

Dynamics of Long-Acting and Reversible Contraceptive Adoption During the First Year Postpartum: A Secondary Analysis of the Yam Daabo Cluster Randomized-Controlled Trial in Burkina Faso and DR Congo

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Keywords: family planning, postpartum, long-acting and reversible contraceptives, survival modeling, median time

Posted Date: May 20th, 2020

DOI: <https://doi.org/10.21203/rs.3.rs-29605/v1>

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Abstract

Background: an earlier adoption of contraceptive methods during the postpartum period could help women to extend the inter-pregnancy interval. This article aimed to determine and compare the timing and dynamics of long-acting and reversible contraceptives (LARC) use (i.e., intra-uterine device and implant) in Burkina Faso (BF) and the DR Congo (DRC).

Methods: Study participants were followed up to 12 months postpartum. We used Royston-Parmar's semi-parametric model to estimate the effect of the interventions. All multivariate results were adjusted for covariates found to be imbalanced between the intervention and control groups. We used a Mantel-Haenszel-type method to compare adjusted hazard ratios (aHR) between the two countries. We computed the median time of contraceptive adoption in each group by country.

Results: Our analysis included 567 postpartum women in BF (284 in the intervention group and 283 in the control group) and 553 in the DRC (274 in the intervention group and 279 in the control group). Interventions had an effect in LARC use in BF (aHR 1.85; $p=0.001$) as well as DRC (aHR 2.78; $p<0.001$), but no difference between the two countries adjusted rate ratios ($p=0.344$). In both countries, median time to LARC adoption was shorter in the intervention group than control (in BF, difference=39 days; in DRC, difference=86 days).

Conclusion: The Yam Daabo intervention package resulted in an increased and earlier adoption of LARC in both rural settings in Burkina Faso and urban settings in DR Congo. Such an intervention could be relevant in similar contexts in Sub-Saharan Africa.

Plain English summary: Many studies showed that postpartum family planning use is low and unmet need for contraception following pregnancy is high in low- and middle-income countries. The Yam Daabo cluster-randomised controlled trial showed that a package of six low-technology interventions, designed in a participatory manner and aimed at strengthening routine antenatal and postnatal services in primary health clinics, doubled the proportion of women using short-acting and long-acting reversible modern contraceptives up to 12 months post partum when compared with women using routine care. This paper, which is a secondary analysis of the Yam Daabo trial, focuses on long-acting and reversible contraceptive (LARC) because of their multiples advantages and few disadvantages by reporting the dynamics of LARCs adoption during the first year postpartum. Such an analysis is very relevant because an earlier adoption of LARC in poor countries such as Burkina Faso and the DR Congo, with a high fertility rate, is effective in spacing pregnancies.

Yam Daabo's interventions showed a reduction of the median time of LARCs adoption in the intervention group compared to the control group in both countries (just under 2 months for the median time for LARC adoption in intervention group, difference of 39 days in Burkina Faso; 75 days postpartum for the median time for LARC adoption in intervention group, difference of 86 days in the DR Congo). This is an important point for the decision makers. According to our results, if the women are checked in the six postpartum weeks, as recommended by the WHO about postnatal care in 2013, and exposed to Yam

Daabo's interventions, this might increase an earlier PPFP use and specifically LARC use. Considering the high effectiveness of LARC, this may contribute to prevent unintended pregnancies and extend the inter-pregnancy interval. This is all the more important since most of these countries have very high fertility rates with high unmet needs for contraception. These results have important programmatic implications for countries with similar context.

Background

To prevent maternal deaths, family planning (FP) is an effective strategy to address women's and couples' fertility choices by helping them limit the number of children and extend the inter-pregnancy interval by at least two years[1]. According to an analysis of 27 countries Demographic and Health Surveys (DHS), 95% of women who gave birth within the previous 12 months wished to avoid a pregnancy in the following 24 months but up to 70% did not use contraception[2]. Several interventions to help women satisfy their contraceptive needs in the postpartum period have been implemented in many countries. Research in different contexts, where interventions focused on counselling (during pregnancy and/or after childbirth), showed a significant increase in the use of contraceptive methods in the postpartum period[3,4]. In contrast with single-intervention studies, Yam Daabo was a cluster randomized-controlled trial that tested a set of different PPFP interventions that were implemented from the third trimester of pregnancy throughout the extended postpartum period until one year. The package comprised three facility-based interventions (PPFP refresher course for providers, supportive supervision, and availability of contraceptive services seven days a week) and three client-oriented interventions (invitation letter to husbands or partners, appointment card, and a decision-making tool for clients and providers to enable a systematic counselling approach on PPFP). Yam Daabo aimed at strengthening existing primary healthcare services and did not focus on promoting a specific contraceptive method. It was conducted in rural settings in Burkina Faso and urban settings in DR Congo, two sub-Saharan African countries with limited resources.

Yam Daabo was effective in increasing the use of modern PPFP methods at 12 months postpartum. In Burkina Faso, modern contraceptive prevalence was 55% among women who received the package and 29% among those who received routine care in control clusters (adjusted prevalence ratio 1.79, 95%CI = 1.30–2.47)[5]. In DR Congo, modern contraceptive prevalence was 46% among women in the intervention group and 35% in the control group (adjusted prevalence ratio 1.58, 95%CI = 0.74–3.38)[6].

But, all of studies that measured the effects of various interventions on the use of postpartum family planning (PPFP), have not explored the median time to these methods' adoption. In other words, we do not know whether previous interventions contribute to earlier adoption of methods among women in the intervention group than those in the control group.

This paper aims to explore the timing and dynamics of the adoption and use of long-acting and reversible contraceptives (LARC) in both countries. LARC methods have specific advantages, including a high satisfaction rate and low discontinuation rate[7], high effectiveness (LARC methods failure rates are <1%

for IUDs and the subdermal implant[8]), safety as it is estrogen free, convenient use for women who do not need to take it on a regular basis, such as contraceptive pills or injectables, long acting effect of two to five years for different implant types and ten years for the copper Intra Uterine Device, and reversibility (user can choose the time for removal to return to fertility)[9]. In addition, their use requires a skilled service provider who may not be available in certain outreach areas in low-income countries like Burkina Faso and DR Congo[10].

Methods

We performed a secondary analysis of the Yam Daabo study, which was a two-group, multi-intervention, single-blinded, cluster-randomized controlled trial with health centres as the randomization units. The study involved two countries: Burkina Faso and DR Congo. Methodological details on the Yam Daabo are available elsewhere[11].

Outcomes

In this analysis, the contraceptive methods are grouped into two categories: LARC (IUDs and implants) and SARC (pills and injectables). We did not consider other short-acting methods, such as condoms, spermicides, and the lactational amenorrhea method (LAM), because condom and spermicide use are spontaneous and so, it is difficult to define an exact duration of utilization. As for LAM, its correct use may not exceed 5–6 months and, therefore, we assumed that it was not reasonable to include it into our twelve-month long analysis. We performed an intention-to-treat analysis, and our event of interest was the use of a LARC and the competing event was the use of a SARC.

Statistical analysis

Considering the description of the event of interest, we opted for a survival analysis with competing risk. Indeed, the use of contraceptive methods is often indicated by states of transitions. Thus, a woman can move from a state of nonuser (after delivery) to a state of LARC or SARC user. The adoption of a SARC does not necessarily prevent the adoption of a LARC or vice versa in the future, but if a woman adopts a SARC, the probability for her using a LARC during the first year postpartum is strongly modified. Thus, under this assumption, we considered the adoption of a SARC method as a competing event against our main event (adoption of LARC). Indeed, in the analysis of survival events, the concept of competing risk is defined as being the situation where another event occurs and stands against the occurrence of the studied event or fundamentally distorts the probable occurrence of the event of interest[12].

For the choice of type of modelling, we compared the different models (Kaplan-Meier non-parametric modelling, parametric modelling (Weibull, Exponential, Gompertz, Loglogistic, Lognormal, G-gamma and Royston-Parmar), and semi-parametric modelling (Cox's modelling)) using the Akaike's Information Criteria (AIC). The Royston-Parmar's flexible model had the lowest AIC and was therefore selected.

We used the Stata *stpm2cr* command [13] to estimate the intervention effectiveness on LARC use, taking into account the competing event. The *stpm2cr*'s command fits competing risks flexible parametric regression models (Royston-Parmar models using restricted cubic splines functions) by directly modelling the cumulative incidence function (CIF). The command also produces estimates hazard ratios (HR) for our exposure variable. Results were adjusted by all the variables found to be imbalanced between the intervention and control group. To be consistent with the comparison of the adjusted hazard ratios between the two countries, we calculated stratified rate ratios and significance tests by using a Mantel-Haenszel-type method.

We also produced the CIF curves for LARC and SARC use over time in each country and computed the median survival time and restricted mean survival time of the adoption for both groups of contraceptives.

Results

Our analysis included 567 postpartum women in Burkina Faso (284 in the intervention group) and 553 in DR Congo (274 in the intervention group). Figure 1 section summarizes the study flow.

Outcomes and estimation

Univariate analysis showed a positive effect of the interventions on LARC and SARC adoption in Burkina Faso (Table 1): at 12 months postpartum, when compared to control group, women in the intervention group increased their probability of using LARC by 1.93 (95%CI = 1.36–2.74) and SARC by 2.11 (95%CI = 1.50–2.98). In DR Congo, women of the intervention group were three times more likely to use LARC (HR = 2.90; 95%CI = 1.79–4.70) when compared to women in the control group, but there was no difference with regard to SARC use (HR = 0.73; 95%CI = 0.49–1.10).

After adjusting for co-variables found to be imbalanced between the intervention and control groups, differences in LARC use persisted in Burkina Faso (aHR = 1.85; 95%CI = 1.30–2.64; $p = 0.001$) and DR Congo (aHR = 2.78; 95%CI = 1.71–4.52; $p < 0.001$). However, there was no difference between the two countries adjusted rate ratio ($p = 0.344$).

Adjusted results for SARC showed significant difference in Burkina Faso (aHR = 2.07; 95%CI = 1.46–2.92; $p < 0.000$) but none in DR Congo (aHR = 0.75; 95% CI = 0.50–1.12; $p = 0.158$).

Long-acting and reversible contraceptives				
	Crude Hazard Ratio (95% CI)	p	Adjusted Hazard Ratio (95% CI)	p
Burkina Faso				
Control group				
Intervention group	1.93(1.36-2.74)	0.000	1.85 [†] (1.30-2.64)	0.001
DR Congo				
Control group				
Intervention group	2.90(1.79-4.70)	0.000	2.78 [‡] (1.71-4.52)	0.000
Short-acting and reversible contraceptives				
Burkina Faso				
Control group				
Intervention group	2.11(1.50-2.98)	0.000	2.07 [†] (1.46-2.92)	0.000
DR Congo				
Control group				
Intervention group	0.73(0.49-1.10)	0.129	0.75 [‡] (0.50-1.12)	0.158
Covariables: [†] For Burkina: age, pregnancy number, and abortion number [‡] For the DRC: stillbirth number, educational status, and occupation				

Table 1

Use of long-acting and reversible contraceptives and short-acting and reversible contraceptives at 12 months postpartum

Analysis of the median survival time and the restricted mean survival time of contraceptive methods adoption showed differences between the intervention and control groups in both countries (Table 2). In Burkina Faso, for the median survival time, there was on average a difference of 39 days (5 weeks and 4 days) for LARC adoption, as users in the intervention group adopted their method at 55 days postpartum (just under 2 months) against 94 days (more than 3 months) in the control group. In DR Congo, the difference was 86 days (close to 3 months), with a median time of LARC adoption at 75 days postpartum (2.5 months) in the intervention group versus 161 days (approximately 5 months and 15 days) in the control group.

As for SARC, the median time of use in Burkina Faso was 57 days (8 weeks and 1 day) postpartum in the intervention group against 69 days (9 weeks and 6 days) in the control group (difference of 12 days). In DR Congo, it was 191 days postpartum (6 months 11 days) in the intervention group against 249 days (8 months and 9 days) in the control group (difference of 58 days).

Analysis of the restricted mean survival time of LARC and SARC adoption showed similar differences.

Number of users/Total number of women		Median time	RMST
Long-acting and reversible contraceptives			
Burkina Faso			
Control group	49/283	94	106
Intervention group	86/284	55	98
DR Congo			
Control group	23/279	161	192
Intervention group	58/274	75	113
Short-acting and reversible contraceptives			
Burkina Faso			
Control group	50/283	69	98
Intervention group	95/284	57	95
DR Congo			
Control group	57/279	249	231
Intervention group	40/274	191	188

Table 2
Proportion of long-acting and short-acting reversible contraceptives users and median survival time and Restricted mean survival time (RMST) of adoption
The numerical results found in median survival time analysis between the two countries are similar to the graphical results for the comparison of the cumulative incidence curves of LARC and SARC use (Figure 2).

Discussion

Findings and interpretations

First, although Yam Daabo did not promote a particular method, our results showed that Yam Daabo interventions had similar effects on significantly increasing LARC adoption in Burkina Faso and DR

Congo as compared intensity testing between the two countries did not find a significant difference. It is important to note that the majority of LARC services concerned implants, as service providers at the primary healthcare clinics enrolled in Yam Daabo were mostly auxiliary midwives or nurses who were not allowed to offer IUDs unlike midwives or physicians. LARC methods provide more security against pregnancy than SARC in addition to being simple to use (no daily or periodic administration) and cost-effective in the long term. According to Secura et al in 2013, the use of LARC is more than 99% effective against pregnancies, and over 20 times more effective at preventing unintended pregnancy compared to the contraceptive pill, patch, or ring [14]. The effect of Yam Daabo on LARC adoption may be because its interventions addressed several service utilization barriers like the low knowledge and skills of service providers, misconceptions among providers and clients. Considering all the advantages of LARC methods, it is noteworthy that women in the intervention group chose to use more LARC than SARC although there was no promotion of any particular method and women had to pay for both methods and services, including for LARC which has higher upfront cost than SARC. Providers' adequate knowledge and skills, which were strengthened by supportive supervision, combined with quality counselling over several encounters were likely contributing factors.

Second, our results showed an earlier adoption of LARC and SARC in the intervention groups of both countries. On average, the control groups, which received routine care, adopted LARC and SARC later than the 6-week postpartum visit, which is dedicated in both countries to PPFP information and services. In Burkina Faso, it was at 3 months postpartum for LARC and 2 for SARC, which contrasted with a much later adoption in DR Congo at more than 5 months postpartum for LARC and more than 8 for SARC. Our Yam Daabo formative research already revealed that women appeared to rarely attend the 6-week postpartum visit [15], which is confirmed by this secondary analysis. These findings may have important implications to inform the revision of policies and practices in both countries and particularly DR Congo: under routine care, the 6-week postpartum visit dedicated to PPFP should be delayed to better match women's timing for PPFP adoption. However, further research to inform such a policy change at the national level would be needed as our research settings were limited to rural areas in Burkina Faso and to urban settings in DR Congo. Nonetheless, for similar contexts in Sub-Saharan Africa, our interventions could help improve an earlier and increased adoption of postpartum contraceptives, which could help women effectively extend their inter-pregnancy interval or limit the number of children.

Third, as noted above, there was an earlier adoption of LARC and SARC in Burkina Faso than in DR Congo. In addition to the difference in research settings (rural vs. urban), various factors could further explain the contrasting results, including the heterogeneity between both countries in terms of perinatal policies and systems; uneven levels of facility-based delivery; differences in maternity care providers; heterogeneous quality of care; and other determinants pertaining to contexts, values, and experiences of postpartum care. Yam Daabo interventions aimed to strengthen some of these factors within an overall primary healthcare service strengthening approach, which was aligned with national health policies [11]. Besides, to support the idea of structural differences between the health systems and policies of both countries, an analysis of the DHS data in Burkina (2010) and in the DR Congo (2013), showed differences between the proportions of women who attended postpartum visits at six weeks. In Burkina Faso, 72% of

postpartum women received postnatal care within 48 hours of childbirth against 44% in DR Congo. Moreover, 52% of women did not receive postnatal care (including late care, i.e. 41 days after delivery) in DR Congo [16] against 17% in Burkina Faso [17]. However, it is during this period that counseling may be critical to equip women with knowledge to inform the adoption of contraceptive methods of their choice. Thus, if women do not return to health centers, they will not be adequately exposed to PPFP information and services. In addition, according to Kwete et al, several factors could explain the high reliance on traditional methods in DR Congo, which would delay their adoption of modern contraceptives: the years of political turmoil that led to a scarcity of medical supplies, the deeply ingrained fear of side effects (particularly the sterility) from modern methods, and the promotion of natural methods by faith-based organizations that run more than half of the health facilities in the country [18]. All the above-mentioned factors could have had an effect on postpartum contraceptive dynamics.

Our non-significant results on SARC use in DR Congo might be explained by the fact that three of the four control health centres were “contaminated” by benefiting from family planning activities (mostly related to SARC) that were initiated by other nongovernmental organisations. As such, participants from these sites were exposed to free contraceptive methods and services, which likely biased the results.

Limitations

In the present study, we focused on dynamics of LARCs adoption. Initially, we wanted to use the multi-states parametric survival model studied by several authors[19–21], authorizing transition distributions to assess the effect of interventions. Unfortunately, statistical models did not converge, and we were unable to perform such an analysis. One of the reasons was the low proportion of shifting from SARC to LARC. Indeed, only 15 SARC users out of 214 shifted to LARC during the study period. Therefore, we considered the adoption of a SARC as a competing event against LARC adoption by using the more flexible Royston-Parmar model.

Conclusion

Our secondary analysis brought more nuances to the primary outcomes of Yam Daabo by highlighting the effectiveness of its intervention package in empowering more postpartum women opt for LARC as well as adopt it earlier after childbirth.

Declaration

Ethics approval

The trial was approved by WHO Research Ethics Review Committee, the ethics committee for health research in Burkina Faso and the School of Public Health ethics committee in DR Congo. Moreover, the trial was registered in the Pan African Clinical Trials Registry (PACTR201609001784334).

Consent for publication

Not applicable

Availability of data and materials

Requests for the anonymised, coded trial data can be made to the Department of Reproductive Health and Research, World Health Organization (reproductivehealth@who.int). Data sharing is subject to WHO data sharing policies and data use agreements with the participating research centres.

Competing Interests

The authors declare that they have no competing interests.

Funding

The study funder (Government of France) had no role in study design, data collection, data analysis, data interpretation, or writing the Article.

Authors contribution

AC, TM, NTT, AS, AC-K, BT, SL, JK, RY participated in all phases of the project (from design to data collection) and revised the article.

AC analyzed this article data and wrote the first draft with the important contributions from AB, TM, NTT and SK to data analysis and drafting.

DM and SK were the main investigators of the project in BF and in DR Congo. As such, they participated in all phases of the project and revised the article. All other authors contributed toward data analysis, drafting, and revising the paper and agreed to be accountable for all aspects of the work.

Acknowledgments

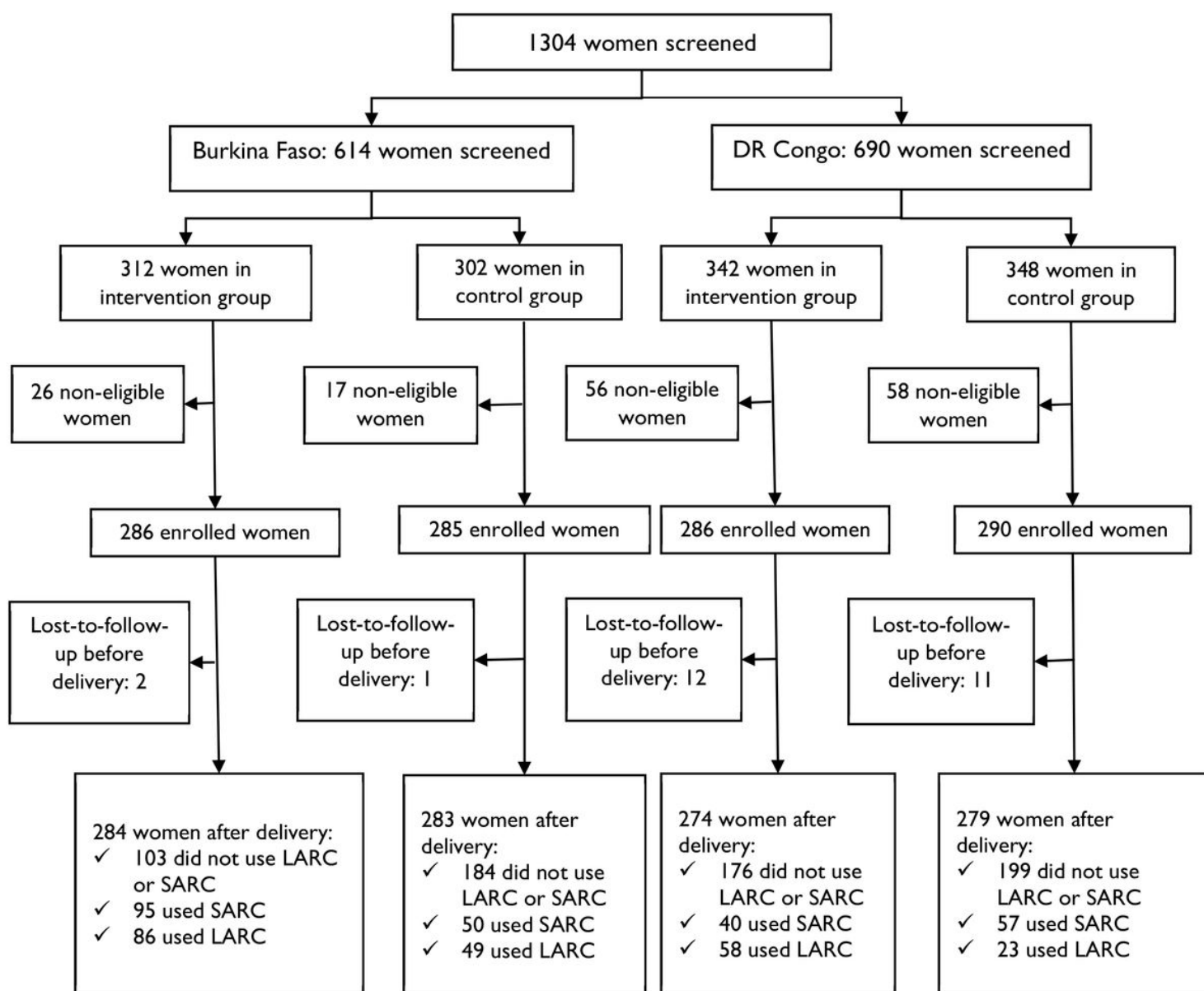
This work was carried out as part of the epidemiology thesis of the corresponding author. Special thanks go to the World Health Organization for agreeing to provide us the database for secondary analyzes and for offering the scholarship of doctoral studies in epidemiology. We also thank the Government of France generously provided funding for this research grant in the context of the Muskoka Initiative on Maternal and Child Health.

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Figures



LARC: long-acting and reversible contraceptives

SARC: short-acting and reversible contraceptives

Figure 1

Flow chart of the study

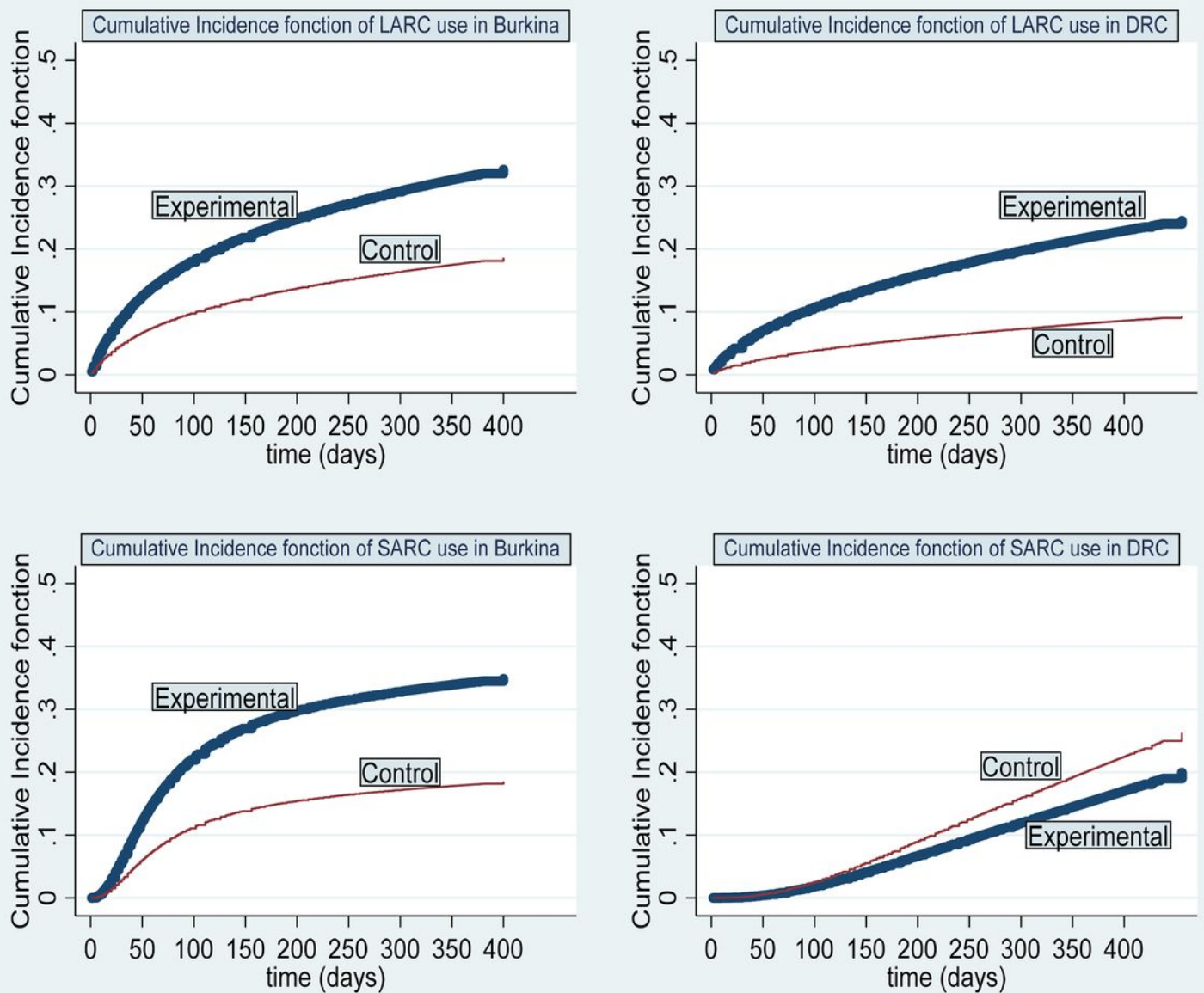


Figure 2

Comparison of cumulative incidence function of a long-acting and reversible contraceptives (LARC) and short-acting and reversible contraceptives (SARC) use in Burkina Faso and the DR Congo.