provision on the vaccine take-up cannot be measured in this study. However, if I treat the baseline tetanus vaccination rate as the control group (39.9 percent) and the information effect is captured at the lowest cash incentive offered (55.6 percent), the conservative estimate of information effect is 15.7 percentage points. This suggests the possibility that the mere information can have a large effect on vaccination behavior. I also found the suggestive evidence that farther distance to the health clinic reduced the clinic attendance although the distance from each respondent's house to the health clinic was not randomly varied.

B. What works and what does not work to improve the vaccine take-up?

(1) Effect of Conditional Cash Transfer

a. Contribution to Literature

Over the past decade, conditional cash transfer programs (CCTs) to improve the health service utilization has been paid much attention to. However, there has not been a CCT program which exclusively focuses on vaccination uptake as a conditionality (Barham and Maluccio, 2009). Rather, existing CCTs included immunization as one of conditionalities together with regular health check-ups and school attendance (for example, Gertler 2004, Barham and Maluccio 2009, Robertson et al. 2013). Thus it has been difficult to identify how cost-effective the CCT program is on vaccination take-up as they could only measure the combination effect of various conditionalities of CCTs. And even if the past literature measured treatment effects of CCTs on vaccination, such effects have been small and limited (Rodrigues and Espinoza, 2013). One exception is from Banerjee et al (2010). They found the large effect (20 percentage-points increase) of small in-kind incentives (equivalent to $2.85) on children immunization rate. Although they set the vaccination as a sole conditionality, their program was not CCT but conditional in-kind transfer program and they combined this intervention with supply-side program, namely they constructed the immunization camp in each village. Thus my study is the first, to my knowledge, to exclusively focus on the vaccination take-up as a sole conditionality for the cash transfer.

So far, CCTs to enhance the vaccination behavior have been only applied to children or pregnant women (for example, Gertler 2004 and Banerjee et al 2010). However, the vaccination among adults is no less important than one among children and pregnant women. This paper examines the effect of conditional cash transfer on adult women's vaccine take-up. Specifically, this study focuses on the take-up of tetanus-toxoid vaccine by general women at childbearing age. Although the tetanus-toxoid vaccine is recommended only to pregnant women in most of countries including Nigeria, it might be more cost-effective to recommend the immunization to all the women at child-bearing age if non-pregnant women are more responsive to CCT program for receiving the vaccine and pregnant women face higher cost of attending the clinic for vaccination such as physical burden. This is especially so for tetanus vaccine of which women need to receive multiple doses to have the long-term immunity to protect both themselves

and their future babies. Only one shot of tetanus vaccine does not have a sufficient efficacy to prevent neonatal tetanus deaths (43-percent efficacy). However, multiple (2 -3) doses of tetanus vaccine increased the efficacy up to 98 percent. The immunity lasts 1 to 2 years with 2 doses, 5 years with 3 doses, and it lasts throughout childbearing years with 5 doses (WHO, 2008). It might be better for women to start taking the tetanus vaccine so that they have enough time to receive multiple doses to obtain enough protection for long duration both for themselves and for babies. Thus it is important to determine who we should target and the timing when women should initiate the uptake of vaccine.

b. Results

The clinic attendance was 55.73 percent when the amount of conditional cash transfer offered was the lowest (5 Naira), 76.67 percent if the cash transfer size was medium (300 Naira), and 86.4 percent if the cash transfer was the highest (800 Naira). The take-up rate of the tetanus vaccine also has a very similar figure. The overall vaccine uptake rate is 72.61 percent. The vaccine take-up was 54.69 percent, 75.85 percent, and 85.37 percent for low, middle and high incentive respectively. Even with the lowest cash incentives, the vaccine take-up was very high. For the comparison, Nigeria demographic and health survey (2008) indicates that the percentage of pregnant women who received tetanus toxoid injection around the study site was 16.3 percent.

To measure the effect of CCT on vaccine take-up in a regression framework, I estimate

$$(2) \qquad Vaccinated_{ij} = \propto + \beta_1 CCT300_{ij} + \beta_2 CCT800_{ij} + X'_{ij}\mu + \varepsilon_{ij}$$

Whether a woman i received the tetanus-toxoid vaccine at the assigned health clinic is indicated by *Vaccinated* = 1. *CCT300* (*CCT800*) is a dummy variable which takes 1 if 300 (800) Naira was offered to a woman i. In this analysis, the sample was restricted to those whose conditionality for the cash transfer was "Vaccination".

The vaccine take-up was highly responsive to financial incentives. The effect of the medium CCT (approximately $2 of CCT) on vaccine take-up is 20.4 percentage-points and the effect of the highest CCT (about $5.3) is 27. 6 percentage points as compared to when respondents were offered the lowest amount of CCT (Table 4 column 1). This effect is considered very large even compared to other similar program. As a comparison, Banerjee et al. (2010) found that the conditional in-kind transfer (equivalent to about $2.9) increased the vaccination take-up by 21 percentage points in rural India. But the area faced extremely low vaccination rate in prior to the intervention (6 percent base-line vaccination rate) which made it easier for the intervention to have a larger effect. Respondents under the study from Banerjee et al faced almost no transportation cost as the immunization camp was set inside the village while respondents in my study needed to visit the health clinic which took on average 30 minutes.

Heterogeneous Treatment Effect by pregnancy status

Table 4 column 2 presents the differential effect of CCT by pregnancy status. My sample consists of 299 pregnant women and 1,341 non-pregnant women under "Vaccination" conditionality. If there was no cash incentive involved, then the take-up rate is weakly higher among pregnant women. But non-pregnant women were more responsive to the cash incentive than pregnant women. Pregnant women were 15 percentage-points less responsive to the medium amount of cash incentive than non-pregnant women. In

fact, the effect of medium CCT among pregnant women is no different from the effect of the lowest CCT. Once the amount of cash incentive increased to the highest, then there was no longer a difference in vaccine take-up among pregnant and non-pregnant women. This result implies that the willingness to pay for the vaccine is higher among pregnant women if no cash incentive is involved presumably because they have a higher motivation to protect the baby in their womb. Once the small amount of money encourages women for vaccination, it attracts more of non-pregnant women possibly due to the low cost of vaccination non-pregnant women have. However, if the cash incentive is large enough, then it can offset the high cost the pregnant women bears. This result has a very important policy implication. It indicates that it is more cost effective to target non-pregnant women.

c. Cost-Benefit Analysis

Here I examine how cost effective the CCT program was. The cost includes the cost of vaccine, cost of CCT, and cost of administrating CCT and the benefit includes the costs averted due to vaccination, specifically medical care costs averted, work loss averted, and preserved future earnings for both women and unborn children. I assume that women will have 3 children on average from the day of the intervention.

I compare the cost-effectiveness of CCT between the medium amount ($2) of cash incentive and the lowest amount ($0.33). The average cost per person under the medium CCT is $3.65 and the average benefit per person is $2.69. Although CCT is a strong method to boost the vaccination take-up, it appears that the CCT program is expensive. I also calculate the cost effectiveness of the information intervention, in other words, flipcharts intervention. I assume that the effect of the information intervention as the difference between the baseline tetanus vaccination rate and the vaccination rate of women under the lowest CCT ($0.33) because all the women received the information intervention through the program. Then I found that the average cost per person under the lowest CCT is $1.68 and the average benefit per person is $2.09.

(2) Effect of Emotion Intervention

a. Theoretical Consideration

A. Framing

Health messages can be conveyed either with the emphasis on the benefits of implementing recommended behavior (gain-framed) or the costs of not implementing it (loss-framed). Rothman and Salovey (1997) examined which framed information is more effective in promoting health behaviors. Postulating from prospect theory (Kahneman & Tversky, 1979), gain-framed message is predicted to be more persuasive in promoting prevention behaviors such as the use of sun screen while loss-framed message is predicted to be more persuasive in promoting detection behaviors such as the breast self-examination.

O'Keefe and Nan (2012) examined the relative persuasiveness of gain- and loss-framed messages specifically in promoting vaccination behavior. Although Rothman and Salovey (1997) predict that gain-framed message is more effective in promoting vaccination as vaccination is considered as a prevention behavior, O'Keefe and Nan found that there was no significant difference in persuasion between gain- and loss-framed messages. On the other hand, there are evidences that loss-framed messages are more

persuasive in promiting vaccination behaviors (Abhyankar et al. 2008 and Gerend and Sheperd 2007). Thus the effect of loss-framed messages on vaccination intention and take-up has not been consistent.

B. Priming

The flipcharts intervention is framed as priming in a way that the two flipcharts prepared in my study supposedly contain the same information but only fear flipcharts appeals to emotion by showing the painful pictures. Although priming is a very common research area in psychology, it is yet a rarely-explored field in Economics literature. Bertrand, Karlan, Mullainathan et al. (2010) is one of such examples. They examined the effect of advertising contents on loaning decisions. One of the advertising components was a photo of an attractive female which increased the loan demand. However, they jointly examined the effect of several advertising components thus were unable to identify the effect of each content on decision. My study, on the other hand, will identify the effect of the sole component of flipcharts; emotion (or presumably fear) on vaccination decision.

Choi et al. (2012) examined the effect of small cues on saving choices. One of their interventions is to use anchoring. Anchoring is a cognitive bias that one relies too heavily on piece of information they have. By randomly providing the example of high contribution rate for the retirement savings plan, recipients of such information are found to actually contribute more. My study can be considered as anchoring as fear flipcharts could potentially increase the perceived disease susceptibility and severity which might trigger the behavioral change. However, fear flipcharts is not just a mere piece of information but emotional information. In order to examine the possible effect of emotional information, other literatures need to be referred to. In the next section, I will introduce Fear Appeals literature.

C. Fear Appeals:

We might as well consider the intervention as fear appeals. Fear appeals are persuasive messages that arouse fear.

The most recent fear-appeals theory, extended parallel process model (Witte 1994), claims that the perceived threat of the message and perceived efficacy of the recommended action are main driving forces of behavioral change. The model explains the three possible consequences of fear appeals. The first consequence is inaction. This will happen if the fear appeals don't scare people, in other words, the threat is perceived irrelevant or insignificant. The second one is to take the recommended action, the desired outcome. If the threat is perceived serious, then one will think whether he can eliminate the threat by taking the recommended action (perceived efficacy). If the answer is yes, then he will take the action but otherwise, the third outcome will be reached: denial or defensive avoidance. This has an adverse effect on recommended action. In this case, fear appeals backfire. This possibility of backfire is the main reason why researchers have been discussing the appropriateness of fear appeals as a policy instrument. It is discussed that fear appeals might have negative effect on outcomes if respondents do not believe they are able to effectively avert a threat (Witte and Allen, 2000). Thus it is recommended that fear appeals be accompanied by strong efficacy messages that make respondents believe that threats would be removed if they perform a recommended action.

Substantial amounts of researches have been done to test the effectiveness of fear appeals in health-related issue (Witte and Allen, 2000). Many claimed that the fear appeals motivate the desirable health behaviors. For example, Dillard and Anderson (2004) imposed the threat of influenza such as its symptoms and examined whether respondents received influenza vaccines. They found that threats increased vaccine take-up and stronger threats worked better. On the other hand, there are significant amount of literatures which state that the fear appeals do not affect health behaviors or they can even have a counterproductive effect (Job R, 1988). Jepson and Chaiken (1990) found that the fear has an adverse effect on information processing that can lead to adverse health behaviors. Overall, it is generally concluded that fear appeals work best if the fearful information comes along with high-efficacy messages (Witte and Allen, 2000). Efficacy messages involve a suggestion which advices respondents to seek for health behaviors in order to avoid the fearful consequences that fear appeals emphasizes. In my study, flipcharts clearly state the importance of vaccination as a prevention method against tetanus multiple times to emphasize the importance.

Although there is substantial number of similar studies as the fear intervention in the literature of framing, priming, and fear appeals, the evidence is extremely scarce in sub-Saharan Africa and most of such researches have been conducted on HIV-related topic. Levine et al. (2009) is one of such example. They examined the effect of fear appeals on attitudes around HIV in Namibia to find that the use of fear appeals was not effective in an environment where people already have high-level of fear on HIV. Bastien (2011) is another example. He examined the potential effect of fear appeals in HIV-prevention behaviors among youths in Tanzania by asking them about the perceptions of fear-arousal intervention but it did not examine the effect of fear appeals on actual health behaviors.

Thus my study is the first, to my knowledge, to examine the causal effect of such loss-framed messages on actual health behaviors in Sub-Saharan Africa. Although no study has examined the effect of fear appeals on vaccination behavior in Africa, this is a very important research question especially in Africa and more attention should be paid to as this region specifically faces the low vaccination rate and it is worth examining the efficacy of priming among people whom we need to focus on most.

b. Empirical Strategy

Among women who were offered cash transfers conditioned upon vaccination, 71.81 percent of respondents under fear flipcharts attended assigned health clinics for vaccination while 74.18 percent received vaccination if shown no-fear flipcharts.

To measure the effect of priming intervention, cash incentive, and the combination effect of these two incentives on vaccination take-up in a regression framework, I estimate

$$(3) \quad Vaccinated_{ij} = \propto +\beta_1 Fear_{ij} + \beta_2 CCT300_{ij} + \beta_3 CCT800_{ij} + \beta_4\left(Fear_{ij} * CCT300_{ij}\right) + \beta_4\left(Fear_{ij} * CCT800_{ij}\right) + X'_{ij}\mu + \varepsilon_{ij}$$

Receiving tetanus vaccination at assigned clinics is indicated by *Vaccinated*. *Fear* = 1 if a respondent *i* in village *j* was shown fearful flipcharts. Here I exclude women whose conditionality for the cash transfer was "Just Show-up" but the comparison was between women who were shown fear flipcharts and women who were shown no-fear flipcharts under "Vaccination" conditionality.

On average, fearful flipcharts did not increase the vaccination take-up at any amount of cash incentives. Higher amount of CCT offered to women who were shown fearful flipcharts did not influence the vaccination uptake differently from women who were shown no-fear flipcharts with the same amount of cash incentives offered (Table 6).

There is a potential concern that the fear flipcharts did not arouse enough fear and it led to the insignificant effect of the intervention. However, I claim that this is not the case. In order to examine the transition of emotional state due to the exposure to flipcharts, all the respondents were measured their heart rate right before and immediately after the flipcharts intervention regardless of the type of intervention received. Table 7 column7 indicates that fear flipcharts increased the heart rate by 6.39 beats per minute more than no-fear flipcharts did. This is a rigorous evidence that fear flipcharts influenced the respondents' emotion more than no-fear flipcharts.

Furthermore, I found that women who were shown fear flipcharts were more likely to feel frightened, tensed, nervous, and uncomfortable than those who were shown no-fear flipcharts (Table not shown). More importantly, fear flipcharts also increased the perceived risk of the disease and perceived severity of tetanus (Table 7). For example, fear flipcharts increased the hypothetical number of people out of 100 a respondent thinks die because of tetanus increased by 2.55. Fear flipcharts also increased the probability that a woman feels very worried about tetanus, feels that tetanus is very bad, and feels that it is very important to be protected from tetanus more than no-fear flipcharts. On the other hand, the fear flipcharts did not change the perceived vaccine efficacy. Thus this evidence strengthens my argument that fear flipcharts successfully arouse fear and increased the perceived risk of disease among women while it did not affect the perceived vaccine efficacy.

Overall, results indicate that the fearful information of disease does not enhance the vaccination take-up even though it altered the perception.

c. Subgroup Analysis of Fear Intervention

The perceived risk of contracting tetanus might depend on personal past experiences. Although fear flipcharts did not increase the vaccination take-up on average, the intervention might have affected respondents differently by their past experiences. In this section, I examined the effect of fear intervention on vaccination take-up by the past experience of receiving tetanus vaccine.

I found that the fear intervention had an adverse effect on the vaccination take-up among women who never received tetanus vaccine before while it had no effect among those who received tetanus vaccine before (Table 8). Fear flipcharts decreased the vaccine take-up among non-experienced women by 3.7 percentage points while it had no effect among experienced women.

This difference in response to the fear intervention might be attributed to the difference in perceived risk of disease. However, the result shows that that is not the case. The fear intervention increased the

perceived risk of contracting disease as well as the perceived severity of disease both among experienced and non-experienced women (Table 10). As past researches indicate (Witte and Allen, 2000), the adverse effect of the intervention among non-experienced women can still be explained even though the fear intervention increased the perceived disease severity, if they have the low perceived vaccine efficacy.

Fear appeals literature introduces the insight of such adverse effects. Specifically, it raises the possibility that fear appeals backfire if the emphasis on self-efficacy in fear intervention is insufficient. Caplin (2002) introduced the possibility of counter-productive effect of fear appeals using a theoretical model. Whether one decides to take vaccination is based on cost-benefit analysis: if the benefit of receiving the vaccine in the presence of fear is more than the cost, one decides to take up the vaccine. The key assumption is that one pays more attention to the fear intervention if she decides to take the vaccination than if she decides not to take it. It is proved in the model that if one has low perceived risk of disease or low efficacy of vaccine, then fear appeals could backfire on the vaccination behavior. The intuition is as follows: the fear intervention makes one more stressed about disease when she decides to take the vaccination. Thus she would be better off not taking the action if she does not have the high perceived vaccine efficacy. This conclusion from the theoretical model is consistent with what I found among women who never received tetanus vaccine before. Table 9 panel B presents the positive correlation between the tetanus-vaccine experience and perceived efficacy of vaccine or perceived risk of tetanus. In other words, non-experienced women have lower perceived efficacy of vaccine and lower perceived risk of tetanus. According to the model, if the perceived efficacy of vaccine or the perceived risk of disease is low, fearful information can rather reduce the vaccination take-up and the result I found here is consistent with this hypothesis.

d. Emotion Effect on Timing of Clinic Visit

The priming intervention might have affected the process under which respondents decide if they want to receive the vaccine or not. If fearful flipcharts increased the perceived susceptibility of tetanus and perceived importance of vaccine, the priming might have hastened women's visit to the clinic. At the same time, respondents might think about vaccination as a fearful (or unpleasant) event after the intervention until the time they get vaccinated and such emotion might affect adversely on decisions on when to visit the clinic. We can think of such relationship between emotion and vaccination decisions over time in the framework of anticipated dread. Harris (2010) documented a nice review on anticipated dread and its effect over time. He described that people often choose to undergo unpleasant events sooner rather than later. This is to minimize the additional negative cost; which is the dread in this case, over the period until the event is being anticipated.

To measure the effect of the priming intervention on timing of clinic visit among women who attended the clinic in a regression framework, I estimate

$$(4) \quad Hours\ before\ Clinic\ Attendance_{ij} = \propto + \beta_1 Fear_{ij} + \beta_2 CCT300_{ij} + \beta_3 CCT800_{ij} + \beta_4\left(Fear_{ij} * CCT300_{ij}\right) + \beta_4\left(Fear_{ij} * CCT800_{ij}\right) + X'_{ij}\mu + \varepsilon_{ij}$$

Number of hours taken before respondent *i* in village *j* attended the assigned clinic is indicated by *Hours before Clinic Attendance*. Hours include their sleeping time if they decided to attend the clinic in the

different day from the day that the intervention was implemented. Analysis was done using the sample of women whose conditionality for the cash compensation was "Vaccination". Average respondents took 67.21 hours before attending the clinic.

Fearful flipcharts neither hastened women's attendance at the clinic nor delayed it on average (Table 11 column 1). The result is consistent with the effect of fear intervention on vaccine take-up. The intervention had no effect on behavioral change.

There are, however, literatures on the anticipated dread in combination with monetary incentives. Myerson and Green (1995) and Rachlin, Rainieri and Cross (1991) examined the time effect of anticipated dread in combination with monetary compensation and found that if monetary compensation is not involved, then people choose to accept a loss when the loss was scheduled to occur later in time. Table 11 column 2 shows the combination effect of anticipated dread and cash incentives. Although insignificant, the fear intervention without cash incentive decreased the probability of attending the clinic at given time by 11.8 percentage points while the higher amount of cash incentives offset such negative effect of the fear intervention.

Subgroup Analysis by the Past Vaccine Experience

Here I examine the differential effect of the fear intervention on the hours. As Table 11 column 3 and 4 present, the fear intervention delayed the attendance only among non-experienced women who were offered the lowest amount of cash incentives. This finding reconciles with the story that fearful flipcharts backfired on the vaccine take-up among non-experienced while it did not have any effect among experienced women. This result was considered to be attributed to the low perceived risk of tetanus (Table 9). Thus, the result of the fear effect on the timing of clinic visit is consistent with the result on the fear effect on vaccine take-up among non-experienced women. With low perceived risk and low vaccine efficacy, the fear intervention not only had an adverse effect on vaccine take-up only among non-experienced women but also on the timing of the vaccination.

Overall, I found a consistent result that the fear flipcharts had an adverse effect on vaccination take-up at least among women who never received tetanus vaccine before whom the policy maker should put the first priority on. Thus we should conclude that we should be careful in using the loss-framed message to increase the vaccine take-up at least in sub-Saharan Africa if people face low perceived vaccine efficacy and low perceived risk of disease.

(3) Social Network Effect

This section evaluates the spillover effect on the clinic attendance and vaccination take-up. If the individual health behavior in areas with low health service utilization is influenced by peers, we should focus on intervention which takes advantage of peer influence as a policy implication. To measure the spillover effect, I use the random variation of treatment status of the peer: namely if the peer was shown the fear flipcharts and if she was offered a high amount of cash incentive.

a. Data

A. Village-level variation of Treatment Status

i. Fear Flipcharts

In addition to the random individual-level variation in fear treatment, this study also randomizes the intensity of fear treatment by village. Villages in the study site were randomly assigned the percentage of respondents receiving the fear treatment. This saturation design enables me to examine the extent to which the peer affects the vaccination (Baird et al. 2012). The percentage of respondents shown fear flipcharts ranges from 8.3 percent to 73.7 percent with the average of 31.7 percent.

ii. Amount of CCT

Although the intensity of high CCT recipients is not intentionally randomized, I claim that it is still randomized by village. Because interviewers randomly assigned the amount of cash transfer to each respondent when they meet each respondent but the treatment status was not pre-determined, the ratio of respondents receiving the highest amount of CCT should be random in small sample like the case of this study. The percentage of respondents receiving the highest amount of cash transfer ranges from 18.2 percent to 60 percent with the average of 34.9 percent. Due to the difference in research design between intensity of CCT treatment and that of fear treatment, the variance of the intensity of CCT treatment is much smaller with narrower range than that of the intensity of fear treatment.

B. Geographical Location of Respondent's House

Village might not be a correct unit in measuring the spillover effect (Godlonton and Thornton, 2012). Information might spread only within the neighborhood. This study measured the GPS coordinates of each respondent's house. This enables me to analyze the spillover effect within a closer geographical proximity than within village. Because the assignment of treatment status to respondents is random, the random assignment rule should also apply to their neighbors.

C. Friends Network Data

This project has a unique data on social networks for each respondent. Each respondent was asked to list their friends in 6 categories: a best friend, a friend whom she admires, a friend whom she talks about health issues with, a friend whom she goes to health clinic together with, a friend whom she visits when the friend is sick and a friend who visits her when she is sick. This section analyzes the effect of friends network on vaccination take-up. Because the specific intervention assigned to each respondent was random, the intervention assigned to friends of a respondent was also random. In Table 14, I test the balance of the experiment by the type of the intervention any friends of a respondent received. Although there is some imbalance on religion and the past tetanus vaccine experience the amount of cash transfer friends received, the experiment overall looks quite balanced in terms of respondents' intervention status as well as their demographic characteristics. Variables related to attitudes around disease and vaccine, on the other hand, seems quite unbalanced. Overall, if a respondent has some friends who received any intervention; either high amount of CCT or the fear intervention, it is likely that she has lower perceived risk of contracting disease, lower perceived severity of disease and lower perceived vaccine efficacy at the baseline. This unbalance might be attributed to the information spread.

b. Estimation Strategy and Results

A. Village-level variation of Treatment Status

The intensity of treatment within each village is random and this analysis examines if saturation occurs (Baird et al. 2012). The specification to measure the effect of saturation on vaccination take-up controlling for the own treatment status is:

$$(5) \qquad Vaccinated_{ij} = \propto + \beta_1 \left(\%Intervention_{ij}\right) + X'_{ij}\mu + \varepsilon_{ij}$$

X includes own treatment status. *%Intervention* indicates either the percentage of respondents in village *j* who were shown the fear flipcharts, the percentage of respondents in village *j* who received the highest amount of cash incentives. Table 12 Columns 1 and 4 show that the fear intervention does not have saturation effect on vaccination behavior. This is consistent with the main result that the fear intervention did not have any effect on the vaccine take-up. The result implies that the intervention would not have an effect for others if it does not have effect on the person who receive the intervention. On the other hand, there is a positive saturation effect of cash transfer (Table 12 Columns 2 and 5). The clinic attendance and the vaccination take-up increased by 1.27 and 1.29 percent respectively as the ratio of respondents with highest amount of cash transfer increases by 1 percent.

More directly, one's vaccination behavior could be affected by peers' vaccination behavior. The specification estimating the effect of the percentage of women in a village who received the vaccination under the study on one's vaccination take-up is:

$$(6) \qquad Vaccinated_{ij} = \propto + \beta_1 \left(\%Vaccinated_{ij}\right) + X'_{ij}\mu + \varepsilon_{ij}$$

%Vaccinated indicates the percentage of respondents in village *j* who received the tetanus vaccine under the study. Because the dependent variable is endogenous, I used *%Intervention*, especially the percentage of women in the village who received the highest amount of CCT as an instrumental variable.

$$(7) \qquad \%Vaccinated_{ij} = \propto + \beta_1 \left(\%Intervention_{ij}\right) + X'_{ij}\mu + \varepsilon_{ij}$$

The first stage shows the strong positive correlation (not shown). Table 12 Columns 3 and 6 indicates that as the percentage of women who received the vaccine increased by 1 percent in a village, then the probability a respondent in the village decides to take a vaccine increases by 0.78 percentage point.

B. Geographical Location of Respondent's House

Here I examine the spillover effect of geographical neighbor's treatment status, specifically fear-flipcharts intervention and CCT treatment on vaccination take-up. The main specification estimating the spillover effect of peer's treatment status on one's vaccination take-up is:

$$(8) \qquad Vaccinated_{ij} = \propto + \beta_5 Intervention\ Ratio_{ij} + X'_{ij}\mu + \varepsilon_{ij}$$

Intervention Ratio indicates the percentage that peers of respondent *i* were shown fear flipcharts or the percentage that neighbors of respondent *i* were offered the highest amount of cash transfer. My main analysis uses the neighbors who live within 300 meters from each respondent's household as peers. The distance was measured based on geographical coordinates of each household. It should be noted, however, that even if there exists a household which is located in the neighborhood of respondent *i*, I did not count the household as a neighbor of respondent *i* if there was no eligible women in the household. In other words, neighboring household of a respondent consists of households whose member was eligible and was interviewed as well. The average number of neighbors within 300 meters is 33.74 while the average number of women in a village is 31.24. Thus this geographical measure of the peer effect essentially is the noisy measure of the village-level spillover effect.

Table 13 shows the consistent result of geographical-based peer effect and village-level peer effect. Neighbors' treatment status on the fear intervention does not have effect on the attendance nor the vaccine take-up. On the other hand, the attendance and the vaccination rate increases by 0.42 and 0.43 percentage points respectively if the percentage of neighbors who received the highest amount of CCT increased by 1 percent.

The effect of neighbor's vaccination status on own vaccination behavior can be specified as:

$$(9) \quad Vaccinated_{ij} = \propto + \beta_5 Vaccinated\ Ratio_{ij} + X'_{ij}\mu + \varepsilon_{ij}$$

Vaccinated Ratio indicates the percentage that peers of respondent *i* received the vaccine under this study. Similar to the specification (6), I used the percentage of neighbors who were offered the highest amount of CCT as an IV. I have a consistent result with village-level peer effect. The 1 percent increase in the neighbors who received vaccination increased the probability of one's clinic attendance and receiving the vaccine by 0.772 and 0.834 percentage point.

Because the criteria for the neighbor: 300 meters will cover the entire village in most of cases, I also examined the neighbor effect by changing the distance: 100 meters, 500 meters, and only the closest neighbor. For each specification, the result did not change much (Table not shown).

One thing to be noted here is the size of coefficient for the spillover effect of highest amount of CCT. While the percentage of women in the village who received the highest amount of CCT increased the vaccine take-up by 1.29 percentage points, the percentage based on geographical neighbors increased the take-up only by 0.428 percentage points. This is presumably because of the smaller variation of the percentage of women who received the highest CCT in the village.

C. Friends Network Data

It is natural to think that social networks based on geographical location do not necessarily capture social networks. Thus this section uses friends network to estimate the spillover effect within such network. Possible mechanisms in which friends affect one's vaccination behavior include information or cash sharing. If respondent *i*'s friend was shown fear flipcharts or was offered cash incentive, she might share the information or cash acquired with respondent *i*. The specification estimating the effect of friends shown fear flipcharts or receiving the highest amount of cash incentives on own vaccination take-up is:

$$(10) \quad Vaccinated_{ij} = \propto + \beta_1 (Any\ Friends\ shown\ Fear\ Flipcharts_{ij}) + X'_{ij}\mu + \varepsilon_{ij}$$

$$(11) \quad Vaccinated_{ij} = \propto + \beta_1 (Any\ Friends\ Receive\ CCT800_{ij}) + X'_{ij}\mu + \varepsilon_{ij}$$

Any Friends shown Fear Flipcharts is a binary variable which indicates if any of respondents' friends were shown fear flipcharts. *Any Friends Receive CCT800* is a binary variable which indicates if any of the respondent's friends received the highest amount of CCT (CCT=800). A woman is considered as respondent *i*'s friend if respondent *i* listed the woman in one of the 6 categories described above.

The result was consistent with that with other two specifications. There was no friends effect of fear flipcharts on vaccination take-up (Table 15 column 1 and 4). On the other hand, having friends who were offered highest amount of cash incentive increased own vaccination take-up by about 3 percentage point (Table 15 column 2 and 5).

More directly, one's vaccination behavior could be affected by her friends' vaccination behavior. The specification estimating the effect of friends' vaccination take-up on one's vaccination take-up is:

$$(12) \quad Vaccinated_{ij} = \propto + \beta_1 (Any\ Friends\ Receive\ Tetanus\ Vaccine_{ij}) + X'_{ij}\mu + \varepsilon_{ij}$$

Any Friends Receive Tetanus Vaccine is a binary variable which indicates if any of the respondent's friends received tetanus vaccination as a result of this study. I use an instrumental variable strategy to identify the causal effect of friends receiving vaccine on own vaccination take-up, relying on the random variation in the amount of cash incentives offered to friends. The first stage is:

$$(13) \quad Any\ Friends\ Receive\ Tetanus\ Vaccine_{ij} = \propto +\beta_1(Any\ Friends\ Receive\ CCT800_{ij}) + X'_{ij}\mu + \varepsilon_{ij}$$

If any of friends received the vaccine, it increased own vaccination take-up by 4 percentage points (Table 15 column 3 and 6).

c. Heterogeneous Spillover Effect

I examine the differential spillover effect by the past experience of tetanus vaccine. I found that among non-experienced women, friends are the strong motivation for the vaccine take-up but the influence from village and neighbors is insignificant (Table 17, 18 and 19). Among experienced women, on the other hand, friends did not affect their behavior while the influence from village and neighbors was strongly positive (Table 17, 18 and 19). This is a suggestive evidence that the type of peers matters for vaccination behavior by specific group of women. From the policy perspective, friends network is worth focusing on rather than geographical peers in order to influence those who never received the vaccine before.

5. Conclusion

I conduct a randomized controlled trial in the rural northern Nigeria to examine the reason for low vaccination and how to improve it.

I study if women face emotional barriers to vaccination by randomizing the conditionality for the cash transfer, either to just show-up at the clinic or to receive vaccination. I also examine the effect of fearful information on vaccination take-up by randomizing the provision of pictorial information which involves fearful images of disease patients as well as the effect of CCT and social networks on vaccination by randomizing the amount of cash incentives offered to each respondent. Intervention was carried out immediately after the baseline survey and respondents were given one week to decide whether they attend the clinic and receive vaccination against tetanus.

My study has four main findings. First, women perceived the emotional barrier to vaccination at the health clinic but this barrier is small and it does not seem to be the main attribute to the low vaccination take-up. Second, small financial incentives had large effect on vaccination take-up. Third, emotional information did not motivate the vaccination take-up on average. Rather the intervention backfired among women who never received tetanus vaccine before and these women are the ones we would like to focus on the most in boosting the vaccination rate. Thus it is not advisable to use the loss-framed message in sub-Saharan Africa. And finally, friends network can be the strong incentives for women to receive vaccination.

This study is the first to shed light on the emotional factors on health behaviors in sub-Saharan Africa. Main results imply that women in rural northern Nigeria face small emotional barriers to vaccination and this barrier is easily overcome by small amount of cash incentives and friends network. However, it is revealed that we should be careful in using emotional information in order to motivate women for vaccination in rural African setting.

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Table 1: Balance Test

Flipcharts	No Fear						Fear				
Conditionality	Just Show-up			Vaccination							
CCT	CCT=5	CCT=300	CCT=800	CCT=5	CCT=300	CCT=800	CCT=5	CCT=300	CCT=800	Total Observations	Joint F test (p-value)
	[1]	[2]	[3]	[4]	[5]	[6]	[7]	[8]	[9]		
Age	24.408	24.622	25.368	25.255	24.841	25.706	24.890	25.299	25.433	2482	0.229
Highest Education = Primary	0.269	0.199	0.206	0.258	0.234	0.233	0.269	0.230	0.270	2482	0.358
Not Married	0.155	0.147	0.168	0.145	0.169	0.137	0.163	0.150	0.141	2482	0.965
Muslim	0.482	0.528	0.471	0.491	0.507	0.457	0.461	0.540	0.525	2482	0.398
Received Tetanus vaccine in the Past	0.392	0.374	0.388	0.422	0.414	0.396	0.388	0.394	0.418	2482	0.968
Has Paid Work	0.424	0.295	0.450	0.436	0.510	0.383	0.408	0.449	0.460	2482	0.083
Ever used clinic	0.682	0.713	0.701	0.742	0.755	0.681	0.714	0.755	0.760	2482	0.197
Distance to Health Clinic	1.724	1.734	1.694	1.638	1.633	1.801	1.810	1.658	1.676	2482	0.582
Have Children	0.722	0.759	0.787	0.811	0.769	0.786	0.751	0.755	0.730	2482	0.302
Observations	245	286	291	275	290	313	245	274	263	2482	
F test for joint significance of covariates											
compared to [1]											
compared to [2]	0.167										
compared to [3]	0.131	0.612									
compared to [4]	0.460	0.038	0.371								
compared to [5]	0.118	0.243	0.602	0.274							
compared to [6]	0.107	0.287	0.672	0.094	0.007						
compared to [7]	0.945	0.242	0.455	0.722	0.153	0.571					
compared to [8]	0.307	0.688	0.688	0.372	0.879	0.138	0.493				
compared to [9]	0.318	0.131	0.134	0.125	0.484	0.053	0.398	0.978			

Notes;

F test for joint significance of covariates: This tests whether all the covariates listed are jointly equal in predicting assignment to the treatment group.

Table 2: "Just Show-up" Conditionality Effect

	Attended at Health Clinic	Received Vaccine	Received Vaccine (Conditioned on Clinic Attendance)
	(1)	(2)	(3)
CCT Conditionality: Just Show-up	-0.003	-0.034*	-0.042***
	(0.016)	(0.019)	(0.011)
Constant	0.532***	0.627***	1.081***
	(0.187)	(0.194)	(0.071)
Observations	1700	1700	1268
R-squared	0.02	0.02	0.04
Mean of Dependent Variables	0.746	0.731	0.980
Covariates	X	X	X
Fixed Effect by Village (80 villages)	X	X	X

Notes:

Sample restricted to respondents under No-Fear flipcharts. Control group for "CCT Conditionality: Just Show-up" is the group of women under "Vaccination" Conditionality. Robust standard errors clustered by villages (80 villages) are presented. Covariates include age, primary education, secondary or higher education, marital status, religion (Muslim or not), dummy variable to indicate if the respondent ever received tetanus vaccine before, dummy variable to indicate if the respondent has paid work, dummy variable to indicate if the respondent ever used the same clinic before, distance from the house to the health clinic based on GPS coordinates. Coefficients for "CCT Conditionality: Just Show-up" under probit model are (1) -0.003 (0.021) (2) -0.043* (0.023). They indicate the marginal effects with standard deviation in the parenthesis. * significant at 10%; ** significant at 5%; *** significant at 1%

Table 3: "Just Show-up" Conditionality Effect by Past Vaccine Experience

	Attended at Health Clinic	Received Vaccine	Received Vaccine (Conditioned on Clinic Attendance)
	(1)	(2)	(3)
CCT Conditionality: Just Show-up	-0.018	-0.047**	-0.038***
	(0.020)	(0.021)	(0.011)
Received Tetanus Vaccine Before	-0.007	-0.010	-0.002
	(0.028)	(0.028)	(0.006)
(Just Show-up) * (Received Tetanus Vaccine Before)	0.038	0.031	-0.012
	(0.038)	(0.038)	(0.011)
Constant	0.541***	0.634***	1.078***
	(0.184)	(0.191)	(0.071)
Observations	1700	1700	1268
R-squared	0.021	0.024	0.039
Mean of Dependent Variables	0.746	0.731	0.979
Covariates	X	X	X
Fixed Effect by Village (80 villages)	X	X	X
p value of F test [Just Show-up + (Just Show-up) * (Received Tetanus Vaccine Before)] = 0	0.516	0.631	0.000

Notes:

Sample restricted to respondents under No-Fear flipcharts. Control group for "CCT Conditionality: Just Show-up" is the group of women under "Vaccination" Conditionality. Robust standard errors clustered by villages (80 villages) are presented. Covariates include age, primary education, secondary or higher education, marital status, religion (Muslim or not), dummy variable to indicate if the respondent ever received tetanus vaccine before, dummy variable to indicate if the respondent has paid work, dummy variable to indicate if the respondent ever used the same clinic before, distance from the house to the health clinic based on GPS coordinates. Coefficients for "CCT Conditionality: Just Show-up" under probit model are (1) (2). They indicate the marginal effects with standard deviation in the parenthesis. * significant at 10%; ** significant at 5%; *** significant at 1%

Table 4: Effect of CCT

	Received Tetanus Vaccine	
	(1)	(2)
CCT=300	0.204***	0.229***
	(0.022)	(0.025)
CCT=800	0.276***	0.280***
	(0.027)	(0.029)
Pregnant		0.092
		(0.057)
CCT=300 * Pregnant		-0.150**
		(0.066)
CCT=800 * Pregnant		-0.040
		(0.057)
Constant	0.417**	0.448***
	(0.163)	(0.162)
Observations	1660	1640
R-squared	0.11	0.12
Mean of Dependent Variables	0.734	0.734
Covariates	X	X
Fixed Effect by Village (80 villages)	X	X
p-values of F test:		
(CCT=300 + CCT=300 * Pregnant) = 0		0.182
(CCT=800 + CCT=800 * Pregnant) = 0		0.000
(CCT=300 * Pregnant) = (CCT=800 * Pregnant)		0.041

Notes:

Sample restricted to respondents under Vaccination conditionality for cash transfer program. Robust standard errors clustered by villages (80 villages) are presented. Covariates include age, primary education, secondary or higher education, marital status, religion (Muslim or not), dummy variable to indicate if the respondent ever received tetanus vaccine before, dummy variable to indicate if the respondent has paid work, dummy variable to indicate if the respondent ever used the same clinic before, distance from the house to the health clinic based on GPS coordinates. Coefficients for "CCT=300 ", "CCT800", "CCT300 * pregnant", "CCT800 * pregnant" under probit model are (1) 0.205*** (0.018), 0.298*** (0.017) (2) 0.227*** (0.018), 0.295*** (0.183), -0.206** (0.095), -0.007 (0.076). They indicate the marginal effects with standard deviation in the parenthesis. * significant at 10%; ** significant at 5%; *** significant at 1%

Table 5: Did CCT Change the Attitude? (Endline)

Attitudes:	Likely to contract tetanus	Number of people who die of tetanus	Very worried about Tetanus	Tetanus is very bad	Very important to be protected from tetanus	Vaccine Efficacy	Heart rate
	(1)	(2)	(3)	(4)	(5)	(6)	(7)
CCT=300	0.020	0.979	-0.009	0.070**	0.022	0.898	-0.260
	(0.028)	(1.491)	(0.026)	(0.028)	(0.027)	(1.479)	(0.732)
CCT=800	0.007	0.641	0.008	0.080***	0.022	2.182	0.648
	(0.023)	(1.385)	(0.026)	(0.029)	(0.023)	(1.578)	(0.647)
Constant	0.501**	67.759***	0.435	-0.292	0.321	15.935	41.035***
	(0.243)	(14.149)	(0.267)	(0.230)	(0.212)	(17.330)	(7.743)
Observations	1524	1523	1524	1524	1524	1520	1386
R-squared	0.091	0.073	0.125	0.096	0.095	0.093	0.343
Mean of Dependent Variables	0.472	38.281	0.644	0.716	0.797	31.574	90.594
Covariates	X	X	X	X	X	X	X
Fixed Effect by Village (80 villages)	X	X	X	X	X	X	X

Notes:

Sample restricted to respondents under Vaccination conditionality for cash transfer program. Robust standard errors clustered by villages (80 villages) are presented. 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 as " high likelihood" to the question "what is the likelihood that you get tetanus?" "Number of people who die of tetanus" is a number of people out of 100 a respondent provided 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 is 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 is 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 hypothetical number of unvaccinated people who get tetanus and number of vaccinated people who get tetanus. "Heart rate" indicates the heart rate of a respondent. Covariates include age, primary education, secondary or higher education, marital status, religion (Muslim or not), dummy variable to indicate if the respondent ever received tetanus vaccine before, dummy variable to indicate if the respondent has paid work, dummy variable to indicate if the respondent ever used the same clinic before, distance from the house to the health clinic based on GPS coordinates, and baseline attitudes such as likelihood of contracting tetanus, number of people the respondent thinks die out of tetanus, if the respondent is very worried about tetanus, if the respondent thinks tetanus is very bad, subjective vaccine efficacy and heart rate. * significant at 10%; ** significant at 5%; *** significant at 1%

Table 6: Impact of Fear

	Received Tetanus Vaccine	
	(1)	(2)
Fear	-0.023	-0.011
	(0.020)	(0.034)
CCT=300		0.212***
		(0.029)
CCT=800		0.283***
		(0.035)
CCT=300 * Fear		-0.016
		(0.044)
CCT=800 * Fear		-0.015
		(0.042)
Constant	0.592***	0.420**
	(0.169)	(0.163)
Observations	1660	1660
R-squared	0.02	0.11
Mean of Dependent Variable	0.734	0.734
Covariates	X	X
Fixed Effect by Village (80 villages)	X	X
p-values of F test:		
Fear + (CCT=300 * Fear) = 0		0.366
Fear + (CCT=800 * Fear) = 0		0.368

Notes:

Sample restricted to respondents under Vaccination conditionality for cash transfer program. Robust standard errors clustered by villages (80 villages) are presented. Covariates include age, primary education, secondary or higher education, marital status, religion (Muslim or not), dummy variable to indicate if the respondent ever received tetanus vaccine before, dummy variable to indicate if the respondent has paid work, dummy variable to indicate if the respondent ever used the same clinic before, distance from the house to the health clinic based on GPS coordinates. Coefficients for "Fear", "CCT300 * Fear ", "CCT800 * Fear" under probit model are (1) -0.033 (0.025) (2) -0.028 (0.036), -0.007 (0.050), -0.029 (0.066). They indicate the marginal effects with standard deviation in the parenthesis. * significant at 10%; ** significant at 5%; *** significant at 1%

Table 7: Did Fear Intervention Work? (Endline)

Attitudes:	Likely to contract tetanus	Number of people who die of tetanus	Very worried about Tetanus	Tetanus is very bad	Very important to be protected from tetanus	Vaccine Efficacy	Heart rate
	(1)	(2)	(3)	(4)	(5)	(6)	(7)
Fear	0.016	2.554**	0.142***	0.139***	0.107***	-1.220	6.393***
	(0.018)	(1.173)	(0.028)	(0.027)	(0.026)	(1.339)	(0.683)
Constant	0.507**	67.335***	0.375	-0.298	0.294	17.226	38.514***
	(0.238)	(14.104)	(0.268)	(0.234)	(0.217)	(16.869)	(7.641)
Observations	1524	1523	1524	1524	1524	1520	1386
R-squared	0.091	0.076	0.147	0.113	0.112	0.092	0.391
Mean of Dependent variable	0.472	38.281	0.644	0.716	0.797	31.574	90.594
Covariates	X	X	X	X	X	X	X
Fixed Effect by Village (80 villages)	X	X	X	X	X	X	X

Notes:

Sample restricted to respondents under Vaccination conditionality for cash transfer program. Robust standard errors clustered by villages (80 villages) are presented. All the dependent variables are measured right after the flipcharts intervention. "Likely to get tetanus" is a binary variable which takes 1 if a respondent answers as " high likelihood" to the question "what is the likelihood that you get tetanus?" "Number of people who die of tetanus" is a number of people out of 100 a respondent provided to a question "How many people do you think are at risk of getting Tetanus at some point?". "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 is 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 is 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 hypothetical number of unvaccinated people who get tetanus and number of vaccinated people who get tetanus. "Heart rate" indicates the heart rate of a respondent. Covariates include age, primary education, secondary or higher education, marital status, religion (Muslim or not), dummy variable to indicate if the respondent ever received tetanus vaccine before, dummy variable to indicate if the respondent has paid work, dummy variable to indicate if the respondent ever used the same clinic before, distance from the house to the health clinic based on GPS coordinates and baseline attitudes such as likelihood of contracting tetanus, number of people the respondent thinks die out of tetanus, if the respondent is very worried about tetanus, if the respondent thinks tetanus is very bad, subjective vaccine efficacy and heart rate. * significant at 10%; ** significant at 5%; *** significant at 1%

Table 8: Impact of Fear by Past Vaccine Experience

	Received Tetanus Vaccine
	(1)
Fear	-0.037*
	(0.021)
Received Tetanus Vaccine Before	-0.013
	(0.028)
Fear * (Received Tetanus Vaccine Before)	0.035
	(0.038)
Constant	0.594***
	(0.169)
Observations	1660
R-squared	0.02
Mean of Dependent Variable	0.734
Covariates	X
Fixed Effect by Village (80 villages)	X
p value of F test (Fear + Fear * Received Tetanus Vaccine Before) = 0	0.957

Notes:

Sample restricted to respondents under Vaccination conditionality for cash transfer program. Robust standard errors clustered by villages (80 villages) are presented. Covariates include age, primary education, secondary or higher education, marital status, religion (Muslim or not), dummy variable to indicate if the respondent has paid work, dummy variable to indicate if the respondent ever used the same clinic before, distance from the house to the health clinic based on GPS coordinates. Coefficients for "Fear", " Received Tetanus Vaccine Before", "Fear * Received Tetanus Vaccine Before" under probit model are (1) -0.055* (0.027), -0.021 (0.036), 0.050 (0.044). They indicate the marginal effects with standard deviation in the parenthesis. * significant at 10%; ** significant at 5%; *** significant at 1%

Table 9: Tetanus Vaccine Experience and Ex-Ante Perceived Efficacy of Vaccine

Sample:	Never Received Tetanus Vaccine Before	Received Tetanus Vaccine Before	Difference
	(1)	(2)	(3)
Panel A: Demographics:			
Age	24.552	26.272	1.720***
Highest Education = Primary	0.240	0.260	0.020
Not Married	0.198	0.082	-0.116***
Muslim	0.513	0.473	-0.040
Has Paid Work	0.398	0.504	0.106***
Ever used clinic	0.674	0.822	0.148***
Distance to Health Clinic	1.711	1.694	-0.017
Have Children	0.675	0.905	0.230***
Panel B: Attitudes toward Disease & Vaccine:			
Likely to get tetanus	0.333	0.445	0.112***
Likely to avoid tetanus	0.522	0.664	0.142***
Very worried about Tetanus	0.260	0.491	0.231***
Tetanus is very bad	0.372	0.534	0.162***
Very important to be protected from tetanus	0.413	0.612	0.199***
Vaccine Efficacy	20.928	24.25	3.322***
Observations	987	673	1660

Notes:

Sample restricted to respondents under Vaccination conditionality for cash transfer program. All the dependent variables are measured before the flipcharts intervention. "Likely to get tetanus" is a binary variable which takes 1 if a respondent answers as " high likelihood" to the question "What is the likelihood that you get 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 is 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 is 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 hypothetical number of unvaccinated people who get tetanus and number of vaccinated people who get tetanus. * significant at 10%; ** significant at 5%; *** significant at 1%

Table 10: Differential Effect of Fear Flipcharts by Past Vaccine Experience (Endline)

	Likely to contract tetanus	Number of people who die of tetanus	Very worried about tetanus	Tetanus is very bad	Important to be protected from tetanus	Vaccine Efficacy	Heart Rate
	(1)	(2)	(3)	(4)	(5)	(6)	(7)
Fear	0.036	3.625**	0.147***	0.155***	0.130***	-0.078	4.837***
	(0.026)	(1.749)	(0.038)	(0.035)	(0.035)	(1.590)	(0.802)
Received Tetanus Vaccine Before	-0.022	0.310	0.126***	0.147***	0.153***	4.706*	-0.533
	(0.045)	(2.327)	(0.039)	(0.035)	(0.037)	(2.426)	(0.710)
Fear * (Received Tetanus Vaccine Before)	-0.049	-2.634	-0.010	-0.040	-0.059	-2.817	3.807***
	(0.042)	(2.303)	(0.050)	(0.043)	(0.039)	(2.809)	(1.081)
Constant	0.501**	67.020***	0.374	-0.303	0.287	16.929	38.869***
	(0.237)	(14.124)	(0.268)	(0.235)	(0.218)	(16.891)	(7.525)
Observations	1524	1523	1524	1524	1524	1520	1386
R-squared	0.091	0.076	0.147	0.114	0.113	0.093	0.396
Mean of Dependent Variables	0.472	38.281	0.644	0.716	0.797	31.574	90.594
Covariates	X	X	X	X	X	X	X
Fixed Effect by Village (80 villages)	X	X	X	X	X	X	X
p value of F test (Fear + Fear * Received Tetanus Vaccine Before) = 0	0.647	0.485	0.001	0.001	0.016	0.216	0.000

Notes:

Sample restricted to respondents under Vaccination conditionality for cash transfer program. Robust standard errors clustered by villages (80 villages) are presented. All the dependent variables are measured right after the flipcharts intervention. "Likely to get tetanus" is a binary variable which takes 1 if a respondent answers as " high likelihood" to the question "what is the likelihood that you get tetanus?" "Number of people who die of tetanus" is a number of people out of 100 a respondent provided to a question "How many people do you think are at risk of getting Tetanus at some point?". "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 is 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 is 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 hypothetical number of unvaccinated people who get tetanus and number of vaccinated people who get tetanus. "Heart rate" indicates the heart rate of a respondent. Covariates include age, primary education, secondary or higher education, marital status, religion (Muslim or not), dummy variable to indicate if the respondent ever received tetanus vaccine before, dummy variable to indicate if the respondent has paid work, dummy variable to indicate if the respondent ever used the same clinic before, distance from the house to the health clinic based on GPS coordinates and baseline attitudes such as likelihood of contracting tetanus, number of people the respondent thinks die out of tetanus, if the respondent is very worried about tetanus, if the respondent thinks tetanus is very bad, subjective vaccine efficacy and heart rate. * significant at 10%; ** significant at 5%; *** significant at 1%

Table 11: Impact of Fear on Timing of Clinic Visits (Hazard Model)

	Hours before Clinic Attendance			
	Total		Never Received Tetanus Vaccine	Received Tetanus Vaccine Before
	(1)	(2)	(3)	(4)
Fear	-0.031	-0.118	-0.327**	0.174
	(0.059)	(0.110)	(0.139)	(0.229)
CCT=300		0.522***	0.388***	0.695***
		(0.095)	(0.130)	(0.182)
CCT=800		0.700***	0.640***	0.816***
		(0.097)	(0.116)	(0.162)
CCT=300 * Fear		0.106	0.331*	-0.207
		(0.140)	(0.193)	(0.275)
CCT=800 * Fear		0.175	0.406***	-0.178
		(0.122)	(0.148)	(0.247)
Observations	1646	1646	978	668
Mean of Dependent Variable	67.206	67.206	66.000	68.967
Covariates	X	X	X	X
Fixed Effect by Village (80 villages)	X	X	X	X
p-values of F test:				
Fear + (CCT=300 * Fear) = 0		0.898	0.975	0.832
Fear + (CCT=800 * Fear) = 0		0.477	0.403	0.977

Notes:

Sample restricted to respondents under Vaccination conditionality for cash transfer program. Robust standard errors clustered by villages (80 villages) are presented. Covariates include age, primary education, secondary or higher education, marital status, religion (Muslim or not), dummy variable to indicate if the respondent ever received tetanus vaccine before, dummy variable to indicate if the respondent has paid work, dummy variable to indicate if the respondent ever used the same clinic before, distance from the house to the health clinic based on GPS coordinates. * significant at 10%; ** significant at 5%; *** significant at 1%

Table 12: Spillover Effect (Village-Level)

	Attended at Health Clinic			Received Tetanus vaccine		
	OLS		IV	OLS		IV
	(1)	(2)	(3)	(4)	(5)	(6)
% of Fear	-0.170			-0.164		
	(0.161)			(0.164)		
% of CCT=800		1.274***			1.293***	
		(0.488)			(0.461)	
% of Women who Received Tetanus Vaccine			0.777***			0.789***
			(0.067)			(0.071)
Constant	0.552***	-0.011	-0.241*	0.598***	0.030	-0.204
	(0.189)	(0.211)	(0.142)	(0.188)	(0.210)	(0.139)
Observations	2482	2482	2482	2482	2482	2482
R-squared	0.141	0.159	0.315	0.134	0.152	0.305
Mean of Dependent Variable	0.737	0.737	0.737	0.726	0.726	0.726
Covariates	X	X	X	X	X	X
Fixed Effect by Health Facility (10 clinics)	X	X	X	X	X	X

Notes:

Sample used here is the main sample of 2,490 women whose household location is recorded with GPS coordinates. Each independent variable represents the percentage of women in a village who received fear intervention, offered the highest CCT (800), or who received the tetanus vaccine. The percentage does not include own intervention. The instrument used in IV regression for "% of Women who Received Tetanus Vaccine" is "% of CCT=800". Robust standard errors clustered by villages (80 villages) are presented. Covariates include own treatment status (binary variable to indicate if fear flipcharts was shown, binary variable to indicate if the respondent was offered CCT300 (CCT800), interaction term between fear flipcharts dummy and each CCT dummy, binary variable to indicate if the conditionality for CCT was "Just Show-up", and the interaction between "Just Show-up" conditionality dummy and each CCT dummy), total number of respondents in the village, age, primary education, secondary or higher education, marital status, religion (Muslim or not), dummy variable to indicate if the respondent ever received tetanus vaccine before, dummy variable to indicate if the respondent has paid work, dummy variable to indicate if the respondent ever used the same clinic before, distance from the house to the health clinic based on GPS coordinates. The average number of women in one village is 31.235. * significant at 10%; ** significant at 5%; *** significant at 1%

Table 13: Spillover Effect (GPS coordinates-based Neighbor level)

	Attended at Health Clinic			Received Tetanus vaccine		
	OLS		IV	OLS		IV
	(1)	(2)	(3)	(4)	(5)	(6)
% of HH with Fear Flipcharts in 300 meters	-0.033			-0.022		
	(0.134)			(0.135)		
% of HH with High CCT (CCT=800) in 300 meters		0.419*			0.428*	
		(0.232)			(0.237)	
% of HH who received Tetanus Vaccine in 300 meters			0.772***			0.834***
			(0.216)			(0.180)
Constant	0.460**	0.291	-0.236	0.534***	0.365*	-0.232
	(0.195)	(0.196)	(0.241)	(0.188)	(0.190)	(0.189)
Observations	2447	2447	2447	2447	2447	2447
R-squared	0.139	0.146	0.310	0.132	0.140	0.297
Mean of Dependent Variable	0.737	0.737	0.737	0.726	0.726	0.726
Mean of Independent Variable	0.313	0.348	0.719	0.313	0.348	0.719
Covariates	X	X	X	X	X	X
Fixed Effect by Health Facility (10 clinics)	X	X	X	X	X	X

Notes:

Sample used here is the main sample of 2,490 women whose household location is recorded with GPS coordinates. The instrument used in IV regression for "% of HH who received Tetanus Vaccine in 300 meters" is "% of HH with High CCT (CCT=800) in 300 meters". Robust standard errors clustered by villages (80 villages) are presented. Covariates include own treatment status (binary variable to indicate if fear flipcharts was shown, binary variable to indicate if the respondent was offered CCT300 (CCT800), interaction term between fear flipcharts dummy and each CCT dummy, binary variable to indicate if the conditionality for CCT was "Just Show-up", and the interaction between "Just Show-up" conditionality dummy and each CCT dummy), total number of respondents in 300 meters, age, primary education, secondary or higher education, marital status, religion (Muslim or not), dummy variable to indicate if the respondent ever received tetanus vaccine before, dummy variable to indicate if the respondent has paid work, dummy variable to indicate if the respondent ever used the same clinic before, distance from the house to the health clinic based on GPS coordinates. The average number of total friends in 300 meters is 33.740, the average number of total friends who received fear intervention is 10.799, who received the high CCT is 11.618, who received tetanus vaccine is 24.628. * significant at 10%; ** significant at 5%; *** significant at 1%

Table 14: Balance Test (Spillover - Friends Network)

	Any Friend received CCTT800	No Friend Received CCT800	Difference	Any Friend Received Fear Intervention	No Friend Received Fear Intervention	Difference
	(1)	(2)	(3)	(4)	(5)	(6)
Intervention:						
Fear	0.309	0.316	-0.007	0.345	0.311	0.034
CCT=300	0.374	0.338	0.036	0.327	0.344	-0.017
CCT=800	0.361	0.348	0.013	0.39	0.344	0.046
Demographics:						
Age	25.34	25.077	0.263	25.435	25.065	0.370
Primary School Attended	0.237	0.240	-0.003	0.248	0.239	0.009
Secondary School or More	0.302	0.272	0.030	0.303	0.272	0.031
Not Married	0.154	0.152	0.002	0.157	0.152	0.005
Muslim	0.416	0.506	-0.090***	0.491	0.496	-0.005
Ever Received Tetanus Vaccine Before	0.354	0.404	-0.050*	0.373	0.402	-0.029
Has Paid Work	0.477	0.429	0.048	0.478	0.430	0.048
Ever Used Clinic	0.736	0.721	0.015	0.735	0.721	0.014
Distance to Clinic (GPS)	1.73	1.705	0.025	1.717	1.707	0.010
Have Children	0.777	0.763	0.014	0.77	0.764	0.006
Attitudes:						
Likely to contract tetanus	0.337	0.376	-0.039	0.378	0.370	0.008
Number of people who die of tetanus	29.553	30.230	-0.677	26.536	30.624	-4.088***
Worried about tetanus	0.327	0.352	-0.025	0.323	0.352	-0.029
Tetanus is bad	0.347	0.435	-0.088***	0.354	0.434	-0.080***
Important to get tetanus vaccine	0.385	0.499	-0.114***	0.406	0.496	-0.090***
Vaccine Efficacy	20.011	22.553	-2.542	18.697	22.720	-4.023**
Heart Rate	87.361	86.753	0.608	85.622	86.989	-1.367
Observations	291	2191	2482	287	2195	2482

Notes:

Sample used here is the main sample of 2,490 women. * significant at 10%; ** significant at 5%; *** significant at 1%

Table 15: Spillover Effect (Friends Network)

	Attended at Health Clinic			Received Tetanus Vaccine		
			IV			IV
	(1)	(2)	(3)	(4)	(5)	(6)
Any Friends received Fear Intervention	0.019			0.014		
	(0.020)			(0.020)		
Any Friends received Highest CCT (800)		0.032*			0.033	
		(0.019)			(0.021)	
Any Friends received Tetanus Vaccine			0.043*			0.044*
			(0.024)			(0.027)
Constant	0.316**	0.315**	-0.291*	0.379***	0.379***	-0.225
	(0.142)	(0.141)	(0.153)	(0.138)	(0.137)	(0.153)
Observations	2482	2482	2482	2482	2482	2482
R-squared	0.11	0.11		0.11	0.11	
Mean of Dependent Variable	0.737	0.737	0.737	0.726	0.726	0.726
Mean of Independent Variable	0.116	0.117	0.241	0.116	0.117	0.241
Covariates	X	X	X	X	X	X
Fixed Effect by village (80 villages)	X	X	X	X	X	X

Notes:

"Any Friends received Fear Intervention" is the binary variable which indicates if any of respondent's friends were shown fear flipcharts the fear intervention. "Any Friends received Highest CCT" is the binary variable which indicates if any of respondent's friends received the highest amount of CCT (CCT=800). "Any Friends received Tetanus Vaccine" is the binary variable which indicates if any of respondent's friends received tetanus vaccine. The instrument used in IV regression for "Any Friends received Tetanus Vaccine" is "Any Friends received Highest CCT". "Friends" are defined as someone whom each respondent listed in either one of 6 categories: a best friend, a friend whom they admire, a friend whom they talk about health issues with, a friend whom they go to health clinic together with, a friend whom they visit they she is sick, a friend who visits them when they are sick. Sample used here is the main sample of 2,490 women whose household location is recorded with GPS coordinates. Robust standard errors clustered by villages (80 villages) are presented. Covariates include own treatment status (binary variable to indicate if fear flipcharts was shown, binary variable to indicate if the respondent was offered CCT300 (CCT800), interaction term between fear flipcharts dummy and each CCT dummy, binary variable to indicate if the conditionality for CCT was "Just Show-up", and the interaction between "Just Show-up" conditionality dummy and each CCT dummy), age, primary education, secondary or higher education, marital status, religion (Muslim or not), dummy variable to indicate if the respondent ever received tetanus vaccine before, dummy variable to indicate if the respondent has paid work, dummy variable to indicate if the respondent ever used the same clinic before, distance from the house to the health clinic based on GPS coordinates. Coefficients for "Any Friends received Fear Intervention", " "Any Friends received Highest CCT" "Any Friends received Tetanus Vaccine" under probit model are (1) 0.026 (0.026) (2) 0.050* (0.024) (3) 0.056* (0.030) (4) 0.019 (0.026) (5) 0.050* (0.026) (6) 0.058* (0.033) . They indicate the marginal effects with standard deviation in the parenthesis. * significant at 10%; ** significant at 5%; *** significant at 1%

Table 16: Social Network and Risk Perception (Endline)

	Likely to contract tetanus	Number of people who die of tetanus	Very worried about Tetanus	Tetanus is very bad	Very important to be protected from tetanus
	(1)	(2)	(3)	(4)	(5)
Any Friends received Fear Intervention	0.034	1.173	0.038	0.042	0.011
	(0.029)	(1.615)	(0.028)	(0.024)	(0.026)
Constant	0.801***	48.572***	0.408	-0.038	0.391*
	(0.219)	(12.356)	(0.239)	(0.191)	(0.175)
Observations	2285	2282	2285	2285	2285
R-squared	0.085	0.096	0.142	0.113	0.119
Mean of Dependent Variable	0.470	38.159	0.612	0.697	0.771
Mean of Independent Variable	0.116	0.116	0.116	0.116	0.116
Covariates	X	X	X	X	X
Fixed Effect by village (80 villages)	X	X	X	X	X
	(6)	(7)	(8)	(9)	(10)
Any Friends received Highest CCT (800)	-0.022	0.302	0.005	0.001	0.013
	(0.039)	(1.406)	(0.027)	(0.024)	(0.024)
Constant	0.802***	48.650***	0.410	-0.035	0.392*
	(0.218)	(12.330)	(0.239)	(0.189)	(0.175)
Observations	2285	2282	2285	2285	2285
R-squared	0.084	0.096	0.141	0.112	0.119
Mean of Independent Variable	0.117	0.117	0.117	0.117	0.117
Covariates	X	X	X	X	X
Fixed Effect by village (80 villages)	X	X	X	X	X
	(11)	(12)	(13)	(14)	(15)
Any Friends received Tetanus Vaccine	-0.030	0.408	0.006	0.001	0.017
	(0.052)	(1.878)	(0.036)	(0.033)	(0.031)
Constant	0.940***	27.137	0.250	0.049	0.606**
	(0.214)	(14.000)	(0.276)	(0.253)	(0.202)
Observations	2285	2282	2285	2285	2285
R-squared	0.283	0.330	0.256	0.246	0.241
Mean of Independent Variable	0.241	0.241	0.241	0.241	0.241
Covariates	X	X	X	X	X
Fixed Effect by village (80 villages)	X	X	X	X	X

Notes:

Sample restricted to respondents under Vaccination conditionality for cash transfer program. Robust standard errors clustered by villages (80 villages) are presented. All the dependent variables are measured right after the flipcharts intervention. "Likely to get tetanus" is a binary variable which takes 1 if a respondent answers as " high likelihood" to the question "what is the likelihood that you get tetanus?" "Number of people who die of tetanus" is a number of people out of 100 a respondent provided to a question "How many people do you think are at risk of getting Tetanus at some point?". "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 is 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 is 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 hypothetical number of unvaccinated people who get tetanus and number of vaccinated people who get tetanus. "Heart rate" indicates the heart rate of a respondent. Covariates include age, primary education, secondary or higher education, marital status, religion (Muslim or not), dummy variable to indicate if the respondent ever received tetanus vaccine before, dummy variable to indicate if the respondent has paid work, dummy variable to indicate if the respondent ever used the same clinic before, distance from the house to the health clinic based on GPS coordinates and baseline attitudes such as likelihood of contracting tetanus, number of people the respondent thinks die out of tetanus, if the respondent is very worried about tetanus, if the respondent thinks tetanus is very bad, subjective vaccine efficacy and heart rate. * significant at 10%; ** significant at 5%; *** significant at 1%

Table 17: Spillover Effect (Village-Level) by Past Vaccine Experience

	Attended at Health Clinic					
	Never Received Tetanus Vaccine			Received Tetanus Vaccine Before		
			IV			IV
	(1)	(2)	(3)	(4)	(5)	(6)
% of Fear	-0.173			-0.087		
	(0.148)			(0.244)		
% of CCT=800		0.728			2.290***	
		(0.447)			(0.509)	
% of Women who Received Tetanus Vaccine			0.584***			0.975***
			(0.155)			(0.097)
Constant	0.776***	0.414*	0.117	0.086	-0.818**	-0.798***
	(0.195)	(0.224)	(0.216)	(0.356)	(0.367)	(0.263)
Observations	1493	1493	1493	989	989	989
R-squared	0.154	0.159	0.304	0.133	0.185	0.341
Mean of Dependent Variable	0.746	0.746	0.746	0.723	0.723	0.723
Mean of Independent Variable	0.317	0.351	0.743	0.317	0.346	0.701
Covariates	X	X	X	X	X	X
Fixed Effect by Health Facility (10 clinics)	X	X	X	X	X	X

Notes:

Sample used here is the main sample of 2,490 women whose household location is recorded with GPS coordinates. Each independent variable represents the percentage of women in a village who received fear intervention, offered the highest CCT (800), or who received the tetanus vaccine. The percentage does not include own intervention. The instrument used in IV regression for "% of Women who Received Tetanus Vaccine" is "% of CCT=800". Robust standard errors clustered by villages (80 villages) are presented. Covariates include own treatment status (binary variable to indicate if fear flipcharts was shown, binary variable to indicate if the respondent was offered CCT300 (CCT800), interaction term between fear flipcharts dummy and each CCT dummy, binary variable to indicate if the conditionality for CCT was "Just Show-up", and the interaction between "Just Show-up" conditionality dummy and each CCT dummy), total number of respondents in the village, age, primary education, secondary or higher education, marital status, religion (Muslim or not), dummy variable to indicate if the respondent ever received tetanus vaccine before, dummy variable to indicate if the respondent has paid work, dummy variable to indicate if the respondent ever used the same clinic before, distance from the house to the health clinic based on GPS coordinates. The average number of women in one village is 31.235. * significant at 10%; ** significant at 5%; *** significant at 1%

Table 18: Spillover Effect (GPS coordinates-based Neighbor level) by Past Vaccine Experience

	Attended at Health Clinic					
	Never Received Tetanus Vaccine			Received Tetanus Vaccine Before		
			IV			IV
	(1)	(2)	(3)	(4)	(5)	(6)
% of HH with Fear Flipcharts in 300 meters	0.014			-0.094		
	(0.113)			(0.245)		
% of HH with High CCT (CCT=800) in 300 meters		0.216			0.781***	
		(0.240)			(0.282)	
% of HH who received Tetanus Vaccine in 300 meters			0.575			0.978***
			(0.372)			(0.294)
Constant	0.747***	0.665***	0.165	-0.021	-0.334	-0.798**
	(0.199)	(0.213)	(0.383)	(0.343)	(0.337)	(0.392)
Observations	1470	1470	1470	977	977	977
R-squared	0.154	0.156	0.304	0.140	0.161	0.334
Mean of Dependent Variable	0.746	0.746	0.746	0.723	0.723	0.723
Mean of Independent Variable	0.314	0.350	0.733	0.312	0.345	0.697
Covariates	X	X	X	X	X	X
Fixed Effect by Health Facility (10 clinics)	X	X	X	X	X	X

Notes:

Sample used here is the main sample of 2,490 women whose household location is recorded with GPS coordinates. The instrument used in IV regression for "% of HH who received Tetanus Vaccine in 300 meters" is "% of HH with High CCT (CCT=800) in 300 meters". Robust standard errors clustered by villages (80 villages) are presented. Covariates include own treatment status (binary variable to indicate if fear flipcharts was shown, binary variable to indicate if the respondent was offered CCT300 (CCT800), interaction term between fear flipcharts dummy and each CCT dummy, binary variable to indicate if the conditionality for CCT was "Just Show-up", and the interaction between "Just Show-up" conditionality dummy and each CCT dummy), total number of respondents in 300 meters, age, primary education, secondary or higher education, marital status, religion (Muslim or not), dummy variable to indicate if the respondent ever received tetanus vaccine before, dummy variable to indicate if the respondent has paid work, dummy variable to indicate if the respondent ever used the same clinic before, distance from the house to the health clinic based on GPS coordinates. The average number of total friends in 300 meters is 33.740, the average number of total friends who received fear intervention is 10.799, who received the high CCT is 11.618, who received tetanus vaccine is 24.628. * significant at 10%; ** significant at 5%; *** significant at 1%

Table 19: Spillover Effect (Friends Network) by Past Vaccine Experience

	Attended at Health Clinic					
Sample:	Never Received Tetanus Vaccine			Received Tetanus Vaccine Before		
			IV			IV
	(1)	(2)	(3)	(4)	(5)	(6)
Any Friends received Fear Intervention	0.046**			-0.033		
	(0.021)			(0.040)		
Any Friends received Highest CCT (800)		0.054***			-0.005	
		(0.019)			(0.040)	
Any Friends received Tetanus Vaccine			0.073***			-0.007
			(0.025)			(0.053)
Constant	0.557***	0.552***	-0.079	-0.079	-0.087	-0.671***
	(0.183)	(0.182)	(0.208)	(0.237)	(0.235)	(0.226)
Observations	1493	1493	1493	989	989	989
R-squared	0.14	0.14		0.11	0.11	
Mean of Dependent Variable	0.746	0.746	0.746	0.723	0.723	0.723
Mean of Independent Variable	0.121	0.126	0.261	0.108	0.104	0.210
Covariates	X	X	X	X	X	X
Fixed Effect by village (80 villages)	X	X	X	X	X	X

Notes:

"Any Friends received Fear Intervention" is the binary variable which indicates if any of respondent's friends were shown fear flipcharts the fear intervention. "Any Friends received Highest CCT" is the binary variable which indicates if any of respondent's friends received the highest amount of CCT (CCT=800). "Any Friends received Tetanus Vaccine" is the binary variable which indicates if any of respondent's friends received tetanus vaccine. The instrument used in IV regression for "Any Friends received Tetanus Vaccine" is "Any Friends received Highest CCT". "Friends" are defined as someone whom each respondent listed in either one of 6 categories: a best friend, a friend whom they admire, a friend whom they talk about health issues with, a friend whom they go to health clinic together with, a friend whom they visit they she is sick, a friend who visits them when they are sick. Sample used here is the main sample of 2,490 women whose household location is recorded with GPS coordinates. Robust standard errors clustered by villages (80 villages) are presented. Covariates include own treatment status (binary variable to indicate if fear flipcharts was shown, binary variable to indicate if the respondent was offered CCT300 (CCT800), interaction term between fear flipcharts dummy and each CCT dummy, binary variable to indicate if the conditionality for CCT was "Just Show-up", and the interaction between "Just Show-up" conditionality dummy and each CCT dummy), age, primary education, secondary or higher education, marital status, religion (Muslim or not), dummy variable to indicate if the respondent ever received tetanus vaccine before, dummy variable to indicate if the respondent has paid work, dummy variable to indicate if the respondent ever used the same clinic before, distance from the house to the health clinic based on GPS coordinates. Coefficients for "Any Friends received Fear Intervention", " "Any Friends received Highest CCT" "Any Friends received Tetanus Vaccine" under probit model among women who never received tetanus vaccine are (1) 0.067** (0.026) (2) 0.083** (0.024) (3) 0.100*** (0.034) (4) -0.042 (0.066) (5) -0.012 (0.066) (6) -0.017 (0.067). They indicate the marginal effects with standard deviation in the parenthesis. * significant at 10%; ** significant at 5%; *** significant at 1%

Appendix 1. Research Design

Priming		No Fear		Fear	Total
Conditionality		Just show-up	Vaccine	Vaccine	
		[T1]	[T2]	[T3]	
CCT (Naira)	N5	245	275	245	765
	N300	286	290	274	850
	N800	291	313	263	867
	Total sample	822	878	782	2482

Note:

$1 = N150 approximately