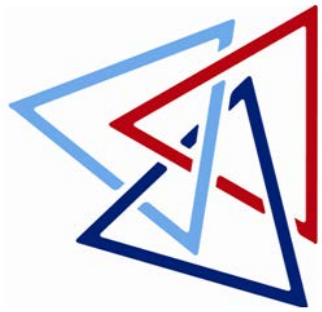


The Thula Baba Box study: A package intervention aimed at improving early access to antenatal care in Cape Town, South Africa. Evidence from a pilot randomised controlled trial

Laura Rossouw, Rulof Burger and Ronelle Burger

Abstract

A key factor linked to South Africa's relatively high maternal mortality ratio is late access to antenatal care. Early access is especially important in the SA context with its high prevalence of HIV amongst pregnant women. This study examined the impact of a package intervention (consisting of an incentive called the Thula Baba Box and a community health worker programme) on the utilisation of maternal health services at an earlier gestational age. To evaluate the impact of the package intervention, a pilot randomised controlled trial involving 100 women of age 18 and older was conducted in an urban area. Women in the treatment group were eligible to receive both the Thula Baba Box and at least two community health worker visits, while women in the control group were subject to standard clinical practice. Both groups were interviewed at recruitment and once again after giving birth. The measured outcomes are the timing of antenatal care visit, whether they attended more than four times and whether they gave birth at a health facility. We found that women in the treatment group were likely to seek care on average 1.35 months earlier than women in the control group. They were also significantly more likely to go to the antenatal clinic at least four times. The intervention had no detectable impact on the probability of giving birth at a facility. Women exposed to the Thula Baba Box and community health worker support were significantly more likely to utilise maternal healthcare services than their counterparts. The intervention can be a useful tool to improve maternal health outcomes.

The **Research Project on Employment, Income Distribution and Inclusive Growth** is based at SALDRU at the University of Cape Town and supported by the National Treasury. Views expressed in REDI3x3 Working Papers are those of the authors and are not to be attributed to any of these institutions.

© REDI3x3

The Thula Baba Box study: A package intervention aimed at improving early access to antenatal care in Cape Town, South Africa. Evidence from a pilot randomised controlled trial

Laura Rossouw, Rulof Burger and **Ronelle Burger**

(Department of Economics, Stellenbosch University)

1. Background[1]

The reduction of global maternal mortality to less than 70 deaths per 100 000 live births by 2030 has been identified as one of the United Nation's Sustainable Development Goals (United Nations, 2015). This reduction has also been identified as a policy priority for the national and Western Cape Departments of Health of South Africa (Western Cape DOH, 2014). South Africa's maternal mortality ratio is far higher than that of its upper middle income country peers. These disappointing outcomes are not attributable to low government spending, as countries that have similar levels of per capita government expenditure on health have maternal mortality ratios (MMR) around 60 deaths per 100 000 live births, while South Africa's ratio was estimated to be 310 in 2008 (Bradshaw & Dorrington, 2012). The high incidence of HIV plays a persistent role in the country's MMR. In 2008-2010, 40.5% of maternal deaths in South Africa were related to non-pregnancy related infections, predominantly HIV (Pattinson, 2012).

List of abbreviations
ANC = Antenatal care
AOR= Adjusted odds ratios
CHW = Community health worker
CI = confidence intervals
DHIS = District Health Information Systems
MMR = Maternal mortality ratio
TA = Treatment arm
OR = Odds ratios
TBB = Thula Baba Box
WCDoH = Western Cape Department of Health

There is little evidence that current interventions are having the desired impact. Intensification of prevention of mother-to-child HIV transmission may have resulted in a small improvement in maternal and infant mortality. However, maternal mortality indicators still lag far behind that of South Africa's peers and are not within reach of global targets, suggesting that current strategies and programmes are not sufficient.

One of the demand-side factors linked to South Africa's poor maternal health outcomes is late and infrequent antenatal care access (ANC) (Pattinson, 2012). Pattinson (2012) reports

[1] Funding for the project was received from the Abdul Latif Jameel Poverty Action Lab (JPAL), Broadreach Healthcare and REDI3x3. Several smaller sponsorships were also obtained from Ackermanns, Agrimark SA and Jonsson. Also see Endnote at the end of the paper.

that in almost a quarter of maternal deaths, the mothers never attended antenatal clinics or did not attend frequently enough. Early access to antenatal care is particularly vital for maternal health in South Africa with its high HIV prevalence. HIV prevalence amongst pregnant women in South Africa is approximately 30% (Shisana, Rhele, Simbayi, Zuma, Jooste, Zungu, Labadarios & Onoya, 2012). Early initiation of antiretroviral treatment is necessary to prevent vertical transmission and to promote the health of both the mother and the infant (World Health Organization, 1999; Moodley, Moodley, Sebitloane, Maharaj & Sartorius, 2016).

The South African department of health suggests that pregnant women should access antenatal care before 20 weeks of gestation, as this will minimize the risk of vertical transmission. Earlier access at 14 weeks is recommended by the WHO to minimize the risk even further (Schnippel, Mongwenyana, Long & Larson, 2015). However, according to the 2012 District health information system (DHIS) 59.9% of women only sought antenatal care at a gestational age of 20 weeks/five months or later (National Department of Health, 2012). Therefore, improving access to care at an earlier gestational age is a key task facing the South African government, especially in the context of high HIV prevalence amongst pregnant women.

Contrary to what is the case in many other developing countries, frequency of antenatal care visits and institutional births are not considered high priority problems. The frequency of antenatal care is overall high, with South African women making an average of 3.7 visits to antenatal care (National Department of Health, 2012). South Africa also fares well in terms of birth at facilities, as approximately 91.3% of women give birth at a health facility (National Department of Health, 2012).

Medical literature reports on the possible benefits of antenatal care. These are predominantly to detect, monitor and treat dangerous symptoms and conditions which may lead to morbidity or mortality of mother or infant (Liu, Chen, Chan & Chen, 2015). Although more epidemiological evidence is required to determine with certainty which antenatal interventions lead to better health outcomes, interventions aimed at monitoring and treating chronic conditions such as anaemia, infections and hypertensive diseases of pregnancy are largely found to be effective (Carroli, Rooney & Villar, 2001). Research studies finding weak effects often attribute these to possible endogeneity stemming from the non-random allocation of antenatal care to more high risk cases (Conway & Deb, 2005; Conway & Kutinova, 2006). However, medical literature has predominantly focused on the role of antenatal care on infant health outcomes, rather than infant and maternal health outcomes jointly. This has

led to an underestimation of the contributing value of antenatal care to improving health outcomes (Conway & Kutinova, 2006).

Given that healthcare to pregnant women is free of charge in South Africa (Cooper, Morroni, Orner, Moodley, Harries, Cullingworth & Hoffman, 2004), there are other factors barring access to antenatal care. The limitations to available and current nationally representative health surveys mean that research on the barriers to antenatal care access in South Africa is scarce and limited to specific areas. In peri-urban Pretoria, Haddad and colleagues found that early access is associated with planned and wanted pregnancies. Fear of HIV testing and self-perceived HIV stigma acted as a deterrent to accessing care earlier. They also detected the presence of superstitious behaviour against accessing care early (Haddad, Makin, Pattinson & Forsyth, 2016). Another study in peri-urban Johannesburg found that the main contributors to late access were late identification of pregnancy status and not having time to access care (Solarin & Black, 2013).

In this article, we report the results from a pilot randomised controlled trial where we tested a demand-side package intervention to improve timing and frequency of antenatal care access. The package intervention consisted of two interventions which were jointly implemented. The first was an incentive, the Thula Baba Box (TBB), which we used to encourage pregnant women to visit ANC by providing it as a reward for early and frequent clinic attendance. In the second intervention, we supported the women with advice, guidance and health information delivered by experienced local community health workers (CHW).

The intervention was tested in Lwandle and Nomzamo, two low-income areas in Cape Town, during 2015. This was a community level intervention, with women recruited door-to-door and visited at their homes.

The study will consider whether a package intervention aimed to address demand-side constraints was effective in motivating pregnant women to access healthcare at facilities in a low-income, urban setting in South Africa. The aim of the intervention is to decrease the gestational age at which women access antenatal care.

2. Methods

2.1 Synopsis of the package intervention

Intervention 1: The Thula Baba Box incentive

The Thula Baba Box (TBB) is a starter kit for new mothers, based on the idea of the Finnish baby boxes. The Finnish box was used to curb infant mortality in Finland in the 1930s and is still given to all pregnant women in Finland to this day (Kela, 2015). Research was conducted and interviews done with new mothers, healthcare workers and policy makers to adjust the box to a South African setting.

The box is valued at R440 ($27.8 on 29 February 2016) and contains baby clothing, a blanket, wash products (face cloth, hand soap, aqueous cream, baby jelly and wipes), maternity pads, condoms, a kangaroo mother care wrap, plastic balls, health information brochures and some nursery rhymes. The box is clear plastic and can be used by the mother for storage or as a baby bath.

The box is used as an incentive to promote earlier and frequent antenatal care attendance, given conditional on the mother accessing antenatal care at least four times and with the first visit occurring within four weeks after her first interaction with the CHW. The content of the TBB is predominantly aimed at the baby in line with evidence indicating that targeting the incentive towards the baby rather than the mother makes for a stronger incentive (Smith, Weinman, Johnson & Wait, 1990). While infant health outcomes are not the focus of the study, it is anticipated that the box may improve health outcomes of infants.

Incidentally, this use of the box as an incentive is in line with its historic role in Finland. It was awarded to mothers if they accessed antenatal care before 16 weeks gestation (Gissler, M., Geraedts, M., Hemminki, E., & Buekens, 1998). There is a substantive literature on the use of incentives to promote early antenatal care attendance in developed countries. McQuide et al. (1998) compiled a comprehensive survey of the presence of maternity benefits in Europe in the 1990s. Austria, Finland, France, Hungary and Luxembourg all offered pregnancy allowances to pregnant women, while Finland, France, Hungary and Luxembourg made receipt of the allowance conditional on early (and frequency in Luxembourg) timing of antenatal visits (McQuide, Delvaux & Buekens, 1998). Some of the conditional cash transfer programmes in Latin American countries such as Mexico (Gertler, 2004; Barham, 2011), Brazil (Brauw, Gilligan, Hoddinott, Moreira & Roy, 2012) and Honduras (Eichler, Levine & Group, 2009; Lagarde, Haines & Palmer, 2014), and the Suraksha Yojana scheme in India (Lim,

Dandona, Hoisington, James, Hogan & Gakidou, 2010), have made cash transfers conditional on antenatal care seeking behaviour and have found some evidence of success.

Theoretically, the rationale for incentives is three-fold: it can alleviate credit constraints, correct time preference inconsistencies and help to address financial barriers (Dupas, 2011; Lunze & Paasche-Orlow, 2013). In healthcare, incentives are often promoted as once-off nudges aimed at transforming social norms and individual expectations to promote long term prudent health behaviour. It works by *"triggering a virtuous circle of 'good' habits"* (Ranganathan & Lagarde, 2012). Incentives can also be used as a method of rebalancing a person's discount rates, or a "nudging" effect towards responsible and prudent behaviour and improved individual outcomes. Often it is assumed that individuals make optimal and rational choices by weighing possible costs and benefits. Recent research in behavioural economics has shown that this is essentially flawed. In truth, individuals often miscalculate the true values of possible costs and benefits, especially future costs, leading to non-optimal health behaviour choices. Incentives are designed to correct such short-term distortions, "nudging" individuals towards the outcomes they desire to achieve over the long term.

Incentive programmes have been used successfully in promoting preventative health behaviour for childhood immunization (Banerjee, Duflo, Glennerster & Kothari, 2010), promoting performance of agents in pro-social tasks aimed at development (Ashraf, Bandiera & Jack, 2014), preventing sexually-transmitted infections (de Walque, Dow, Nathan, Abdul, Abilahi, Gong, Isdahl, Jamison, Jullu, Krishnan, Majura, Miguel, Moncada, Mtenga, Mwanyangala, Packel, Schachter, Shirima & Medlin, 2012), and HIV testing (Thornton, 2008).

Given the popularity of incentives for antenatal care, it is surprising that there are only a small number of rigorous assessments of its impact. There have been a range of smaller randomised controlled trials across countries (Laken & Ager, 1995; Melnikow, Palieschekey & Stewart., 1997; Dupas, 2005; Rosenthal, Li, Robertson & Milstein, 2009) with varying levels of success. The studies found that the impact is conditional on the duration of required behaviour change (Eichler *et al.*, 2009; Lunze & Paasche-Orlow, 2013), the incentive payment or transfer structure (Sindelar, 2010), costs imposed on the user (Kremer & Miguel., 2004; Tarozzi, Mahajan, Blackburn, Kopf, Krishnan & Yoong, 2014) and the size of incentives (Thornton, 2008; Banerjee *et al.*, 2010; Dupas, 2011; de Walque *et al.*, 2012). These influences were all considered in the design of our programme: our incentive is of a large enough size to motivate behaviour change over a few months and to justify the costs which the programme imposes on the participant; and we used a gift rather than a cash transfer given its possible positive health externalities and that this will dictate the manner in which the incentive is used.

Intervention 2: Community health worker support

The second intervention entailed providing pregnant women with the required support and information via monthly visits by a local and trained CHW. With the help of an established and reputable CHW NGO Philani Health and Nutrition, we recruited women with existing CHW experience from the Lwandle and Nomzamo communities. In preparation for this study they received further specialist training in antenatal care and nutrition from Philani Health and Nutrition. The scope of the Philani programme's impact is reported elsewhere (Le Roux, Tomlinson, Harwood, O'CONNOR, Worthman, Mbewu & A, 2013; Le Roux, Rotheram-Borus, Stein & Tomlinson, 2014; Rotheram-Borus, Tomlinson, Le Roux & Stein, 2015; Tomlinson, Rotheram-Borus, Harwood, Le Roux, O'Connor & Worthman, 2015).

The service that the CHWs provide is seen as supplemental to the standard clinical practice, and is focused on providing health information and psycho–social support. CHW visited their mothers at least once a month, with visits ranging from between 30 to 90 minutes each. The content of these visits included promoting early and frequent antenatal care visits, discussing pregnancy and infant danger signs, the dangers of drinking and smoking during pregnancy, the importance of HIV and TB testing, maternal nutrition and general health, infant feeding options, the importance of bonding, and providing general emotional support. Once the CHW established a rapport with the pregnant women, they spoke about HIV status and the importance of disclosing one's HIV status, encouraging the HIV positive mothers to be open about their status.

Each CHW was responsible for covering a specific geographical area within Lwandle and Nomzamo, visiting each household and identifying possible clients.

Similar programmes have been used in a developed country context to specifically promote earlier and frequent attendance of antenatal clinics (Julnes, Konefal, Pindur & Kim, 1994; Rogers *et al.*, 1996; Daaleman, 1997). In these programmes, similar to the Philani programme, mothers from the community were recruited and trained to provide antenatal support. The impact of these programmes on earlier antenatal care range from significantly positive (Rogers *et al.*, 1996) to only suggestive evidence (Julnes *et al.*, 1994; Daaleman, 1997). Antenatal home-visiting programmes have also been effectively used to promote adequate antenatal care usage (Issel, Forrestal, Slaughter, Wiencrot & Handler, 2011).

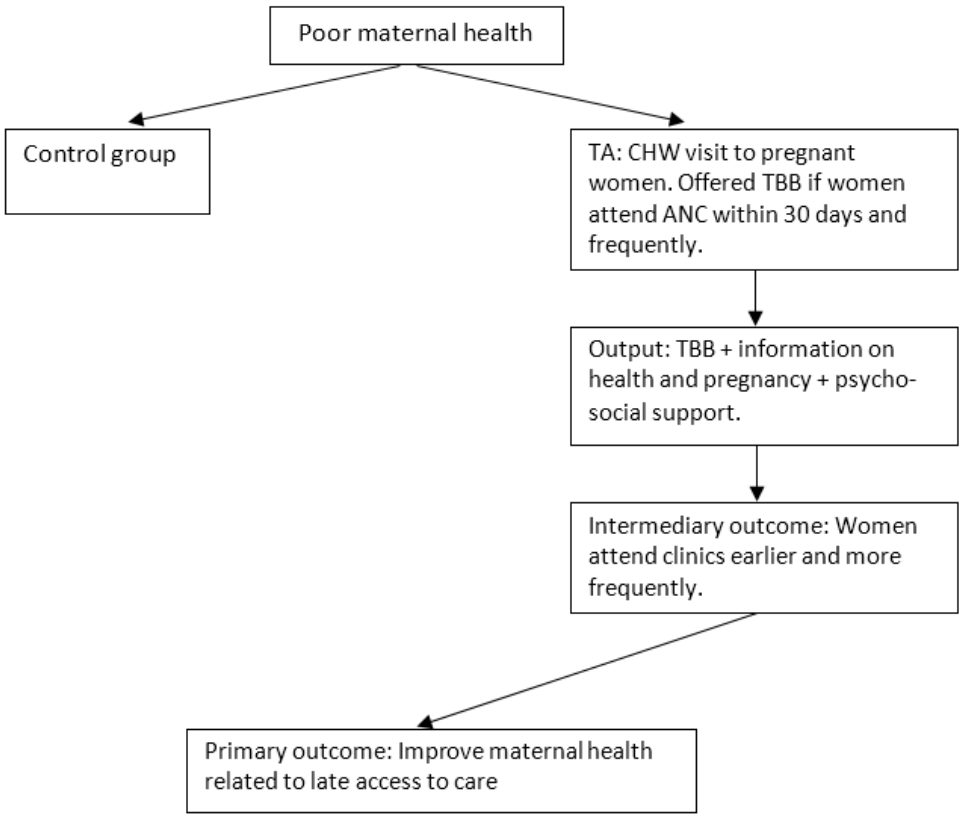
2.2 The study design

In order to address the multiple constraints related to poor healthcare seeking behaviour amongst pregnant women, we administered the TBB and the CHW support interventions jointly as a package intervention.

After recruitment, women were first randomised into either the intervention or the control arm using an on-site lottery. All women completed a baseline questionnaire that captured their basic profile, their socio-economic background, their health seeking behaviour, their understanding of pregnancy risks, their household situation and their perspectives on their pregnancy.

Women selected to receive the package intervention were told that they would receive monthly visits from the CHW and if they went to the antenatal clinic within the next 30 days and made the four necessary visits, they would receive the TBB after they had given birth. The women were also told that if they did not comply fully with these conditions, they would only receive a partial version of the box. Women in the control group were subject to standard clinical practice and received neither box nor CHW visit. This study design is illustrated in Figure 1.

Figure 1: Graphical depiction of the study design



2.3 The study setting

We selected Lwandle and Nomzamo for the intervention because these sites had few competing interventions, had relatively low rates of early access to antenatal care, but good general health system performance. The latter was important because in a setting with severe supply side problems (e.g. overburdened and ineffective primary care facilities) one would not be able to observe the impact of a demand-side intervention.

Lwandle and Nomzamo are situated in the Metro region of the Western Cape. Figure 2 shows a map of the Metro region of the Western Cape (yellow), with Lwandle and Nomzamo highlighted in blue. These are both low-income areas with high levels of unemployment and informal housing. They fall within the Eastern Health sub-district of the Metro region, where approximately 43% of women attend antenatal care after 20 weeks of gestation (National Department of Health, 2012).

Figure 2: Map of the Metro region in the Western Cape, South Africa.

2.4 Study area and sample size

The study targeted women who were pregnant but who had not yet been to an antenatal care facility. The CHWs went door-to-door in the sampling area, identifying and recruiting pregnant women for the study. Women who were of reproductive age and sexually active were also offered a pregnancy test, and recruited into the study if they were pregnant. The sample consists of female residents of Lwandle or Nomzamo who either knew they were pregnant and who had not yet been to the antenatal clinic, or women who did not know they were pregnant when the CHW approached them but found out via a pregnancy test offered by the CHW. Due to ethical considerations, only women aged 18 and older were considered for the study.

Due to budgetary limitations, a sample of 100 women (50 control, and 50 intervention) was obtained for this study. It is therefore viewed as a pilot study for implementing a larger scale intervention. After attrition (discussed in the results section), a total sample of 72 participants remained. Power calculations reveal that with a sample size of 100 women, an estimated r-square of 0.2 and significance level of 0.1, an unconditional standard effect size of 0.5 is required to have statistical power of 80%. With a final sample size of 72, this effect size needs to be 0.59.[2]

2.5 Data collection and sampling methods

Data was collected using a baseline questionnaire (conducted following recruitment into the sample) and an endline questionnaire (asked one week after birth). Recruitment of participants occurred between 21 January and 13 March 2015. The final study participants gave birth during November, 2015. Women in the treatment group received their Thula Baba Box after they had given birth, when the endline questionnaire was implemented.

The questionnaires contain questions on background information (e.g. race, SES status, employment), antenatal care (gestational age, pregnancy identification method, why have not visited clinic), health (SRH, BMI, MUAC, depression, nutrition, knowledge of FAS), support system (presence of support system, knowledge of support groups) and the father's role in infant's life (include father into baby's life, perception of role of the father).

Women in the control group received food vouchers worth R30 ($1.9 on 29 February 2016) to compensate them for the time spent completing the questionnaire. The questionnaires

[2] Power calculations are based on the goal of decreasing gestational age at first antenatal clinic booking.

were conducted by the study's CHWs with quality monitoring by the team supervisor and the project manager.

2.6 Description of study variables

The key intermediary outcomes measured in this study is the timing of first antenatal care, but we also consider the frequency of antenatal care visits and institutional births.

The timing of first ANC visit is measured using a binary indicator equal one if the participant went to the ANC on or before five months of gestation. Participants who never went to the antenatal clinic are considered to have gone to the clinic at nine months of gestation.

For frequency of visits, we use a binary indicator to indicate whether they visit the clinic at least four times. Number of visits is affected to some extent by the presence of complications. However, a minimum of four visits is recommended by the WHO. For simplicity and ease of interpretation, we construct institutional births in line with the other two outcome variables where an increase is expected to improve maternal health. It is constructed as a binary variable indicating whether a person did not give birth at a health facility. All health outcome measures are based on information provided in the questionnaires.

2.7 Data analysis

A total of 100 women were recruited during baseline. Refusal to participate at this point was only 3%. These women were randomised into control (50) or treatment (50). The success of the randomization is shown in Table 1. In only one of the 17 descriptive statistics is there a significant difference between the participants in the treatment and the control group.

During the intervention, 29 women were lost due to attrition. The reasons for attriting ranged from migration (38%), abortion due to complications (17%), the respondent was living in a gang area which was unsafe for the CHW (14%), miscarriage (10%), refusal to participate further (10%), stillbirth (7%) to false pregnancy (3%). Attrition did not affect the quality of randomization, as there were still no significant differences in the baseline characteristics of women in the treatment and the control groups (see Table 2). Therefore, the analysis could continue.

The remaining sample size was 72 observations, which were all included in the analysis. The impact of the intervention on the three outcomes is measured using a binary predictor equal to one if the participant is in the treatment group. In the case where we explore the impact of the treatment on the months of gestation when the participant went to the antenatal clinic

for the first time, the outcome variable is a continuous variable. An ordinary least squares estimator is applied to calculate effects.

Since women are recruited at different gestational ages, they receive differing intensity of the intervention. As a result, we always control for the amount of time a person was exposed to our study in the regression analyses.

Furthermore, we explore the reason for the behavioural change amongst participants in the treatment group. Based on the literature on antenatal care incentives and CHW support, we consider time inconsistent preferences and top-of-mind effects.

Behavioural economics research has shown that individuals value their current experiences more than they value experiences and call this the future present time bias or time-inconsistent preferences. This is likely to be relevant for pregnant women who need to make decisions on accessing antenatal care as they would be tempted to postpone the visit because of the much higher value placed on the current period over a later period. This makes them unwilling to invest in something like preventative healthcare since it only affects their future and not their current utility (Dupas, 2011). There is large amount of literature that shows that individuals are often surprisingly short-sighted, and have high discount rates when it comes to their future social benefits.

Whether a participant has time-inconsistent preferences is calculated from a set of questions answered in the endline questionnaire.[3] Participants were asked a series of questions asking them what value gifts they would accept at different points in time. Time-inconsistent preferences are measured with a binary variable labelled "Revealed time-inconsistent preference". Both these variables are also interacted with the binary treatment variable to detect a higher response for the subgroup.

[3] The questions posed to respondents read as follows:

Q88 I'm just going to ask you a question. If a church or NGO want to give you a gift and they say they will either (1) give you R200 today or (2) R300 in one month, which one would you choose? This is not going to happen, I just want to ask you what you think.
(1) R200 today.
(2) R300 in one months' time.

Q89 What if they would give you (1) R200 in 6 months' time or (2) R300 in 7 months' time? Which one would you choose? I just want to state again, that this isn't going to happen, I just want to ask you what you think.
(1) R200 in 6 months.
(2) R300 in 7 months.

For the first question, 75% of women preferred R200 today and 25% preferred R300 in one months' time.
For the second question 54% of women preferred R200 in 6 months and R300 in 7 months.

The second possible channel, through which the intervention may have an effect on frequency and timing of antenatal care, is if it acts as a reminder or moral mirror for women who are overwhelmed by their day-to-day responsibilities. This is referred to as a "top-of-mind" effect, and occurs when a pregnant woman pays limited attention to accessing care since it is low down on her list of priorities. The intervention will have an impact as it serves as a reminder.

The "top-of-mind" effect is measured by looking at the household size, the participant's number of children, whether the pregnancy was planned, and her level of education. All these variables are also interacted with the binary treatment variables to test whether women with these characteristics might respond differently to treatment. Although we do control for level of wealth using the asset index, these proxies for "top-of-mind' effects may be confounded with poverty.

3. Results

3.1 Baseline characteristics of participants

A total of 100 women were recruited during baseline. Refusal to participate at this point was only 5%.[4] We found that take-up and demand for pregnancy tests were very high in the sampling area. Over a period of 36 days, 314 tests were distributed of which 54 were positive, leading to a pregnancy detection rate of 17%. These women were randomised into control (50) or treatment (50). Descriptive statistics of the socio-demographic variables of the sample population, aggregated by treatment and control, is shown in Table 1.

Women in the sample are on average 27 years of age, and unemployment is approximately 60%. Most women in the sample (64%) have secondary level education, but have not finished Grade 12, and a large share of women reported being unmarried. The largest subgroup of participants was Black African (86%), and most participants had poor wealth status (as measured by the asset index). Almost half of participants were foreign nationals (43%), and almost one in three participants were experiencing their first pregnancy (29%). There were on average four household members in participants' households.

[4] High enrolment for incentive or community health worker programmes and studies are not uncommon. Other incentive programmes, such as the CCT programme PROGRESA in Mexico, also encountered high enrolment into the programme. In the PROGRESS programme, 93% of the eligible participants enrolled (Gertler, 2004). Similarly, in a study by Thornton (2008) in Malawi, 91.1% of individuals offered HIV tests accepted. Philani had similar success in recruiting and enrolling women into their programme, with a refusal rate of 2% (Le Roux *et al.*, 2013).

During the intervention, 29 women were lost due to attrition. Attrition did not affect the quality of randomisation – even after taking account of attrition there were still no significant differences in the baseline characteristics of women in the treatment and the control groups. The remaining sample size available for analysis was 72 observations. A balance test (Table 2) reveals that attrition did not relate into significant differences in the observable characteristics of participants in the treatment and control group.

3.2 Main findings

The effect of exposure to the package intervention on utilisation of specific maternal care services are shown in Table 3. The table reports the coefficient estimate on the treatment variable from an ordinary least square estimator, before and after controlling for covariates. The table shows that the interventions had a significant impact on the frequency of antenatal care sought and getting women to an antenatal clinic earlier.

For this part of the analysis, we will only consider women recruited into our sample on or before five months of gestation, since the ability of the intervention to influence the frequency and timing of women's access to antenatal care after this period would have been significantly reduced. This reduces the sample from 72 to 61 women.

Participants who were exposed to the intervention treatment were 23.4 percentage points more likely to go to the antenatal clinic four times or more (significant at a 5% level) and 32.5 percentage points more likely of going to the antenatal clinic for the first time before five months of gestation (significant at a 5% level). The results remain significant and similar in size after controlling for confounding factors.

Table 1: Descriptive statistics on study participants

		Full sample mean	(n)	Treatment mean	(n)	Control mean	(n)	P-value
		(C.I.)	100	(C.I.)	50	(C.I.)	50	
	Age	27.39	100	27.14	50	27.63	50	0.695
		(26.16-28.61)		(25.56-28.72)		(25.71-29.55)		
	Unemployed	0.62	63	0.58	29	0.67	34	0.3737
		(0.53-0.72)		(0.44-0.72)		(0.53-0.80)		
Education	**Choose not to answer**	0.01	1	0.02	1	0	0	0.3149
		(-0.01-0.03)		(-0.02-0.06)		(0.00-0.00)		
	No Schooling	0.02	2	0	0	0.04	2	0.1604
		(-0.01-0.05)		(0.00-0.00)		(-0.02-0.09)		
	Primary (Gr 1-7)	0.15	15	0.14	7	0.16	8	0.8139
		(0.08-0.22)		(0.04-0.24)		(0.05-0.26)		
	Secondary, but no matric	0.64	65	0.62	31	0.67	34	0.6285
		(0.55-0.74)		(0.48-0.76)		(0.53-0.80)		
	Grade 12	0.18	18	0.22	11	0.14	7	0.2819
		(0.10-0.25)		(0.10-0.34)		(0.04-0.24)		
Marital status	**Single**	0.71	72	0.66	33	0.76	39	0.2492
		(0.62-0.80)		(0.52-0.80)		(0.64-0.89)		
	Married	0.25	25	0.26	13	0.24	12	0.7763
		(0.16-0.33)		(0.13-0.39)		(0.11-0.36)		
	Cohabit	0.04	5	0.08	4	0	1	0.0396**
		(0.00-0.08)		(0.00-0.16)		(0.00-0.00)		
Race	**Black African**	0.86	87	0.9	45	0.82	42	0.2707
		(0.79-0.93)		(0.81-0.99)		(0.72-0.93)		
	Coloured	0.11	11	0.06	3	0.16	8	0.1206
		(0.05-0.17)		(-0.01-0.13)		(0.05-0.26)		
	Other	0.03	3	0.04	2	0.02	1	0.3149
		(-0.00-0.06)		(-0.02-0.10)		(-0.02-0.06)		

Assets Index		1.91	100	1.88	50	1.93	50	0.7988
		(-1.7-2.1)		(1.61-2.16)		(1.63-2.23)		
Foreign		0.43	43	0.4	20	0.45	23	0.6087
		(0.33-0.52)		(0.26-0.54)		(0.31-0.59)		
Household size		3.81	100	4.04	50	3.59	50	0.33
		(3.35-4.27)		(3.30-4.78)		(3.03-4.15)		
First pregnancy		0.29	29	0.22	11	0.35	18	0.1426
		(0.20-0.38)		(0.10-0.34)		(0.22-0.49)		

*** p<0.01, ** p<0.05, * p<0.1
Note: Confidence intervals in parenthesis.

Table 1 Balance test: Descriptive statistics on study participants aggregated by treatment status

		Full sample		**Treatment**		**Control**		**P-value**
		mean	**(n)**	**mean**	**(n)**	**mean**	**(n)**	
		Std. dev.		Std. dev.		Std. dev.		
	Age	27.54	72	27.23	39	27.91	33	0.6255
		5.82		5.13		6.60		
	Unemployed	0.67	72	0.62	39	0.73	33	0.3225
		0.47		0.49		0.45		
Education	**Choose not to answer**	0.01	72	0.03	39	0.00	33	0.3613
		0.12		0.16		0.00		
	No Schooling	0.01	72	0.00	39	0.03	33	0.2801
		0.12		0.00		0.17		
	Primary (Gr 1-7)	0.18	72	0.15	39	0.21	33	0.5285
		0.39		0.37		0.42		
	Secondary, but no matric	0.63	72	0.62	39	0.64	33	0.8571
		0.49		0.49		0.49		
	Grade 12	0.17	72	0.21	39	0.12	33	0.3481
		0.38		0.41		0.33		

Marital status	**Single**	0.72	72	0.67	39	0.79	33	0.2588
		0.45		0.48		0.42		
	Married	0.24	72	0.26	39	0.21	33	0.6647
		0.43		0.44		0.42		
	Cohabit	0.04	72	0.08	39	0.00	33	0.1065
		0.20		0.27		0.00		
Race	**Black African**	0.89	72	0.90	39	0.88	33	0.8053
		0.32		0.31		0.33		
	Coloured	0.08	72	0.08	39	0.09	33	0.8335
		0.28		0.27		0.29		
	Other	0.03	72	0.03	39	0.03	33	0.3613
		0.17		0.16		0.17		
Assets Index		1.81	72	1.83	39	1.78	33	0.8261
		0.94		0.94		0.95		
Foreign		0.44	72	0.41	39	0.48	33	0.5323
		0.50		0.50		0.51		
Household size		3.69	72	3.90	39	3.45	33	0.4382
		2.40		2.72		1.95		
First pregnancy		0.26	72	0.21	39	0.33	33	0.2245
		0.44		0.41		0.48		

*** p<0.01, ** p<0.05, * p<0.1

Note: Confidence intervals in parenthesis.

The intervention did not have a significant effect on the probability of delivering at a health facility.[5] The results in Row (3) of Table 3 show that participants in the treatment group were 0.8 percentage points more likely to give birth at home or in the car on the way to the facility. After controlling for confounding factors, the likelihood of delivering at home or on the way to the hospital becomes negative, but remains small. However, the effect is imprecisely estimated. It should be noted that only 10% of women in the sample did not give birth at a facility, making it a low frequency event.

The large and significant impact of the intervention on the timing of first ANC visit requires further investigation. As a result, we explored the impact of the intervention on months of gestation at the time of accessing ANC services in order to quantify the impact of the intervention. For this purpose, we regress the months of gestation at the time of accessing ANC onto the binary variable equal to one if a participant is in the treatment group. This provides me with a more quantifiably relatable measure of the impact of the intervention. The results are shown in Table 4.

Participants are likely to access the antenatal clinic on average 1.2 months earlier if they are in the treatment group (significant at 1% level). After controlling for confounding factors, the effect becomes slightly bigger at 1.35 months earlier, and remains statistically significant at a level of 1 percent.

[5] This is not unexpected given that this was not one of the targeted and incentivised outcomes. Women in the treatment group did receive health information from CHWs to help them prepare for delivery and to educate them on recognising the signs of labour. However, this did not translate into more facility deliveries. Other channels, such as whether a participant owned a car, was also controlled for but did not deliver conclusive results. Geographical access should also not be a problem in this study given its urban context. Haddad and co-authors find that geographical access to clinics in peri-urban Pretoria was difficult for approximately 20% of their sample, but that this had no impact on their care-seeking behaviour (Haddad *et al.*, 2016). To conclude, the barriers to giving birth at facilities are not clear from this analysis.

Table 3: The impact of the intervention on main health facility attendance outcome variables

		Coefficient estimated (unadjusted)	(SE)	**Coefficient estimate (adjusted)**	(SE)	Obser-vations
Went to the ANC more than four times						
	Treatment	0.234**	(0.0990)	0.227**	(0.110)	61
Went to ANC before 5 months' gestation						
	Treatment	0.325***	(0.103)	0.345***	(0.120)	61
Gave birth at home or on the way to the facility						
	Treatment	0.00852	(0.0714)	-0.0347	(0.077)	72

Significance: *** p<0.01, ** p<0.05, * p<0.1. SE = Standard error
Notes: Both adjusted and unadjusted coefficient estimates control for the difference in time that participants were exposed to the study.
Other confounding variables controlled for in the adjusted coefficient estimates are age, education, population group, asset wealth, being foreign, household size, first pregnancy, and found out that they were pregnant from the CHW pregnancy test.
In result (2), where we observe the effect of the number of visits on frequency of visits, we also control for the binary treatment variable.

Table 4: The impact of the intervention on months of gestation participants accessed care

	Coefficient estimated (unadjusted)	(SE)	**Coefficient estimate (adjusted)**	(SE)	Obser-vations
Treatment	-1.170***	(0.418)	-1.348***	(0.433)	72

Significance: *** p<0.01, ** p<0.05, * p<0.1. SE = Standard error
Notes: Both adjusted and unadjusted coefficient estimates control for the difference in time that participants were exposed to the study.
Other confounding variables controlled for in the adjusted coefficient estimate are age, education, population group, asset wealth, being foreign, household size, first pregnancy, and found out that they were pregnant from the CHW pregnancy test.

3.3 Possible channels of effect

The next step is to explore the reason for this behavioural change amongst participants in the treatment group. Two theories are considered, namely time-inconsistent preferences and top-of-mind effects.

Time-inconsistent preferences

The tests for the impact of the intervention on overcoming time-inconsistent preferences as the mechanism for improving the frequency and timing of antenatal care are shown in Tables 5 and 6 respectively. The proxy testing for time-inconsistent preferences is the "revealed

time-inconsistent variable" po(equal to one if participant revealed time-inconsistent preferences). The table shows the results from the interaction of the treatment dummy with the time-inconsistent variable, the coefficient on the time-inconsistent variable and the coefficient estimate on the treatment variable.

In Table 5 we show that the treatment did not affect antenatal care seeking frequency through participants with time-inconsistent preferences. Although women in the treatment group were 22.6 percentage points more likely to access care frequently than women in the control group, this estimate declined to 5 percentage points (0.226 Treatment -0.177 Treatment*Time-inconsistent preferences) for women in the treatment group with time-inconsistent preferences. The coefficient on the time-inconsistent preference variable is also positive, indicating that that women in the control group with time-inconsistent preferences were more likely to access care frequently, compared to participants in the treatment group with time-inconsistent preferences (Table 5, Test 1). This result is contrary to what one would expect given the literature. One possibility is that time-inconsistent preferences were poorly measured. A further concern may be the small cell sizes. The same is true for the timing of antenatal care seeking behaviour (table 6).

Table 5: The impact of the intervention on overcoming time-inconsistent preferences: frequency of care[6]

	Went to the ANC four times or more	**Coefficient estimated (unadjusted)**	**SE**	**Coefficient estimated (unadjusted)**	**SE**
Test 1	Time-inconsistent preference*Treatment			-0.177	(0.235)
	Time-inconsistent preference	0.120	(0.116)	0.221	(0.177)
	Treatment	0.224**	(0.0995)	0.226**	(0.115)

Significance: *** p<0.01, ** p<0.05, * p<0.1. SE = Standard error

Notes: All estimates control for the difference in time that participants were exposed to the study.

Other confounding variables controlled for in the adjusted coefficient estimate are age, education, population group, asset wealth, being foreign, household size, first pregnancy, and found out that they were pregnant from the CHW pregnancy test.

[6] In this interaction analysis, there were 10 participants who had both time-inconsistent preferences and were in the treatment group; there were overall 16 participants who revealed time inconsistent preferences, and 31 respondents in the treatment group.

Table 6: The impact of the intervention on overcoming time-inconsistent preferences: timing of care[7]

	Went to ANC before 5 months' gestation	Coefficient estimated (unadjusted)	SE	Coefficient estimated (unadjusted)	SE
Test 1	Time-inconsistent preference*Treatment			-0.242	(0.245)
	Time-inconsistent preference	-0.0105	(0.121)	0.128	(0.185)
	Treatment	0.326***	(0.105)	0.385***	(0.120)

Significance: *** p<0.01, ** p<0.05, * p<0.1. SE = Standard error
Note: All estimates control for the difference in time that participants were exposed to the study.
Other confounding variables controlled for in the adjusted coefficient estimate are age, education, population group, asset wealth, being foreign, household size, first pregnancy, and found out that they were pregnant from the CHW pregnancy test.

Top-of-mind effect

The tests for whether the intervention had an impact on the frequency and timing of ANC visits via a "top-of-mind" effect is shown in Tables 7 and 8 respectively. We investigate whether the intervention had different effects for those who were dealing with time-consuming responsibilities in the form of having several children or household members, for whom the pregnancy was unplanned (and may therefore engage in avoidance behaviour) or who had fewer years of schooling (and who may therefore be more vulnerable to distractions).

We find mixed evidence that the intervention had a small and positive effect on health-seeking behaviour amongst women who may have been overwhelmed by their day-to-day activities. For respondents in the treatment group, there is an increased likelihood of accessing care frequently (Table 7, test 1 and 2) and earlier (Table 8, test 1 and 2) for every extra child or for extra household member.

However, the effect does not persist when considering unplanned pregnancies (test 3). Women in the treatment group with unplanned pregnancies were 4.85 percentage points less likely to access care four times or more than women in the treatment for whom the pregnancy was planned (Table 7). They were also 34 percentage points less likely to access care before 5 months of gestation than women in the treatment group for whom the pregnancy was planned (Table 8). Additionally, women in the control group with unplanned pregnancies were more likely to access care earlier than women in the treatment group with unplanned pregnancies. Although the overall effect of unplanned pregnancies on timing of care is

[7] In this interaction analysis, there were 10 participants who had both time-inconsistent preferences and were in the treatment group; there were overall 16 participants who revealed time inconsistent preferences, and 31 respondents in the treatment group.

negative as expected, interacting it with the treatment variable delivers counterintuitive results. Therefore, having an unplanned pregnancy may not be a good proxy for women who were 'overwhelmed'.

Table 7: The impact of the intervention through a "top-of-mind" effect: frequency of care

	Went to the ANC four times or more	Coefficient estimated (unadjusted)	SE	Coefficient estimated (unadjusted)	SE
Test 1	Number of children*Treatment			0.133	(0.0838)
	Number of children	-0.0278	(0.0610)	-0.117	(0.0822)
	Treatment	0.204*	(0.111)	0.032	(0.155)
Test 2	Household size*Treatment			0.0503	(0.0484)
	Household size	-0.0383	(0.0274)	-0.0708	(0.0418)
	Treatment	0.227**	(0.110)	0.0429	(0.219)
Test 3	Unplanned pregnancy*Treatment[8]			-0.0485	(0.241)
	Unplanned pregnancy	-0.208*	(0.115)	-0.182	(0.173)
	Treatment	0.182*	(0.108)	0.214	(0.194)

Significance: *** p<0.01, ** p<0.05, * p<0.1. SE = Standard error

Notes: All estimates control for the difference in time that participants were exposed to the study.

Other confounding variables controlled for in the adjusted coefficient estimate are age, education, population group, asset wealth, being foreign, household size, first pregnancy, and found out that they were pregnant from the CHW pregnancy test.

Table 8: Does the intervention work via a "top-of-mind" effect on timing?

	Went to ANC before 5 months' gestation	Coefficient estimated (adjusted)	SE	Coefficient estimated (adjusted)	SE
Test 1	Number of children*Treatment			0.102	(0.0896)
	Number of children	-0.0675	(0.0639)	-0.136	(0.0873)
	Treatment	0.340***	(0.118)	0.203	(0.168)
Test 2	Household size*Treatment			0.0297	(0.0559)
	Household size	-0.0251	(0.0295)	-0.0443	(0.0467)
	Treatment	0.345***	(0.120)	0.236	(0.237)
Test 3	Unplanned pregnancy*Treatment[9]			-0.341	(0.258)
	Unplanned pregnancy	-0.0909	(0.125)	0.0912	(0.185)
	Treatment	0.318***	(0.118)	0.543**	(0.207)

Significance: *** p<0.01, ** p<0.05, * p<0.1. SE = Standard error

Notes: All estimates control for the difference in time that participants were exposed to the study.

Other confounding variables controlled for in the adjusted coefficient estimate are age, education, population group, asset wealth, being foreign, household size, first pregnancy, and found out that they were pregnant from the CHW pregnancy test.

[8] Please note that there were 43 women in this sample for women the pregnancy was unplanned, 21 of which were in the treatment group.

[9] Please note that there were 43 women in this sample for women the pregnancy was unplanned, 21 of which were in the treatment group.

4. Discussion

The package intervention was successful in improving the frequency and timing of antenatal care visits. Specifically, the intervention led to an increase in the probability that a woman would make at least four antenatal care visits and significantly increased their timing of a first antenatal care visit by a month.

It is possible that our intervention had a positive effect on the health outcomes of infants due to the content of the incentive. The soap and recipe for a home remedy for diarrhoea may decrease the incidence of diarrhoea and dehydration caused by diarrhoea (Shahid, Greenough, William, Samadi, Huq & Rahman, 1996; Curtis & Cairncross, 2003).

The kangaroo mother/father care wrap promotes skin-to-skin contact and also has various psychological benefits (Bergman, Linley & Fawcus, 2004). Fathers were also explicitly encouraged to use the wrap in order to promote bonding between infant and father. These effects were not measured due to budgetary limitations.

The results from the study can be applied to low-income women living in an urban setting in South Africa. The study is implemented in the Eastern health sub-district in the Metro-region of the Western Cape. The Metro as a district compares relatively poorly against the other districts of the Western Cape in terms of timing of antenatal visits. However, a programme designed to affect behaviour should take into account both the "monetary and psychological" (Kane, Johnson, Town & Butler, 2004) costs faced by persons needing preventative care. Although the monetary costs faced by our sample may be replicable to other low-income, urban settings, the psychological costs and cultural barriers may differ.

Furthermore, the effect of antenatal care on improving maternal and infant health outcomes often varies by country and subgroups (Conway & Deb, 2005; Conway & Kutinova, 2006; Liu *et al.*, 2015). Conway and Deb, using US data, show that infant birth weight can be increased by 30-35g for each week antenatal care is sought earlier. However, the effect only exists for normal as opposed to complicated pregnancies (Conway & Deb, 2005). Similarly, Liu et al. find that the effects are only significant for women who delivered vaginally, rather than via caesarean (Liu *et al.*, 2015).

Another aspect to consider when exploring the feasibility of scaling up the intervention is the socio-economic position of the recipient. An incentive size which does not lead to coercive behaviour is one which not only covers the direct financial cost and opportunity cost of accessing preventative healthcare (Lunze & Paasche-Orlow, 2013).

A limitation to our study is that it does not control for the quality of care received at the facilities. As a result, it may be that this increased care seeking behaviour does not even translate into improved health outcomes. The conditional cash transfer programmes in Latin America were designed in such a way that increased demand is also met with an improvement in supply. This is necessary to consider when scaling up the intervention.

5. Conclusion

A package intervention consisting of an incentive and community health worker support were successful in promoting the frequency and timing of antenatal care visits in a low-income, urban setting in Cape Town, South Africa. These outcomes fall within the United Nation's Sustainable Development Goals and local South African policy to improve maternal health outcomes.

South African maternal mortality rates are relatively high given the country's level of economic development. A large number of these deaths can be attributed to the prevalence of HIV amongst pregnant women. Given the South African context and the importance of early care-seeking behaviour in improving the health outcomes of HIV positive pregnant women, the intervention can be successful tool to improve maternal health outcomes.

* * *

Endnote

Competing interests: The authors declare that we have no competing interests.

Authors' contribution: LR, RPB and RB all contributed to designing the study. Implementation, fieldwork and project management, and statistical analysis were performed by LR. Manuscript drafting was performed by LR, RB and RPB. All the authors read and approved the final manuscript.

Ethics approval and consent to participate: This study was approved by the Stellenbosch University Humaniora Research Ethics Committee (HS 1020/2014). Participation was voluntary and all participants signed an informed consent form.

Availability of data and materials: Data on which conclusions were drawn will not be shared. This limitation is due to several reasons. Firstly, the sensitivity of the data stems from personal data gathered from participants which may make it possible to identify them. Secondly, funding for the project was received from various sources, with the condition that several articles be delivered from the study. Sharing of the data may jeopardise publication of these deliverables. Finally, approval from our institution's ethics committee includes a very strict data protection policy.

References

Ashraf, N., Bandiera, O. & Jack, B.K. 2014. No margin, no mission? A field experiment on incentives for public service delivery. *Journal of Public Economics*. 120:1–17.

Banerjee, A. V., Duflo, E., Glennerster, R. & Kothari, D. 2010. Improving immunisation coverage in rural India: clustered randomised controlled evaluation of immunisation campaigns with and without incentives. *Bmj*. 340(may17 1):c2220–c2220.

Barham, T. 2011. A healthier start: The effect of conditional cash transfers on neonatal and infant mortality in rural Mexico. *Journal of Development Economics*. 94(1):74–85.

Bergman, N.J., Linley, L.L. & Fawcus, S.R. 2004. Randomized controlled trial of skin-to-skin contact from birth versus conventional incubator for physiological stabilization in 1200- to 2199-gram newborns. *Acta pædiatrica*. 93.

Bradshaw, D. & Dorrington, R.E. 2012. Maternal mortality ratio - trends in the vital registration data. *Sajog-South African Journal of Obstetrics and Gynaecology*. 18(2):38–42.

Brauw, A. De, Gilligan, D.O., Hoddinott, J., Moreira, V. & Roy, S. 2012. The impact of Bolsa Familia on child, maternal, and household welfare. *IFPRI. Washington, DC.* (Jan).

Carroli, G., Rooney, C. & Villar, J. 2001. How effective is antenatal care in preventing maternal mortality and serious morbidity? An overview of the evidence. *Paediatric and Perinatal Epidemiology*. 15:1–42.

Conway, K.S. & Deb, P. 2005. Is prenatal care really ineffective? Or, is the "devil" in the distribution? *Journal of Health Economics*. 24(3):489–513.

Conway, K.S. & Kutinova, A. 2006. Maternal health: Does prenatal care make a difference? *Health Economics*. 15(5):461–488.

Cooper, D., Morroni, C., Orner, P., Moodley, J., Harries, J., Cullingworth, L. & Hoffman, M. 2004. Ten Years of Democracy in South Africa: Documenting Transformation in Reproductive Health Policy and Status. *Reproductive Health Matters*. 12(24):70–85.

Curtis, V. & Cairncross, S. 2003. Effect of washing hands with soap on diarrhoea risk in the community : a systematic review. *Lancet Infectious diseases*. 3(0).

Daaleman, T. 1997. The effect of a paraprofessional home visiting program on utilization of prenatal care. *Kansas Medicine*. 98(2):6–9.

Dupas, P. 2005. The Impact of Conditional In-Kind Subsidies on Preventive Health Behaviors: Evidence from Western Kenya. *Health*. 1–38.

Dupas, P. 2011. Health Behavior in Developing Countries. *Annual Review of Economics*. 3(1):425–449.

Eichler, R., Levine, R. & Group, P.-B.I.W. 2009. *Performance incentives for global health: potential and pitfalls*. Washington DC: CGD Books.

Gertler, P. 2004. Do conditional cash transferts improve child health: Evidence from PROGRESA's control randomized experiment. *American Economic Review*. 94(2):336–341.

Gissler, M., Geraedts, M., Hemminki, E., & Buekens, P. 1998. Insufficient prenatal care in Finland and Baden-Wurttemberg: Characteristics of women and infant outcome. *The European Journal of Public Health*. 8(3):227–231.

Haddad, D.N., Makin, J.D., Pattinson, R.C. & Forsyth, B.W. 2016. Barriers to early prenatal care in South Africa. *International journal of gynaecology and obstetrics*. 132(1):64–67.

Issel, L.M., Forrestal, S.G., Slaughter, J., Wiencrot, A. & Handler, A. 2011. A Review of Prenatal Home-Visiting Effectiveness for Improving Birth Outcomes. *JOGNN - Journal of Obstetric, Gynecologic, and Neonatal Nursing*. 40(2):157–165.

Julnes, G., Konefal, M., Pindur, W. & Kim, P. 1994. Community-based perinatal care for disadvantaged adolescents: evaluation of The Resource Mothers Program. *Journal of Community Health*. 19(1):41–53.

Kane, R.L., Johnson, P.E., Town, R.J. & Butler, M. 2004. A structured review of the effect of economic incentives on consumers' preventive behavior. *American Journal of Preventive Medicine*. 27(4):327–352.

Kela. 2015. *Maternity Package*. [Online], Available: http://www.kela.fi/web/en/maternitypackage [2016, February 29].

Kremer, M. & Miguel., E. 2004. The illusion of sustainability. *National Bureau of Economic Research*. No. w10324.

Lagarde, M., Haines, A. & Palmer, N. 2014. Conditional Cash Transfers for Improving Uptake of Health Interventions in Low- and Middle-Income Countries. *Jama*. 298(16):1900–1910.

Laken, M.P. & Ager, J. 1995. Using incentives to increase participation in prenatal care. *Obstetrics & Gynecology*. 85(3):326–329.

Lim, S.S., Dandona, L., Hoisington, J.A., James, S.L., Hogan, M.C. & Gakidou, E. 2010. India's Janani Suraksha Yojana, a conditional cash transfer programme to increase births in health facilities: an impact evaluation. *The Lancet*. 375(9730):2009–2023.

Liu, T.C., Chen, B., Chan, Y.S. & Chen, C.S. 2015. Does prenatal care benefit maternal health? A study of post-partum maternal care use. *Health Policy*. 119(10):1382–1389.

Lunze, K. & Paasche-Orlow, M.K. 2013. Financial Incentives for Healthy Behavior. *American Journal of Preventive Medicine*. 44(6):659–665.

McQuide, P.A., Delvaux, T. & Buekens, P. 1998. Prenatal care incentives in Europe. *Journal of public health policy*. 19(3):331–349.

Melnikow, J., Paliescheskey, M. & Stewart., G.K. 1997. Effect of a Transportion Incentive on Compliance With the First Prenatal Appointment: A Randomized Trial. *Obstetrics & Gynecology*. 89(6):1023–1027.

Moodley, T., Moodley, D., Sebitloane, M., Maharaj, N. & Sartorius, B. 2016. Improved pregnancy outcomes with increasing antiretroviral coverage in South Africa. *BMC Pregnancy and Childbirth*. 16(1):35.

National Department of Health. 2012. *District health information systems (DHIS) database*. Pretoria: National Department of Health.

Pattinson, R.C. 2012. Saving mothers 2008–2010: fifth report on the confidential enquiries into maternal deaths in South Africa. *Pretoria: National Department of Health.* 1–352.

Ranganathan, M. & Lagarde, M. 2012. Promoting healthy behaviours and improving health outcomes in low and middle income countries: A review of the impact of conditional cash transfer programmes. *Preventive Medicine*. 55(SUPPL.):S95–S105.

Rogers, M.M., Peoples-Sheps, M.D., Suchindran, C., M.M., R., M.D., P.-S. & C., S. 1996. Impact of a social support program on teenage prenatal care use and pregnancy outcomes. *J Adolesc Health*. 19(2):132–140.

Rosenthal, M.B., Li, Z., Robertson, A.D. & Milstein, A. 2009. Impact of financial incentives for prenatal care on birth outcomes and spending. *Health Services Research*. 44(5 PART 1):1465–1479.

Rotheram-Borus, M.J., Tomlinson, M., Le Roux, I. & Stein, J.A. 2015. Alcohol Use, Partner Violence, and Depression. *American Journal of Preventive Medicine*. 49(5):715–725.

Le Roux, I.M., Tomlinson, M., Harwood, J.M., O'CONNOR, M.J., Worthman, C.M., Mbewu, N. & A, J.S. et. 2013. Outcomes of Home Visits for Pregnant Mothers and their Infants: a Cluster Randomised Controlled Trial. *AIDS (London, England)*. 27(9):1461–1471.

Le Roux, I.M., Rotheram-Borus, M.J., Stein, J. & Tomlinson, M. 2014. The impact of paraprofessional home visitors on infants' growth and health at 18 months. *Vulnerable children and youth studies*. 9(4):291–304.

Schnippel, K., Mongwenyana, C., Long, L.C. & Larson, B.A. 2015. Delays, interruptions, and losses from prevention of mother-to-child transmission of HIV services during antenatal care in Johannesburg, South Africa: a cohort analysis. *BMC infectious diseases*. 15:46.

Shahid, N.S., Greenough, William, B., Samadi, A.R., Huq, M.I. & Rahman, N. 1996. Hand washing with soap reduces diarrhoea and spread of bacterial pathogens in a Bangladesh village. *Journal of diarrhoeal diseases research*. 85–89.

Shisana, O., Rhele, T., Simbayi, L.C., Zuma, K., Jooste, S., Zungu, N., Labadarios, D. & Onoya, D. 2012. *South African national HIV prevalence, incidence and behaviour survey*. Cape Town: HSRC Press.

Sindelar, J. 2010. Paying for performance: the power of incentives over habits. *Health economics*. 17:449–451.

Smith, P.B., Weinman, M.L., Johnson, T.C. & Wait, R.B. 1990. Incentives and their influence on appointment compliance in a teenage family-planning clinic. *Journal of Adolescent Health Care*. 11:445–448.

Solarin, I. & Black, V. 2013. "They told me to come back": women's antenatal care booking experience in inner-city Johannesburg. *Maternal and child health journal*. 17(2):359–67.

Tarozzi, A., Mahajan, A., Blackburn, B.G., Kopf, D., Krishnan, L. & Yoong, J. 2014. Micro-loans, Insecticide-Treated Bednets, and Malaria: Evidence from a Randomized Controlled Trial in Orissa, India. *American Economic Review*. 104(7):1909–41.

Thornton, R.L. 2008. The Demand for, and Impact of, Learning HIV Status. *The American economic review*. 98(5):1829–1863.

Tomlinson, M., Rotheram-Borus, M.J., Harwood, J., Le Roux, I.M., O'Connor, M. & Worthman, C. 2015. Community health workers can improve child growth of antenatally-depressed, South African mothers: a cluster randomized controlled trial. *BMC Psychiatry*. 15(1):225.

United Nations. 2015. Transforming our world: the 2030 Agenda for Sustainable Development. *United National Resolutions* 70/1: Geneva.

de Walque, D., Dow, W.H., Nathan, R., Abdul, R., Abilahi, F., Gong, E., Isdahl, Z., Jamison, J., et al. 2012. Incentivising safe sex: a randomised trial of conditional cash transfers for HIV and sexually transmitted infection prevention in rural Tanzania. *BMJ Open*. 2(1):e000747–e000747.

Western Cape DOH. 2014. *Annual Performance Plan 2014*. Cape Town.

World Health Organization. 1999. *HIV in Pregnancy: A Review.* Geneva.

The **Research Project on Employment, Income Distribution and Inclusive Growth (REDI3x3)** is a multi-year collaborative national research initiative. The project seeks to address South Africa's unemployment, inequality and poverty challenges.

It is aimed at deepening understanding of the dynamics of employment, incomes and economic growth trends, in particular by focusing on the interconnections between these three areas.

The project is designed to promote dialogue across disciplines and paradigms and to forge a stronger engagement between research and policy making. By generating an independent, rich and nuanced knowledge base and expert network, it intends to contribute to integrated and consistent policies and development strategies that will address these three critical problem areas effectively.

Collaboration with researchers at universities and research entities and fostering engagement between researchers and policymakers are key objectives of the initiative.

The project is based at SALDRU at the University of Cape Town and supported by the National Treasury.

Consult the website for information on research grants and scholarships.

Tel: (021) 650-5715

www.REDI3x3.org

REDI3X3

Research Project on Employment, Income Distribution & Inclusive Growth

Towards an integrated response to unemployment, inequality and poverty