RELATIONSHIPS BETWEEN MATERNAL HEALTH CARE AND POST-PARTUM MODEN CONTRACEPTIVE USE IN KENYA AND ZAMBIA

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Abstract

This study examines associations between the use of antenatal (ANC) and post-natal care (PNC) and post-partum modern contraceptives. Data come from the most recent Demographic and Health Surveys (DHS) in Kenya (2008-09) and Zambia (2007). Study samples include women who were currently in union and had a live birth within five years before the survey (3,667 in Kenya and 3,587 in Zambia). Tests of exogeneity confirmed that the intensity of ANC and PNC service use and post-partum modern contraceptive practice were not influenced by common unobserved factors. Cox proportional hazard models showed significant associations between the service intensity of ANC and PNC combined, as well as ANC only, and post-partum modern contraceptive use in both countries. No significant associations were observed between PNC service intensity and post-partum FP practice. The study highlights a window of opportunity to promote the use of modern contraceptives after childbirth through ANC service delivery.

Key words: antenatal care, postnatal care, post-partum, family planning, Kenya, Zambia

INTRODUCTION

Despite the vast body of literature on modern contraceptive use, it is often assumed, with little supportive, empirical evidence that women who use maternal health care are more likely than those who do not to use modern contraceptives. It can be a plausible assumption for several reasons. First, family planning (FP) services are often provided within the context of maternal and child health care; therefore women who access these services may likely be exposed to FP counseling and promotion efforts. This mechanism may be particular relevant for women with a high risk pregnancy as health care providers may emphasize post-partum contraception to avoid subsequent pregnancy and health risks (Cicely, Baumslag, & Jelliffe, 1994). Second, as a woman obtains maternal and child health care, she may develop a trust with the health care system. This trust can help remove social barriers to accessing FP services and provide motivations for her to use multiple services from the health care system. Such an effect is independent of whether FP services are included in maternal health care packages. In addition, a woman's early contact with the health care system may also reduce cognitive, psychosocial, and indirect financial barriers - in the forms of time and opportunity costs - to subsequent FP service use. Finally, the use of maternal and child health care likely contributes to improved infant and child survival, motivating mothers to seek and use FP methods.

A surprisingly limited number of research studies have examined linkages between the use of maternal health care, namely antenatal care (ANC), delivery, and postnatal care (PNC), with contraceptive use after a child birth (Ahmed & Mosley, 2002; D. R. Hotchkiss et al., 1999). Results of these studies are mixed in terms of whether maternal health care would lead to FP use after a childbirth, or whether women's use of maternal health care and FP services is determined by some common factors. Zerai and Tsui (2001) reported a strong influence of ANC use on subsequent use of modern contraception in Bolivia, Egypt, and Thailand. The evidence in Bolivia and Egypt also indicated that ANC was an immediate pathway for socio-demographic and other individual-level characteristics to influence contraceptive use, whereas in Thailand, ANC use was not necessarily required to facilitate contraceptive use (Zerai & Tsui, 2001).

More recently, Hotchkiss et al. (2005) examined this topic in five countries: Bolivia, Guatemala, Indonesia, Morocco, and Tanzania. Unlike in Zerai and Tsui (2001), where a dichotomous indicator of ANC usage was used, a continuous index of the intensity of maternal and child health (MCH) service use was constructed based on a series of questions related to

ANC, delivery care, and child vaccination in Hotchkiss et al. (2005). In Morocco, Guatemala, and Indonesia, the evidence suggested that the use of MCH services might have served as a "gateway" to FP use (D.R. Hotchkiss, et al., 2005). In the other two countries, however, the authors found that positive associations between MCH service use and FP practice were best explained by observed and unobserved factors that might have predisposed women to both practices (D.R. Hotchkiss, et al., 2005). Evidence in these two countries is consistent with earlier research findings (Ahmed & Mosley, 2002; D. R. Hotchkiss, et al., 1999).

This current study aims to add to the body of evidence on the associations between maternal health care and FP practice. It seeks to answer the following research questions: 1) is the use of modern FP methods after a childbirth related to the use of antenatal (ANC) and postnatal care (PNC) relating to that index childbirth? and 2) if so, what can be said about the linkages between these services?

DATA AND METHODS

1. Data

This study focuses on Kenya and Zambia, selected for the following reasons: 1) each country has a Demographic and Health Survey (DHS) conducted in 2007 or later; 2) the DHS included a birth and contraceptive calendar; and 3) there was substantial contraceptive use among married and cohabiting women (prevalence of 20% or more). The criteria are to ensure that the study samples will include sufficiently large numbers of contraceptive users after the most recent childbirth to allow meaningful analyses.

At the time of this study, the most recent DHS was conducted in 2008-09 in Kenya and 2007 in Zambia. Data from these surveys are used in this study. Both are based on nationally representative samples of households, men, and women of reproductive age and collected up-to-date information on a number of demographic and health indicators, including: fertility, mortality, FP, maternal and child health, etc. and HIV/AIDS. Details of the sampling procedure can be found in in each country's DHS final report (Central Statistical Office (CSO), Ministry of Health (MOH), Tropical Diseases Research Centre (TDRC), University of Zambia, & Macro International Inc, 2009; Kenya National Bureau of Statistics (KNBS) & ICF Macro, 2010). Data used in this analysis come from information collected with the Woman's Questionnaire. Only women who were currently married or cohabiting with their partners and had a live birth within

five years before the survey were included in this study, resulting in study samples of 3,667 women in Kenya and 3,587 women in Zambia.

2. Outcome

The outcome of interest is the use of modern contraceptive methods after the last childbirth. Information comes from the birth and contraceptive use calendar, included in the DHS Women's Questionnaire, which records month-by-month all events related to pregnancy, pregnancy outcomes, childbirth, breastfeeding, and contraceptive use for 60 months before the survey. The outcome is measured by duration (in months) from the time of the last childbirth to the time that a woman started using a modern method of contraception. At the time of the survey, if a woman had not adopted any modern contraceptive method, she is considered a censor.

3. Independent variables

The main independent variable of interest is the use of ANC and PNC services relating to the last childbirth within five years before the survey. The following questions and categories are used to construct this variable:

1. Whether a woman used ANC services and if so, when she had the first visit (non-use of ANC services, first trimester, second trimester, or last trimester);

2. The number of ANC visits (less than 4 versus 4 or more visits);

3. Whether a woman received tetanus vaccine during her pregnancy (yes versus no);

4. Whether ANC services were provided by a trained provider, including doctors, nurses, and midwives (yes versus no);

5. Whether a woman received the following ANC procedures, including measuring weight, height, blood pressure, taking urine sample and blood sample, breastfeeding counseling, and being told about signs of complications (yes versus no);

6. Whether a woman received PNC checkup and if so, whether it was provided by a trained provider, including: doctors, nurses, and midwives (yes versus no).

Dummy variables were created to indicate binary responses to each question or category. Principal component analysis was used to construct scores that measure the intensity of both ANC and PNC services, as well as the intensity of ANC and PNC services separately. The internal reliability coefficient of these constructs ranges from .77 to .82 in Kenya, and from .50

to .71 in Zambia, indicating a reasonable to high level of correlation between the items used. These continuous service intensity variables were used as the main predictors in the analyses.

Other controlling variables include women's basic socio-demographic characteristics and several variables that may influence contraceptive use. Factors that are hypothesized to directly affect contraceptive in this study include: knowledge of contraceptive methods (measured as the number of modern contraceptive methods known), whether a woman was visited and talked about FP by a field worker in the last 12 months before the survey, whether a woman visited and talked about FP at a health facility in the last 12 months, desire for more children, use of any modern contraceptive method prior to the index[1] childbirth, and whether a woman recalled a FP message in the mass media (TV, radio, and newspapers). Age of the women at their first childbirth may indicate potentially greater risks of pregnancy complications and was hypothesized to be related to ANC use. Durations of breastfeeding and post-partum[2] amenorrhea were also controlled for as they may influence women's decision to start using contraceptives.

4. Methods

Cox proportional hazard model was employed to examine the time duration from the last childbirth to a woman's adoption of a modern contraceptive, as well as factors influencing this interval. Multivariate models were used to assess associations between ANC and PNC service intensity and the outcome, controlling for potential confounders.

Because there is a possibility that ANC and PNC service utilization is endogenous to post-partum modern FP use, i.e. they are determined by the same observed and unobserved women's characteristics, test of exogeneity was performed. We followed the procedure laid out by Bollen, Guilkey and Mroz (1995), which involved estimating two equations: the first equation is an ordinary least square estimation of ANC and PNC service intensity score; the second equation is a proportional hazard model, in which the error term obtained from the first equation was included with the actual service intensity score. If the hazard ratio associated with the error term is not significantly different from zero, one would accept the null hypothesis that the ANC/PNC service intensity is exogenous in the contraceptive use equation. On the other hand, if

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[1] The index childbirth in this study is the last childbirth within five years before the survey.
[2] The term "post-partum" is used loosely in this study to indicate the time after childbirth.

the hazard ratio of the error term is statistically significant from zero, there is evidence of endogeneity and a two-step equation system should be used.

This two-equation procedure also requires ANC/PNC service intensity and post-partum modern FP use to be identified by distinct variables or sets of variables, although some of the determinants may overlap (Bollen, et al., 1995). These are instrumental variables that are theoretically related to one of the dependent variables and not related to the other. In this study, age of women's at first birth was hypothesized to present pregnancy risks and to be related to ANC/PNC services only. Several factors, including the desire for more children, knowledge of modern contraceptives, visits by a FP field worker as well as to a health facility, as well as exposre to FP messages in the media (TV, radio, and newspapers) were hypothesized to be directly associated with only post-partum modern FP use. Hausman specification and log-likelihood ratio tests were used to examine whether the exclusion of these variables from the respective equations was appropriate.

In both countries, the test of exogeneity showed no statistically significant associations between post-partum modern FP use and the error term of ANC/PNC service intensity (results not shown). Specification tests also confirmed that the exclusion of the instrumental variables did not make a difference to the respective equations. Therefore, the intensity of ANC/PNC service use can be employed as a predictor in the proportional hazard model for post-partum modern FP use.

COUNTRY ANALYSIS

The following sections present findings from each country. For the purpose of this study, the discussion focuses on factors that influence post-partum modern contraceptive use, although regression results for ANC/PNC service intensity are also presented in the tables.

1. Kenya

1.1.Country background

Until the first Demographic and Health Survey (DHS) in 1989, Kenya had one of the highest birth rates in the world and experienced high annual population growth rates. FP services were then integrated with maternal and child health (MCH) services but the development of the program was relatively slow (Miller, Ndhlovu, Gachara, & Fisher, 1991). The FP program

became multi-sectoral in the 1980s, with increasing roles of the private sector (Blacker, Opiyo, Jasseh, Sloggett, & Ssekamatte-Ssebuliba, 2005). Nevertheless, the government continues to be the major provider of contraceptives, particularly as most private and NGOs switched to HIV/AIDS activities because of the shift of funding priorities by major donors: 53 percent of all modern method users in 2003 obtained contraceptives from a public sector source (Central Bureau of Statistics (CBS) [Kenya], Ministry of Health (MOH) [Kenya], & ORC Macro, 2004; Family Health International (FHI), 2004).

The use of ANC is widespread: nearly 90% of pregnant women received ANC from a trained medical provider in 2003 (Central Bureau of Statistics (CBS) [Kenya], et al., 2004). The average number of ANC visits per pregnancy is about 4; yet, women often obtain ANC later in the pregnancy: the median pregnancy duration at the first ANC visit is about 5 months (Kenya National Bureau of Statistics (KNBS) & ICF Macro, 2010; Magadi, Madise, & Rodrigues, 2000). An analysis of the Kenya DHS 2003 found a positive association between the number of ANC visits and post-partum FP use (USAID & ACCESS, 2007). However, discussions of FP during ANC visits are rare (Birungi & Onyango-Ouma, 2006; Ministry of Health (MOH) [Kenya], National Council for Population and Development, & ORC Macro, 2000). Results from a recent pilot introduction of an integrated service package showed that the integration was acceptable to both clients and providers (Birungi & Onyango-Ouma, 2006); yet currently there are no standards or guidelines for the integration of these services.

PNC use is much less common compared with the use of ANC services, in part due to a lack of attention and support for post-partum care among both providers and the public (The Safe Motherhood Demonstration Project, 2005). In 2003, just about a half of women received any PNC after a recent childbirth (Central Bureau of Statistics (CBS) [Kenya], et al., 2004). The under-utilization of PNC presents missed opportunities for FP discussion as many Kenyan women reported that PNC visit would be a good time for such a discussion and FP method provision (Warren, Daly, Toure, & Mongi, 2006). Indeed, an intervention that introduced a package of PNC and FP services in Kenya has shown to result in substantial improvement in post-partum FP uptake, as well as earlier initiation of FP use after a childbirth (Mwangi et al., 2008). Few other research studies in Kenya have also suggested that FP services integrated with MCH services might result in increased contraceptive use and fertility decline, even in rural

areas (Goldberg, McNeil, & Alison, 1989; Solo, Billings, Aloo-Obunga, Ominde, & Makumi, 1999).

1.2.Findings

Forty-six percent (1,689) of the Kenyan sample had adopted a modern method of contraception at some point between the last childbirth and the time of the survey. The median time between childbirth and modern contraceptive adoption was 5 months among users. To aid the visual description of post-partum contraceptive use, Figure 1 displays the rate of FP adoption stratified by high and low scores of the ANC and PNC service intensity (cut-off point is the median score).

Figure 1 about here

This figure shows that women who had a high score of ANC/PNC service intensity consistently adopted modern contraceptives earlier and at a higher rate, compared to women with a low ANC/PNC service intensity score. In both groups, contraceptive adoption increased quickly in the first six months after childbirth. In the high service intensity score group, as many as one in four women started using a modern contraceptive within the first 6 months post-partum. The rates of contraceptive adoption slowed down markedly in both groups between 6 and 18 months after childbirth, and became plateau after this point.

Column 1 of Table 1 presents the distribution of the Kenyan study sample. The vast majority (93%) of women in the sample received ANC services; however, Kenyan women initiated ANC fairly late during the pregnancy: 61.3% of them did not initiate ANC until the second trimester; another 15.9% started getting ANC only in the last trimester. More than half (53%) of the Kenyan sample did not meet the WHO's standard of 4 ANC visits during a pregnancy. PNC service use was much less frequent compared with ANC services: only 48.8% of women in the sample received any PNC after the index childbirth.

Among women's characteristics, it is noteworthy that a small, but significant proportion (13%) of them were living in a polygamous marriage. A substantial proportion (18.8%) of women who recently gave birth were not currently married. Women were 19 years old on average at their first birth. About half of the study women wanted to have more children after the index childbirth. Less than half (46.4%) had used a modern method of contraception prior to the index birth. Women in the sample knew 6.72 methods of contraception on average. Most

(91.92%) of them were not visited by a FP field worker within the last 12 months; the majority (70%) also never visited and talked about FP at a health facility during the same time period.

Table 1 about here

ANC/PNC service intensity and post-partum modern contraceptive use

Results shown in column 2 of Table 1 indicate several factors that were significantly related to ANC and PNC service use, including: urban residence, education, household wealth, marital status, prior use of modern contraceptives, and age at first birth. It is important to note that women who ever used a modern method of contraception before the conception of the index child used ANC/PNC services more intensively than did others (p<.001).

Column 3 presents results of the proportional hazard model, predicting post-partum modern contraceptive use, controlling for factors that may influence contraceptive use behaviors. ANC/PNC service intensity was significantly related to the contraceptive use outcome. After controlling for other factors that may influence FP use, an increased ANC/PNC intensity score was significantly associated with a moderate but significant increase in the likelihood of modern FP use after a woman's last birth (hazard ratio=1.11; p<.01).

We also examined the relative importance of the intensity of ANC and PNC services separately to post-partum FP use. Table 2 shows partial results of the multivariate proportional hazard model where two intensity scores were used for ANC and PNC services instead of the composite intensity score. These results indicate a strongly significant, positive association between ANC service intensity and post-partum modern contraceptive use (p<.01). PNC service intensity was not found significantly related to post-partum modern contraceptive use. The associations between controlling factors and the contraceptive use behavior remained the same as in column 3 of Table 1 (discussed below).

Table 2 about here

Other factors associated with post-partum modern contraceptive use

Among basic socio-demographic factors, women's education, household wealth, religion, marital status, and women's employment in the last 12 months consistently had significant, positive associations with post-partum modern contraceptive use. Other important predictors of post-partum modern FP use among this Kenyan sample include: desire for more children, previous use of modern contraceptives prior to the index birth, knowledge of contraceptives,

visits to a health facility within the last 12 months, as well as listening to FP messages on the radio.

Previous use of modern contraception was a strong, positive predictor of post-partum modern FP use: women who used a modern contraceptive prior to the index birth were 1.58 times as likely as those who did not to adopt a modern method of contraception post-partum (p<.001). Modern contraceptive use after the last childbirth was also positively associated with knowledge of contraceptive methods and visits to a health facility. An increase of one method of contraception known to a woman was related to a small but significant increase of post-partum contraceptive use (hazard ratio=1.07; p<.001). The likelihood of using modern contraceptives after the last childbirth was also significantly increased among women who visited and talked about FP at a health facility within the last 12 months, compared to women who did not (hazard ratio=1.21; p<.01). Radio seemed to be the most effective medium for FP messages in this sample: having heard a FP message on the radio was related to a significantly increased likelihood of using modern contraceptives (hazard ratio=1.15; p<.05). As expected, desire for more children after the index childbirth was a negative predictor of post-partum contraceptive use. Compared to women who wanted no more children, those who wanted more children were only .88 times as likely to adopt a modern contraceptive post-partum (p<.05).

2. Zambia

2.1. Country background

Population growth was not deemed a development issue by the Zambian government until the issue of the Fourth National Development Plan in 1989-1993, which included a national population policy aiming to reduce TFR from 7.2 to 6 and to make FP services accessible and affordable to at least 30% of those in need (Lucas, 1992). Currently, only one-third of married women are using modern contraceptives (Central Statistical Office (CSO), et al., 2009).

Similarly to Kenya, the use of ANC services in Zambia is high, even in rural areas (MacKeith, Chinganya, Ahmed, & Murray, 2003; Mayhew, Lush, Cleland, & Walt, 2000; Stekelenburg, Kyanamina, Mukelabai, Wolffers, & van Roosmalen, 2004). Many women have five or more ANC visits during a pregnancy (MacKeith, et al., 2003; Ransjö-Arvidson et al., 1989). Despite a high level of client satisfaction, direct observations indicated poor quality of ANC services: just over half of ANC clients received any health education; in addition, ANC

attendance did not influence the use of other maternal health care, such as facility-based delivery (Stekelenburg, et al., 2004).

While it is recommended that mothers obtain PNC at one and six weeks after delivery, the use of PNC services remains somewhat low and varies widely. In one study in Lusaka, as many as 84% of women reported a postnatal checkup within the first six weeks after birth (MacKeith, et al., 2003). In rural areas, the proportion of PNC use within 6 weeks of delivery could be as low as 42% (Lagro, Liche, Mumba, Ntebeka, & van Roosmalen, 2006). PNC often receives much less attention that ANC and delivery care (Lagro, Liche, Mumba, Ntebeka, & van Roosmalen, 2003). Many women did not know about the existence of PNC or thought that it was only necessary if they had pregnancy complications (Nsemukila et al., 1998). Lagro et al. (2006) also reported that women who gave birth at home felt unwelcome to attend post-partum clinics. Additionally, because services are often not integrated, providers often miss the opportunities for PNC service delivery when women visit a health facility for other services, such as child vaccination (Lagro, et al., 2006).

2.2. <u>Findings</u>

Of the 3,587 Zambian who had given childbirth within five years before the survey, 1,647 (45.9%) adopted a modern method of contraception within the observation period. The median time of adoption was 8 months after the last childbirth.

<center>Figure 2 about here</center>

Figure 2 shows the rate of modern contraceptive adoption among Zambian women who had given birth within 5 years before the survey, by the score of ANC/PNC service intensity. Women who had a low ANC/PNC service score consistently adopted modern contraceptives at a lower rate than women with high service score did. For both groups, modern contraceptive adoption seemed gradual in the first 18 months after childbirth and reached the plateau at this point.

Column 1 of Table 3 presents the distribution of the Zambian study sample. Nearly every woman (97.5%) used ANC services for the index childbirth; yet, the majority (78%) did not initiate ANC visits until the second trimester or later. About 60% of the Zambian sample had at least 4 ANC visits during the index pregnancy. Only half (51.1%) of the study women used any PNC services for the index childbirth.

It should be noted that while the majority of the sample were in a monogamous marriage, one in five women in the sample were not married at the time of the survey; a moderate proportion (11.9%) were in a polygamous marital relationship. The mean age at first birth was 18.6 for women in this sample. Two-thirds of them wanted to have more children after the index birth. Just over half of the women (52.5%) had used a modern method of contraception prior to the index birth. The mean number of modern contraceptive methods known to women in the sample was 6.8. The vast majority of them (92.2%) were not visited by a FP field worker in the 12 months before the survey; about two-thirds never visited and talked about FP at a health facility within 12 months before the survey.

<div align="center">Table 3 about here</div>

ANC/PNC service intensity and post-partum modern contraceptive use

Column 2 of Table 3 shows several women's characteristics that are positively related to the use of ANC and PNC services, including: urban residence, women's education, household wealth, prior use of modern contraceptives, and women's age at the first childbirth. A significant, positive association was observed between women's prior use of modern contraceptives and ANC/PNC service use intensity (coef=.10; p<.01).

Column 3 presents results of the multivariate proportional hazard model. ANC/PNC service intensity score is shown to have a significant, positive association with post-partum modern FP use. The result indicates that after the confounders were controlled for, an increase of one point in the service intensity score was associated with a 8 percentage point increase in the likelihood of post-partum modern FP use (p<.05). When ANC and PNC services were separated in the multivariate model, as shown in Table 4, we found a similar significant, positive association between the ANC service intensity and post-partum modern contraceptive use (hazard ratio=1.08; p<.05). The PNC service intensity score was not shown to have a significant association with post-partum modern FP practice.

<div align="center">Table 4 about here</div>

Other factors associated with post-partum modern contraceptive use

The section below briefly discusses the associations between other women's characteristics and post-partum modern FP use as shown in column 3 of Table 3. These associations did not change whether the composite measure or two separate measures of ANC and PNC service intensity were used in the regressions.

Post-partum modern contraceptive use was positively associated with women's education, marital status, and women's work in the last 12 months. In addition, previous use of modern contraceptives, contraceptive knowledge, as well as visits by a FP field worker and to a health clinic in the 12 months before the survey had positive associations with modern FP use after the last childbirth. Women who had used a modern method of contraception before the index childbirth were also more likely than those who had not to adopt a modern contraceptive post-partum (hazard ratio=1.23, p<.01). An increase of a modern method of contraception known to a woman was also associated with a small but significant increase in the likelihood of modern contraceptive use (p<.01).

Visits by a FP worker as well as to a health center were both associated with an increased likelihood of modern contraceptive use after a woman's last childbirth. Compared to women who were not visited by a FP worker in the last 12 months, those who were had an increase of 20 percentage point in the likelihood of post-partum modern contraceptive use (p<.05). Women who visited and talked about FP at a health clinic were 1.23 times as likely as those who did not to use a modern method of contraception after the last childbirth (p<.001).

DISCUSSION

This study examines the associations between the use of maternal health care (including ANC and PNC services) and post-partum modern FP practice in Kenya and Zambia. The study results indicate a positive association between the intensity of ANC and PNC services and post-partum use of modern contraception in both countries. The more intensively women use ANC and PNC services, the more likely they go on to adopt a modern method of contraception after the index childbirth.

In both Kenya and Zambia, the evidence also suggests that the use of maternal health services is a mediator for individual's socio-demographic characteristics to influence post-partum modern contraceptive use. Tests of exogeneity indicate that maternal health care use and post-partum FP practice were not influenced by common unobserved factors. The two-equation system shows that in both countries, several individual characteristics influence maternal health care use, which in turns influence post-partum modern contraceptive use.

In addition, we found that when maternal health care was disaggregated into ANC and PNC services, only the use of ANC services was found to be significantly related to post-partum

modern contraceptive use. While FP counseling is not often a component of standard ANC service packages, it is possible that the use of ANC services contributes to women's trust in the health care system and overall satisfaction of health care services, which in turn may make women more likely to return for other services. The finding indicates that the promotion of ANC services should be considered as a mechanism to promote post-partum FP use. As most women who attend ANC clinics do not regularly receive any health education (Stekelenburg, et al., 2004), the provision of FP counseling during ANC visits may also serve to improve the quality of these visits and client satisfaction. In fact, previous research suggests that a pilot introduction of a focused ANC package that included FP counseling in two districts in Kenya was welcomed by providers as well as clients and significantly increased the overall quality of care (Birungi & Onyango-Ouma, 2006).

It should be noted that while the study provides statistical evidence of a causal relationship between the use of maternal health care and post-partum modern FP practice, the temporality of this relationship cannot be confirmed. The use of any modern contraceptives prior to the index childbirth was found to be significantly associated with ANC service use, as well as with post-partum contraceptive use in both countries. It indicates that the possibility that the use of ANC services was a result of earlier contacts with the health system for FP services cannot be ruled out.

Public health services in Kenya and Zambia rely heavily on external funding and service delivery is often vertically segregated (Mayhew, et al., 2000). Consequently, maternal health care and FP programs are overseen by different bodies within and outside of the Ministry of Health, with separate sets of service standards and guidelines (Birungi & Onyango-Ouma, 2006; Lush, 2002). As the vast majority of women in our study samples obtained ANC services from the public sector (82% in Kenya and 92% in Zambia), our findings underline the needs for service integration within the public sector in order to take advantage of the pregnancy period as a window of opportunity to promote FP use.

The null finding related to PNC service intensity warrants some discussions. Theoretically, the use of PNC should be related to post-partum FP practice for the same reasons that ANC is related to this contraceptive behavior outcome. It is not clear why we did not find significant associations between PNC use and post-partum FP practice in these two countries. Previous research in the sub-Saharan African region has shown that PNC is among the weakest

aspects of reproductive health programs (Charurat et al., 2010; Mwangi, et al., 2008; Warren, et al., 2006). Health facilities do not routinely record PNC visits; the vast majority of women who deliver their babies at home do not receive any PNC (The Safe Motherhood Demonstration Project, 2005). In addition, although FP counseling is theoretically part of the routine PNC package, in practice it is often overlooked when priority is given to a child's health during postnatal checkups (Lagro, et al., 2006). Even when PNC services are used by women, they still seem to be a missed opportunity for FP promotion; for example, 68% of post-partum women in Kenya had unmet need for FP in during the first year (Borda, 2006). Moreover, access to PNC services remains limited, at least in the two countries under this study (Lagro, et al., 2006).

One limitation of this study is that the results are not necessarily generalizable to all women of childbearing age in Kenya and Zambia. The group of women included in this study, married and cohabiting women who gave birth within the five years before the survey, are significantly different from women who were not included in terms of a number of socio-demographic factors. Study women were older, less educated, poorer, and more likely to live in rural areas than those who were not in the study (results not shown). As a result, the study findings are only applicable to married or cohabiting women who recently gave birth.

Another potential limitation of the study is the possible endogeneity between the FP use outcome and the variables relating to exposure to FP messages on the media and visits by a FP field worker. Some women may have been motivated to adopt a modern method of contraception because of their exposure to FP messages in the media or because they were visited by a FP field worker. On the other hand, it is plausible that women who are already using contraceptives may be more likely than others to pay attention to FP messages in the media and recall them better. Contraceptive users may also be more likely than non-users to be visited by a FP fieldworker for follow up or resupply. Nevertheless, the study results did not change whether these variables were excluded from the model. Therefore, any bias potentially introduced by this type of endogeneity would not significantly change our findings.

Finally, only individual-level factors were examined in this study. It is possible that post-partum modern FP practice is influenced by community-level factors that were not measured. For example, the availability of and access to modern contraceptives in the community may influence a women's use of contraception. Community norms about contraceptive use may also positively influence an individual's contraceptive behaviors. Similarly, facility-level data on the

degree of integration of FP and reproductive health services would have been useful for this type of analyses. Many of these factors, however, are not readily measurable with existing DHS data.

Despite the limitations, this study adds to the currently limited body of evidence of the associations between maternal health care (and ANC service use in particular) and post-partum modern FP use, using recent large-scale survey data in Kenya and Zambia. ANC services could provide an important opportunity to promote the use of modern contraceptives after childbirth. While the causal linkage cannot be completely confirmed, the findings provide strong support for the integration of reproductive health services in order to increase service utilization, at least in the context of these two countries.

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TABLES

Table 1. Factors influencing post-partum modern FP use, Kenya, 2008-09.

Characteristic	Distribution % or mean (s.e.)	ANC/PNC service intensity Coef. (s.e.)	Post-partum modern FP use Hazard ratio (s.e.)[1]
	(1)	(2)	(3)
Median duration from childbirth to modern contraceptive adoption (months)	5		
Timing of first ANC visits			
None	7.67		
1st trimester	15.11		
2nd trimester	61.36		
3rd trimester	15.86		
Had more than 4 ANC visits			
No	52.96		
Yes	47.04		
Use of PNC services			
No	51.19		
Yes	48.81		
ANC and PNC service intensity score (range: -2.75 - .90)	0 (1)	–	1.11 (.04)**
Urban	20.98	.29 (.05)***	.94 (.07)
Age group			
15 – 19	6.35	–	1.00
20 – 24	26.78	.06 (.06)	1.17 (.15)
25 – 29	26.83	.14 (.07)*	1.08 (.14)
30 – 34	20.28	.10 (.07)	.89 (.12)
35 – 39	11.54	-.03 (.08)	.79 (.12)
40 – 49	8.21	-.15 (.08)	.63 (.10)**
Highest education level			
No education	10.64	–	1.00
Primary school	62.08	.49 (.07)***	2.22 (.31)***
Secondary school or higher	27.33	.62 (.07)***	2.35 (.35)***
Wealth quintile			
Poorest	20.51	–	1.00
Poor	19.06	.10 (.05)*	1.45 (.14)***
Middle	18.69	.18 (.05)***	1.48 (.14)***
Rich	19.73	.20 (.05)***	1.63 (.16)***
Richest	22.02	.22 (.06)**	1.56 (.18)***
Religion			
Catholic	20.56	–	1.00
Protestant/Other Christians	68.54	-.02 (.04)	.97 (.06)
Muslim/Others	10.90	-.15 (.06)**	.78 (.08)*
Marital status			
Not married	18.79	–	1.00
Married, monogamous	68.18	.20 (.04)***	2.09 (.15)***
Married, polygamous	13.04	.13 (.06)*	1.45 (.16)**

Characteristic	Distribution % or mean (s.e.)	ANC/PNC service intensity Coef. (s.e.)	Post-partum modern FP use Hazard ratio (s.e.)[1]
	(1)	(2)	(3)
Work in the last 12 months			
No	39.14	–	1.00
Yes	60.86	-.01 (.03)	1.17 (.06)**
Age at first birth	19.18 (3.40)	.02 (.00)**	–
Use of modern contraceptives prior to last childbirth		.19 (.03)***	
No	53.64		1.00
Yes	46.36		1.58 (.09)***
Desire for more children		–	
No	50.30		1.00
Yes	49.70		.88 (.05)*
Knowledge of modern contraceptives (range: 0 - 10)	6.72 (2.61)	–	1.07 (.01)***
Visited and talked about FP by a field worker in the last 12 months		–	
No	91.92		1.00
Yes	8.08		.84 (.08)
Visited and talked about FP at a health facility in the last 12 months		–	
No	70.03		1.00
Yes	20.97		1.21 (.07)**
Heard FP messages on the radio in the last few months		–	
No	28.45		1.00
Yes	71.55		1.15 (.08)*
Saw FP messages on TV in the last few months		–	
No	60.96		1.00
Yes	35.04		1.05 (.08)
Read FP messages in newspapers in the last few months		–	
No	69.44		1.00
Yes	30.56		.88 (.06)
N	3,667		

[1]Model controls for durations of breastfeeding and amenorrhea.
† p<.010; * p<.05; ** p<.01; *** p<.001

Table 2. Influence of ANC and PNC services on post-partum modern FP use, Kenya, 2008-09.

Characteristic	Distribution	Post-partum modern FP use
	% or mean (s.e.)	Hazard ratio (s.e.)[1]
	(1)	(2)
ANC service intensity score (range: -2.72; .88)	.06 (.92)	1.10 (.04)**
PNC service intensity score (range: 0; 2.00)	.55 (.61)	1.03 (.05)
N	3,667	

[1]Model controls for all women's characteristics included in Table 1.
† p<.010; * p<.05; ** p<.01; *** p<.001

Table 3. Factors influencing post-partum modern FP use, Zambia, 2007.

Characteristic	Distribution % or mean (s.e.)	ANC/PNC service intensity Coef. (s.e.)	Post-partum modern FP use Hazard ratio (s.e.)[1]
	(1)	(2)	(3)
Median duration from childbirth to modern contraceptive adoption (months)	8		
Timing of first ANC visits			
None	2.56		
1st trimester	19.57		
2nd trimester	70.03		
3rd trimester	7.85		
Had more than 4 ANC visits			
No	40.09		
Yes	59.91		
Use of PNC services			
No	48.84		
Yes	51.16		
ANC and PNC service intensity score (range: -4.07; 1.27)	0 (1)	−	1.08 (.03)*
Urban	33.65	.40 (.06)***	.93 (.07)
Age group			
15 – 19	8.70	−	1.00
20 – 24	24.24	.06 (.06)	1.04 (.12)
25 – 29	26.56	.02 (.06)	.93 (.11)
30 – 34	19.15	.04 (.07)	.89 (.11)
35 – 39	11.86	.13 (.07)	.76 (.10)*
40 – 44	9.49	.06 (.07)	.55 (.08)***
Highest education level			
No education	13.12	−	1.00
Primary school	60.19	.25 (.05)***	1.35 (.13)**
Secondary school or higher	26.69	.39 (.06)***	1.58 (.17)***
Wealth quintile			
Poorest	21.73	−	1.00
Poor	20.88	−.01 (.05)	.99 (.09)
Middle	19.64	.10 (.05)*	1.07 (.09)
Rich	21.13	.36 (.06)***	1.34 (.14)**
Richest	16.62	.47 (.07)***	1.64 (.20)***
Religion			
Catholic	19.32	−	1.00
Protestant/Other Christians	78.76	-.03 (.04)	1.02 (.07)
Muslim/Others	1.92	-.51 (.11)***	.83 (.18)
Marital status			
Not married	20.35	−	1.00
Married, monogamous	67.79	-.04 (.04)	2.64 (.20)***
Married, polygamous	11.86	-.15 (.06)*	2.28 (.24)***
Work in the last 12 months			
No	43.13	−	1.00
Yes	56.87	-.01 (.03)	1.25 (.07)***

Characteristic	Distribution % or mean (s.e.)	ANC/PNC service intensity Coef. (s.e.)	Post-partum modern FP use Hazard ratio (s.e.)[1]
	(1)	(2)	(3)
Age at first birth	18.60 (3.01)	.04 (.01)*	−
Use of modern contraceptives prior to last childbirth		.10 (.03)**	
No	47.47		1.00
Yes	52.53		1.23 (.07)**
Desire for more children		−	
No	33.64		1.00
Yes	66.36		.95 (.06)
Knowledge of modern contraceptives (range: 1 - 11)	6.77 (2.07)	−	1.04 (.01)**
Visited and talked about FP by a field worker in the last 12 months		−	
No	92.19		1.00
Yes	7.81		1.20 (.10)*
Visited and talked about FP at a health facility in the last 12 months			
No	67.56		1.00
Yes	32.44		1.23 (.07)***
Heard FP messages on the radio in the last few months		−	
No	61.88		1.00
Yes	38.12		1.10 (.06)
Saw FP messages on TV in the last few months		−	
No	83.54		1.00
Yes	16.46		.95 (.08)
Read FP messages in newspapers in the last few months		−	
No	91.81		1.00
Yes	8.19		1.00 (.10)
N	3,587		

[1]Model controls for durations of breastfeeding and amenorrhea.

† p<.010; * p<.05; ** p<.01; *** p<.001

Table 4. Influence of ANC and PNC services on post-partum modern FP use, Zambia, 2007.

Characteristic	Distribution	Post-partum modern FP use
	% or mean (s.e.)	Hazard ratio (s.e.)[1]
	(1)	(2)
ANC service intensity score (range: -4.06; 1.26)	.00 (.99)	1.08 (.03)*
PNC service intensity score (range: 0; 2.00)	.61 (.67)	.95 (.04)
N	3,587	

[1]Model controls for all women's characteristics included in Table 1.
† p<.010; * p<.05; ** p<.01; *** p<.001

FIGURES

Figure 1. Post-partum FP adoption by ANC and PNC service intensity score in Kenya, 2008-2009.
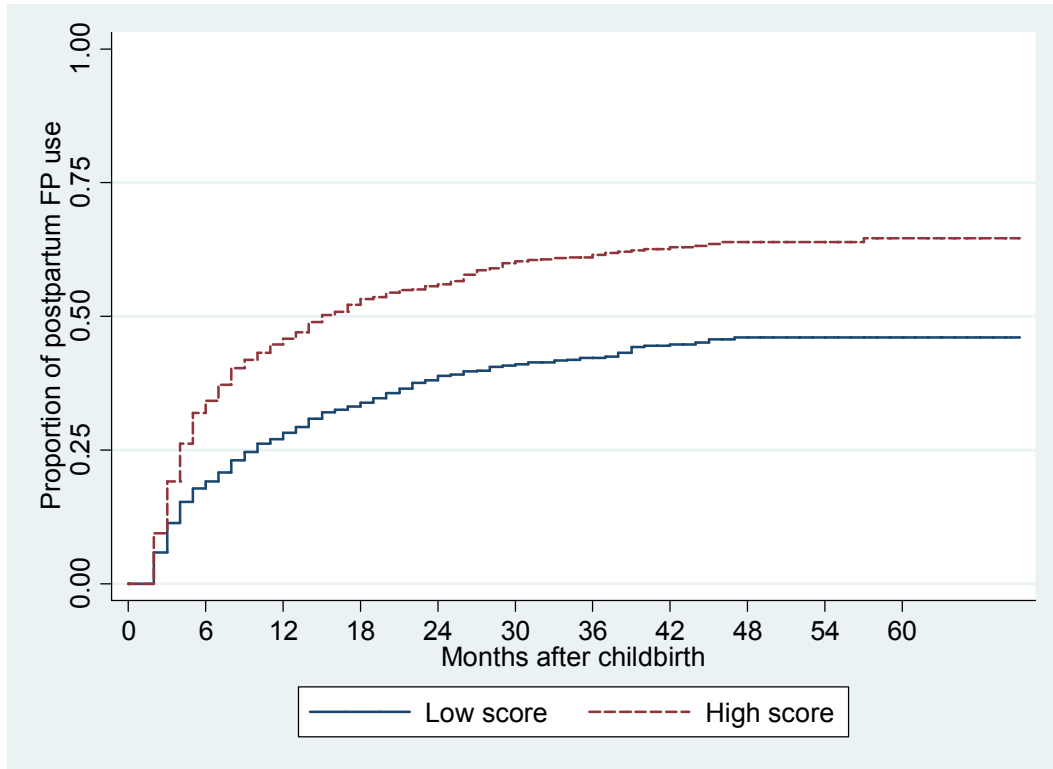
Figure 2. Post-partum FP adoption by ANC and PNC service intensity score in Zambia, 2007.