American Economic Review: Papers & Proceedings 2017, 107(5): 501–505
https://doi.org/10.1257/aer.p20171104

Precommitment, Cash Transfers, and Timely Arrival for Birth: Evidence from a Randomized Controlled Trial in Nairobi Kenya†

By Jessica Cohen, Katherine Lofgren, and Margaret McConnell*

Nearly 2.5 million mothers and babies die each year from complications in the immediate period around childbirth. Nairobi, Kenya has among the highest maternal and neonatal mortality rates in the world. Mounting evidence suggests delivering in a facility is not enough to drive mortality reductions, with utilization of poor quality facilities and delays in receiving care the major contributors to continued poor outcomes (Lozano et al. 2011). In addition to delivering in well-equipped facilities, women must arrive at the facility and be attended to in time for complications to be effectively managed. The "three delays" model attributes poor outcomes to delays in: (i) seeking care; (ii) arriving at the facility for delivery; and (iii) receiving adequate treatment once at the facility (Thaddeus 1994). These delays are strongly associated with morbidity and mortality (Pacagnella et al. 2014).

Delays could occur for many reasons including the need to travel far distances, information gaps about when to seek care in labor, or because women are away from facilities (e.g., because of overcrowding). Our preliminary work in Nairobi suggested that delays could also be occurring because of behavioral barriers to effective decision making and planning around facility delivery. Nairobi offers a very large, complex set of highly heterogeneous maternity facility options. Previous work has highlighted how choice in this type of decision context can lead to deferring decisions (Tversky and Shafir 1992). In our preliminary work, we found that decisions about where to deliver were often made very late in pregnancy. We hypothesized that decision-making delays could lead to poor birth planning, which has been shown to increase delays in seeking care. We designed a "precommitment transfer package" which bundles a labeled cash transfer and precommitment conditional transfer (see online Appendix Section I). This intervention was designed to help women deliver where they want and to reduce delays, both by relieving financial barriers to on-time arrival and by facilitating earlier and more deliberate planning and implementation of plans for delivery. In other work, we analyze the impact of the intervention on the quality of delivery care received.

I. Experimental Design, Data Collection, and Outcome Measurement

The study was conducted between February and September of 2015 in the informal settlements ("slums") of Nairobi. Twenty-four neighborhoods with primarily low-income residents and a mix of private and public maternity facilities were selected. Pregnant women between five to seven months gestation were eligible for the study if they were at least 18, planned to deliver in a facility, did not plan on leaving Nairobi during or after pregnancy, and were reachable by mobile phone. Recruitment methods are described in online Appendix Section II.

Women were surveyed three times during the study—at baseline (five to seven months gestation), midline (eight months gestation),

*Cohen: Harvard T. H. Chan School of Public Health, Building 1, Room 1209, 665 Huntington Avenue, Boston, MA 02115 (e-mail: cohenj@hsph.harvard.edu); Lofgren: Harvard Center for Health Decision Science, 718 Huntington Avenue, 2nd Floor, Boston, MA 02115 (e-mail: klofgren@g.harvard.edu); McConnell: Harvard T. H. Chan School of Public Health, Building 1, Room 1217, 677 Huntington Avenue, Boston, MA 02115 (e-mail: mmcconne@hsph.harvard.edu). This work was generously supported by a Gates Foundation Grand Challenges Explorations award, a Harvard Global Health Institute Burke Fellowship, and a Harvard University Research Enabling Grant. We thank Ginger Golub and George Omondi for superb implementation of the study. We also thank Jacaranda Health for its partnership in implementation. This study received ethical approval from the Harvard T. H. Chan School of Public Health and Amref Health Africa. We thank our discussant Manoj Mohanan for very helpful suggestions on the manuscript.

† Go to https://doi.org/10.1257/aer.p20171104 to visit the article page for additional materials and author disclosure statement(s).

and endline (two to four weeks postpartum). In this paper we focus on just one of the treatment arms—the "precommitment transfer package." The package intervention features two transfers. First, a KSh1,000 (US~$11) transfer during pregnancy with a label stating "we hope that this money will help make it possible for you to deliver in the facility where you want to deliver." Second, an additional KSh 1,000 received if they delivered in a place that they precommitted to deliver during pregnancy (see online Appendix Section III and online Appendix Figure 1). Precommitment occurred in the eighth month of pregnancy (at midline), included a main facility and a "back up" option in case of emergencies, and was confirmed at endline through a birth certificate or discharge papers. The combined amount of the transfer (US$22) was equal to 38 percent of the average total cost paid for delivery in the control group (Table 2).

There were 361 women surveyed at baseline, 299 at midline, and 281 at endline. Attrition at endline was 6.7 percent higher in the control group than the treatment group ($p = 0.098$), but participant characteristics remain balanced at endline (online Appendix Section IV). Reasons for attrition included temporary relocations for birth, miscarriage, and neonatal mortality (see online Appendix Section IV).

Our primary outcome is a "timing index" made up of four items: time between contractions at departure for the facility, time between contractions at facility arrival, dilation at the first exam, and time between arrival at the facility and delivery. We consulted with obstetric gynecologists familiar with low-income countries to select measures that would be predictive of clinically meaningful delays using terminology women would recognize. Broadly, earlier arrival in labor makes it more likely that complications can be detected and managed effectively or referred to a higher-level facility. The index is constructed by normalizing each variable with respect to the control mean and standard deviation, signing each variable so that positive values mean earlier arrival, and taking either an equally-weighted average or a variance-weighted average as in Anderson (2008). (See online Appendix Section V for more details on the index components.) We also explore mechanisms by which the intervention may have improved timely arrival, including planning and transportation.

Table 1—Impact of Treatment on Timing of Facility Arrival and Departure

	Mean in control	Coefficient on treatment
Individual timing metrics		
Contraction spacing at departure for facility[a] (min)	9.13	2.99
		(1.32)
Contraction spacing at arrival to facility[b] (min)	6.38	2.06
		(1.25)
Dilation at first exam (cm)	4.13	−0.27
		(0.33)
Time in facility before birth[c] (hr)	8.67	1.07
		(1.11)
Timing indices (control z-score standardized; negative is closer timing to birth)		
Weighting components equally	0.04	0.18
		(0.10)
Anderson (2008) weighting method	−0.09	0.16
		(0.08)

Notes: OLS regressions include controls for stratification variables noted in text. All variables are the combination of women's and labor companion's responses. A women's response is preferred if both are available. Standard errors are in parentheses.

[a] Contraction at departure topcoded to 90th percentile (30 mins).

[b] Contraction at arrival topcoded to 90th percentile (30 mins).

[c] Time in facility before birth topcoded to 90th percentile (30 hrs).

II. Results

No significant differences between the treatment and control groups are found (either at baseline or endline) except that the treatment group is 6 percent less likely to be married at baseline (online Appendix Table 1).

We present results of regressions of the treatment on our timing index overall and each item separately with respect to the control group in Table 1. All regressions include strata dummies. The precommitment package improves the timing index by 18 percent of one standard deviation ($p = 0.07$) for the equally-weighted index and 16 percent ($p = 0.04$) for the variance weighted index. The precommitment package improves the timing index by 18 percent of one standard deviation ($p = 0.07$) for the equally-weighted index and 16 percent ($p = 0.04$). The intervention reduces dilation at first exam and the time between arrival and birth, but neither of these are statistically significant. Online Appendix

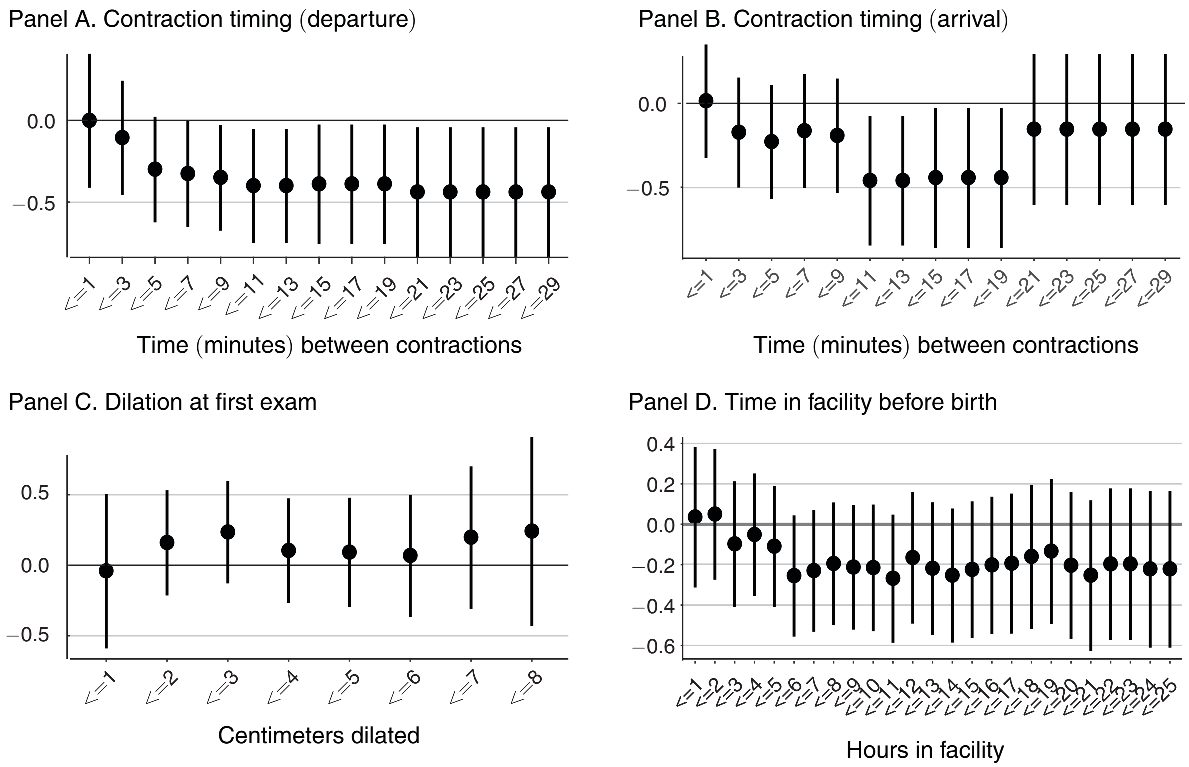

FIGURE 1. CDFs OF TREATMENT VERSUS CONTROL

Figures 3a–3d show kernel density functions for these components and show that the intervention moved women toward more timely arrival for all four components.

Figure 1, panels A–D, plot the difference in CDFs between the treatment and control group. Figure 1, panel A and B, demonstrate that a significant portion of the treatment effects occur where contractions are five minutes apart or less (where participants may be in active labor). Figure 1 panel D demonstrates that a large portion of the treatment effect on the time between arrival and the birth of the baby occurs at six or fewer hours in the facility. Overall, we do not find that the intervention is inducing extremely early arrival and much of the movement appears to be in areas likely to be meaningful for the safety of delivery.

Table 2 explores some of the mechanisms by which the intervention may have improved timing. Eighty percent of treated women delivered in a precommitted location. The intervention moves the facility decision earlier in pregnancy, increasing the probability that a final decision was made by midline (eighth month of pregnancy) by 15 percentage points ($p = 0.03$). It also reduces last minute decisions, increasing the probability of delivering in a facility being considered at midline by 17 percentage points ($p < 0.001$) and delivering in the facility most wanted at midline by 14 percentage points ($p = 0.02$). While we find no impact on the overall distance traveled for delivery, the intervention did reduce the probability of delivering somewhere extremely close (within 2 km) by 10 percentage points ($p = 0.03$). This is consistent with the intervention reducing the probability of walking to the facility by 10 percentage points ($p = 0.03$) and increasing the probability of paying for transport by 12 percentage points ($p = 0.04$). We find no impact on average spending on transport or delivery.

III. Discussion

We find substantial evidence of last minute decisions about delivery facilities, with 41 percent of the control group delivering in a facility not even considered in the eighth month of pregnancy (33 percent if we exclude emergency

TABLE 2—IMPACT OF TREATMENT ON DECISION MAKING AND OTHER POTENTIAL DETERMINANTS OF DELAYS

	Mean in control	Coefficient on treatment
Delivery decisions		
Stated final decision of facility made at midline	0.66	0.15 (0.06)
Delivered at a facility considered at midline	0.59	0.17 (0.06)
Delivered in the facility most wanted at midline	0.42	0.14 (0.06)
Distance to facility		
Distance from neighborhood to facility[a] (km)	6.69	0.33 (0.75)
Delivered within 2 km of neighborhood[a]	0.23	−0.10 (0.05)
Transportation		
Walked to facility	0.22	−0.10 (0.05)
Paid anything for transportation	0.70	0.12 (0.05)
Costs associated with delivery		
Transportation cost[b] (USD)	4.29	0.14 (0.71)
Total cost of delivery[c] (USD)	58.06	−0.76 (10.93)

Notes: OLS regressions include controls for stratification variables noted in text. Distance and transportation categories restricted to women that gave birth within 40km of their neighborhood centroid, a total sample of 265 women compared to the full sample of 281 women. Standard errors are in parentheses.

[a]Neighborhood defined by the geographical centroid.

[b]Transportation costs topcoded to 90th percentile (US$16.4).

[c]Total costs topcoded to 90th percentile (US$252.5).

referrals). While some of this disconnect could be due to new information or changes in preferences late in pregnancy, it may also be that women have trouble making and implementing decisions about delivery facilities. We designed an intervention that incentivized earlier and more effective planning—and reduced cash constraints—in order to encourage earlier arrival. Early arrival is especially important here, since only 37 percent of respondents delivered where they received prenatal care, meaning that facilities are unlikely to have their medical history, and since most referral facilities are outside of the slums (requiring additional transport time and cost).

This was a pilot study with some limitations including nonrandom sampling, attrition, and potential measurement error in timing variables. Nonetheless, we find evidence that cash transfers labeled to help women deliver where they want, combined with an incentivized facility precommitment, leads to earlier and more effective planning for delivery and earlier arrival for childbirth.

We find no evidence that the precommitment package makes choices more conservative (e.g., leading women to precommit to closer or cheaper facilities that would be easier to attain), reduces flexibility in ways that could be welfare decreasing (e.g., by increasing referrals), or causes women to arrive so early in labor that they are turned away (online Appendix Table 4). Perhaps surprisingly, the precommitment transfer package does not increase average spending on delivery or transportation. While some of this may be due to a policy of free deliveries in public facilities, women report spending an average of KSh 1,378 (US$13) at public facilities for a normal delivery. The precommitment package does increase the chance of spending anything on transportation and reduces the likelihood that women walk to a facility while in labor, suggesting that the cash may relieve very extreme financial barriers.

One challenge is the lack of clinical guidance from the literature on how to define clinically meaningful "delays." While earlier arrival is safer in this context (up to a point), there is no current definition of dangerously late arrival, so we are unable to make concrete conclusions about the likely impact of an intervention like this on clinical outcomes, although we do see evidence that it reduces the chances of arriving far into active labor. Understanding the impact of combined precommitment and labeled cash transfers on clinical outcomes for mother and baby will require a much larger study, but would be a valuable contribution, given the large delivery-related mortality for mothers and babies in this population.

REFERENCES

Anderson, Michael L. 2008. "Multiple Inference and Gender Differences in the Effects of Early Intervention: A Reevaluation of the Abecedarian, Perry Preschool, and Early Training Projects." *Journal of the American Statistical Association* 103 (484): 1481–95.

Lozano, Rafael, Haidong Wang, Kyle J. Foreman, Julie Knoll Rajaratnam, Mohsen Naghavi, Jake R. Marcus, Laura Dwyer-Lindgren, et al. 2011. "Progress towards Millennium Development Goals 4 and 5 on Maternal and Child Mortality: An Updated Systematic Analysis." *Lancet* 378 (9797): 1139–65.

Pacagnella, Rodolfo C., José G. Cecatti, Mary A. Parpinelli, Maria H. Sousa, Samira M. Haddad, Maria L. Costa, João P. Souza, and Robert C. Pattinson. 2014. "Delays in Receiving Obstetric Care and Poor Maternal Outcomes: Results from a National Multicentre Cross-Sectional Study." *BMC Pregnancy and Childbirth* 14 (159).

Thaddeus, Sereen, and Deborah Maine. 1994. "Too Far to Walk: Maternal Mortality in Context." *Social Sciences and Medicine* 38 (8): 1091–1110.

Tversky, Amos, and Eldar Shafir. 1992. "Choice under Conflict: The Dynamics of Deferred Decision." *Psychological Science* 3 (6): 358–61.