# Contribution of Community Health Workers on Family Planning Uptake in Mozambique: A Provincial-Level Segmented Time-Series Analysis from 2013-2017

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Abstract

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***Background***: One of the Sustainable Development Goals is to guarantee universal access to family planning services by 2030, and to integrate reproductive health services, including family planning, in national strategies. In 2016, family planning services were formally expanded and deivered at the community level by the *Agentes Polivalentes Elementares (APEs* ) – a cadre of formal community health workers from the Ministry of Health. We aim to evaluate the trend of the new users of these services between 2013-2017 and assess the effectiveness of the strategy of provision of family planning services by the APEs in 2017 at the provincial level in Mozambique.

***Methods:*** To examine the trend of new users of family planning, we conducted a quasi-experimental, provincial-level interrupted time series analysis of the monthly ratio of new users of FP to the population of women of fertile age between January 2013 and December 2017. The relative contribution of the APE program to FP services was assessed using a negative binomial generalized linear mixed model (GLMM) with province-level random-effects and random-slopes for time pre-intervention and time post-intervention.

***Results:*** Overall, the relative monthly increase of the ratio of new users of FP was 1% [1.01(1.01-1.02)] in the period pre-intervention versus 6% [1.06 (1.03-1.09)] in the period post-intervention. The immediate level change post-2016 was not statistically significant [0.91 (0.78-1.07)]. Five provinces had a positive trend of a 2% monthly increase in the ratio of new users of FP in the pre-intervention period and in the period post-intervention the slopes varied between 4% and 14% monthly increase.

***Conclusion:*** There was a positive trend in the monthly number of new users of FP services between 2013-2017 and this trend was larger in the period post-2016, suggesting that the services provided by the APEs had a positive influence on the overall number of new users of FP services across Mozambique.

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## INTRODUCTION

The availability, provision and use of contraceptives have an enormous impact on the health and economy of populations. In Sub-Saharan Africa, the coverage of contraception remains low, and consequently, the population is set to double or even triple in size in the coming decades.[1]

In developing countries, 214 million women of reproductive age want to avoid pregnancy but are not using a modern contraceptive method and the unmet need of contraception in Africa remain high, with 24.2% of women with needs unsatisfied.[2] Complications related to pregnancy are responsible for more than half a million maternal deaths annually, and leave 210 million women with disabilities.[3,4] Contraceptives are a highly cost-effective health intervention and is estimated that contraceptives can avoid close to 230 million births annually, prevent maternal, infant and child deaths, promote the empowerment of women to engage in socio-economic development, reduce poverty and create a sustainable environment by stabilizing population growth. [4-7]

The World Health Organization (WHO) in 2018 reported that the use of contraceptives had increased slightly from 54% in 1990 to 57.4% in 2015 globally. In Africa progress has been slow, with contraceptive use increasing from 23.6% to 28.5% in the same period.[2]

Family planning (FP) was identified as one of the main strategies to decrease maternal mortality in low and middle-income countries. In 2012, sixty-nine world's priority countries made commitments to develop and implement policies to address financing problems and mitigate sociocultural barriers in order to provide access to information, health service and supply of contraceptives, with the main goal of increase by 120 million more women as contraceptive users by 2020 (the 120x20 goal of the FP 2020 initiative).[6,8,9] Additionally, the

global Sustainable Development Goals (SDG) have prioritized universal access to sexual and reproductive health care services, including FP, and the integration of reproductive health and family planning services into national strategies and programs by 2030.[10]

Community-based distribution (CBD) approaches are an important model to reach people where standard methods of delivering health services are not sufficient. The CBD is recommended as the delivering method for low-middle income countries because they offer accessibility, convenience, and affordability for the users of the service than other modes of health service delivery.[11] When appropriately designed and implemented, CBD programs can increase the use of contraception particularly in the scenario of high unmet need for FP, with poor access to health services, and where geographic or social barriers of using health services remain highly influential.[12]

Community health workers (CHWs) are part of CBD and usually, they are members of the community that provides health-related services to their community after having formal short-term training.[13,14]

Existing evidence suggests that CHWs can reduce maternal mortality by expanding access to FP services as they can safely provide birth control pills and condoms, emergency and injectable contraception methods and that they can effectively promote the standard day's method and the lactational method. Additionally, CHWs can refer patients to health facilities for long-acting and permanent methods of FP.[13,15] In Mozambique, the formal CHW cadre are the APEs (agentes polivalentes elementares), and they were empowered to provide FP services in 2016.

Assessing the contribution of the community health worker strategy on family planning uptake can both provide further evidence on the added value of community-based cadres, as well as

to guide decision-making in Mozambique on utilizing APEs to assist in achieving international commitments. There are successful examples in literature from Brazil, Bangladesh, and Nepal, where CHWs achieved positive results in improving maternal and child health, including encouraging FP goals.[13,14]

To our knowledge, only small pilot studies about the safety of using CHW in providing injectable contraceptives were conducted in Mozambique, and there is a lack of information about how much they are contributing to improving FP uptake. [16]

We aim to evaluate if the introduction of FP services by the APEs in 2016 improved the overall number of new users of family planning in the country. To achieve our objective, we describe the trend of new users of contraceptives between the period of January 2013 to December 2017 at the national and provincial level and we evaluate the relative contribution of the provision of family FP services by the APEs in 2017. Information from this study will be essential in helping the process of planning and decision-making regarding financing and resource allocation of FP interventions in Mozambique.

# METHODS

## Study design

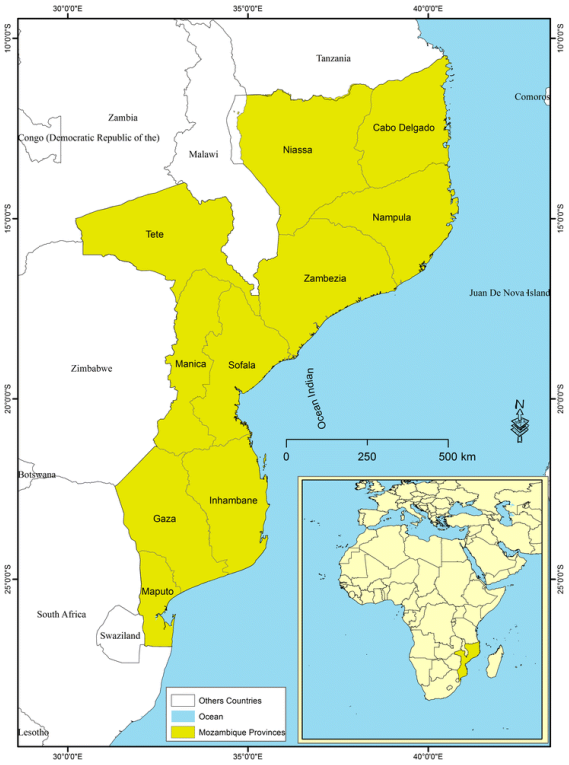
We conducted a quasi-experimental design. We used an interrupted time series (ITS) analysis to assess the trend of the monthly ratio of new users of family planning services to the population of women of fertile age at the provincial level between January 2013 and December 2017.

## Study Setting

Mozambique is admistrativelly constituited by 11 provinces. We used data from 10 of those provinces. We exclude one province, Maputo City, because the intervention was not delivered in this setting.

The provinces of Nampula and Zambezia in the north of the country, are the most populous.[17] The fertility rate is above the national average of 5.3 children per woman in Niassa, Zambezia, Tete, Manica, Cabo Delgado, and Sofala.[18] There is heterogeneity related to primary health care facilities in the country, with a range between 2.4 to 9.6 health centers per 100.000 people between the provinces. Similarly, important heterogeneity is observed in the number of maternal and child nurses where Inhambane province have 16.0 nurses per 10.000 women in reproductive age, whereas Manica has only 5.5 and the national average is 8.8. In 2017 the country had a total of 3432 APEs distributed between ten provinces and 55.9% of the APEs were located in the north of the country (Nampula, Zambezia, Cabo Delgado and Niassa). Disparities in terms of GDP per capita in 2017 is also notable with the range of 208 to 1842 dollars in Manica and Maputo City respectively (see table 1).

***Figure 1: Mozambique location and level-1 administrative division***




Source: https://media.springernature.com

## Study subjects

We conduct an analysis using data of new users of family planning from the Routine Health Information System (RHIS) from January 2013 to December 2017 and the data from APEs program database for the year 2017. A total of 146,040 new users of FP services were registered in the RHIS in the period 2013-2017. We use the number of women in childbearing age (WBA) projected by the national statistics institute based on the 2007 census for each province as a common denominator in order to compare the provinces.[17] At the time of this analysis, the final data of the 2017 census was not available.

## Description of interventions

### *Family Planning Program*

Family planning services are integrated into primary health care, and offered free of charge in all public sector health facilities. Contraceptive services are provided primarily by maternal and child health nurses. To address supply-side limitations including human resource gaps and suboptimal health service coverage in rural areas, the MoH integrated a limited set of contraceptives (pills, injectables and condoms) into the package of services provided by APEs. Family planning services are also provided in semi-annual health extension campaigns between 2013-2015, and annually in 2016 and 2017.

### *Provision of family planning methods by APEs*

In 1978, the MoH launched the *Programa dos Agentes Polivalentes Elementares* (APEs), which is a formal CHW cadre trained, supervised, and salaried through the MoH. The Program was revitalized in 2010 and it was established that APEs would contribute to expand and to improve access to primary health services by devoting 80% of their working time to health promotion and disease prevention activities and the remaining 20% in curative activities focusing on malaria, diarrhea, acute respiratory infections and identification of health danger signs in children, adults, and pregnant women. The provision of FP services by the APEs was officially introduced in March of 2015 and APEs started to be trained on contraceptive delivery from April 2015 to 2016. The timing of training and the beginning of the activities were different between the provinces and we will consider for our analysis that the year 2016 as the year that the implementation of the program started.

The program currently comprises more than 3,800 APEs unequal distributed between the provinces, they are located in 140 districts, covering an estimated population of 4.75 million people, corresponding to 17.5% of the total population, complementing the existing health network. [19]

## Data sources

Data for this study was extracted from multiple MoH databases**.** We obtained information on the number of new users of FP between 2013-2017 from the National Routine Health Management Information System (the *Sistema de Informação em Saúde, Monitoria & Avaliação* or SIS-MA). Information on the number of active APEs and the number of new users of FP from the community level in 2017 were sourced from the MoH APE Program database, which compiles monthly data on APE activities from all provinces in the country.

The number of nurses and health facilities were sourced from MoH reports and reports from National Institute of Statistics. The year and province total population, population of women in reproductive age (WRA) and the gross domestic product per capita (GDPpc) were sourced from the reports of the National Institute of Statistics.

## Data Processing and Analysis

Data on family planning users is restricted to nonpregnant, married or in-union women aged 15-49 years. We define new users of family planning as those women who initiated modern contraceptives for the first time in their lives. We extracted performance data on new users FP in general and by modern contraceptive methods (pills, injectables, IUD, and implants) from

all public health facilities of all provinces except Maputo City for the period 2013-2017. We included implants in the analysis despite being introduced by the in 2015.

Condoms were excluded as they serve purposes beyond contraception, and their distribution is not restricted to women. Also, female, male sterilization and emergency contraception were excluded because of the low number of users of those methods. Maputo City was excluded from analysis as this province does not have APEs. Finally, we removed eight months of data related to the national health weeks campaigns, because it was a source of considerable outliers. These months include May and December 2013, June and December 2014, May and November 2015, July 2016 and November 2017.

After removing Maputo city and national health weeks data, we remain with a total of 410 observation points for the analysis.

### *Statistical methods*

We used an interrupted time series (ITS) analysis of the monthly ratio of new contraceptive users to the total of women at reproductive age. The interruption is between January and December 2016, which aligns with the introduction of new FP services into the APE service package. Therefore, there are pre- and post- 2016 time segments. We used a generalized linear mixed-effects (GLMM) regression with negative binomial family (with province random-intercepts and random-slopes) parameterized as in the following equation.

$$log(y_{pt}) = \left(\alpha_0 + \alpha_p^{RE}\right) + \left(\beta_1 + \beta_{1p}^{RE}\right) \cdot t + \left(\beta_2 + \beta_{2p}^{RE}\right) \cdot t_{post} + \left(\beta_3 + \beta_{3p}^{RE}\right) \cdot I(t_{post} > 2016) + \gamma_1 \cdot \sin\left(\frac{2\pi t}{12}\right) + \gamma_2 \cdot cos\left(\frac{2\pi t}{12}\right) + \gamma_3 \cdot \sin\left(\frac{2\pi t}{6}\right) + \gamma_4 \cdot cos\left(\frac{2\pi t}{6}\right) + offset\left(log\left(PopWRA_{pt}\right)\right) + X\delta$$

where the subscripts p and t respectively index the province (1 to 10) and time in months since January 2013. The outcome is the $y_{it}$ is the new contraceptive users. $PopWRA_{pt}$ is the yearly province population of the woman at reproductive age. Because we include this as an offset in log-scale the outcome becomes a ratio of new contraceptive users to the population. Time is decomposed into 2 linear and seasonal components. The seasonal components are represented by the series of sin and cos terms to represent yearly and semestral seasons. Linear components: one is t for pre-2016 and another is $t_{post}$ for time since January 2017 (post-2016), thus the $\beta_1$ and $\beta_2$ are overall 10 province slopes in respective time segments. The expression $I(t_{post}>2016)$ is a dummy indicator of post-2016, thus $\beta_3$ is an immediate change on the level from overall $\alpha_0$ level in January 2013. All terms with superscript RE represent province-specific deviation from the overall coefficient. The term $X\delta$ represents the other yearly province-specific covariates (centered to 2013 natural log of GDPpc and natural log of number of SMI nurses per 1000 WRA). To exponentiated coefficients are interpreted are relative changes.

This model was fitted in glmmTMB using R version 3.6.1. [20,21] The statistical significance was set at 5% and we report 95% confidence intervals (95%CI).

# RESULTS

***Table 1: Provincial-level descriptive statistics***

| Province | Total population 2017[1] | Population of WRA[1] | Fertility rate 2015[2] | Ratio of PHF per 100.000 People[3] | Ratio of MCH nurses per 10.000 WRA[3] | Ratio of APEs per 10.000 WRA[4] | GDPpc in USD 2017[1] |
|---|---|---|---|---|---|---|---|
| **Total** | 27128530 | 6637330 | 5.3 | 5.3 | 8.8 | 5.2 | 466 |
| **Cabo Delgado** | 1952341 | 465662 | 5.6 | 6.0 | 8.9 | 8.7 | 307 |
| **Gaza** | 1467951 | 364558 | 4.7 | 7.4 | 9.4 | 6.9 | 380 |
| **Inhambane** | 1547850 | 386972 | 4.3 | 8.1 | 16.0 | 7.0 | 716 |
| **Manica** | 2071403 | 486192 | 5.8 | 6 | 5.5 | 5.6 | 208 |
| **Maputo City** | 1273076 | 380781 | 2.5 | 2.4 | 8.4 | 0 | 1,842 |
| **Maputo Province** | 1858597 | 512304 | 3.4 | 4.9 | 7.5 | 3.7 | 1,111 |
| **Nampula** | 5251293 | 1280520 | 5.2 | 3.9 | 6.6 | 5.1 | 357 |
| **Niassa** | 1789120 | 413606 | 6.6 | 9.6 | 10.3 | 8.5 | 181 |
| **Sofala** | 2150769 | 520904 | 6.0 | 6.1 | 12.0 | 4.6 | 600 |
| **Tete** | 2723010 | 621940 | 6.2 | 4.7 | 7.1 | 4.5 | 343 |
| **Zambezia** | 5043120 | 1203891 | 6.3 | 4.4 | 6.4 | 4.2 | 226 |

**WRA: women of reproductive age;** PHC primary health care facility**; GDPc: gross domestic product per capita; MCH: maternal and child health**

*Sources: (1) National Institute of Statistics*[22] *, (2) IMASIDA 2015*[18] *, (3) MoH reports, (4) APEs database*

## Overall trend

In the undjusted model, the variance for the random intercept was 0.21 and reduced to 0.096 in the adjusted model, representing a reduction from 92% to 77% of the proportion of the overall variance due to the province-specific initial level of ratio of new users per 10000 women in reproductive age (RNWRA). Looking to the adjusted model we see that the ratio of new users of family planning in January 2013 was 14.11 (11.52-17.29) and the overall slope in the relative monthly increase of the ratio of new users was 2% [1.02 (95%CI 1.01-1.02)] in the period pre-intervention (January 2013 to December 2015) and the slope went up to 6% [1.06 (1.03-1.09)]

monthly increase in the period post-intervention. However, when we compare the level of change in the year of intervention with the performance in January 2013, we observe a statistically non-significant decreased of 9% [relative ratio of 0.91 (95%CI 0.78-1.07)], meaning that the intervention did not have an immediate effect (see table 2)

***Figure 1: Foresplot of the global results of the country***

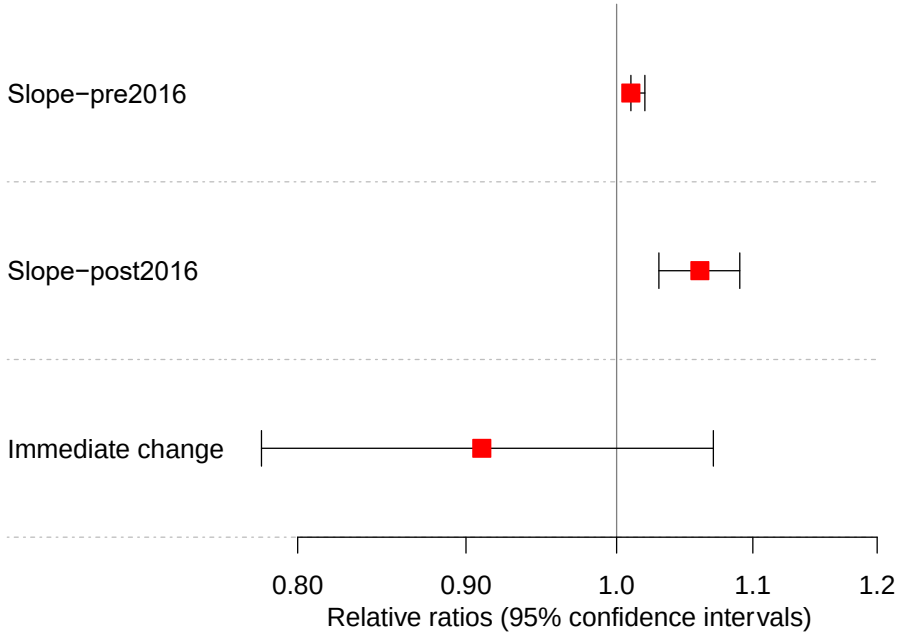



***Table 2: Global results from the negative binomial mixed effects models.***

| | **Unadjusted model** | **Adjusted model** |
|---|---|---|
| | Variance (SD) | Variance (SD) |
| **Intercept** | 0.20609(0.45) | 0.09572 (0.31) |
| **Time pre 2016** | 0.00006(0.01) | 0.00006 (0.01) |
| **Time post 2016** | 0.00101(0.03) | 0.00139 (0.04) |
| **Immediate level of change** | 0.01618( 0.13) | 0.02745 (0.17) |
| | Fixed effects | |
| | Estimate (95%CI) | Estimate (95%CI) |
| **Intercept** | 6989.07 (5232.17 -9335.92) | 14.11 (11.52-17.29) |
| **Time pre 2016** | 1.02 (1.01-1.02) | 1.01 (1.01-1.02) |
| **Time post 2016** | 1.05 (1.02-1.07) | 1.06 (1.03-1.09) |
| **Immediate level change** | 0.91 (0.80-1.03) | 0.91 (0.78-1.07) |

***Figure 2: Time series plot representing the Raw versus predicted ratios***

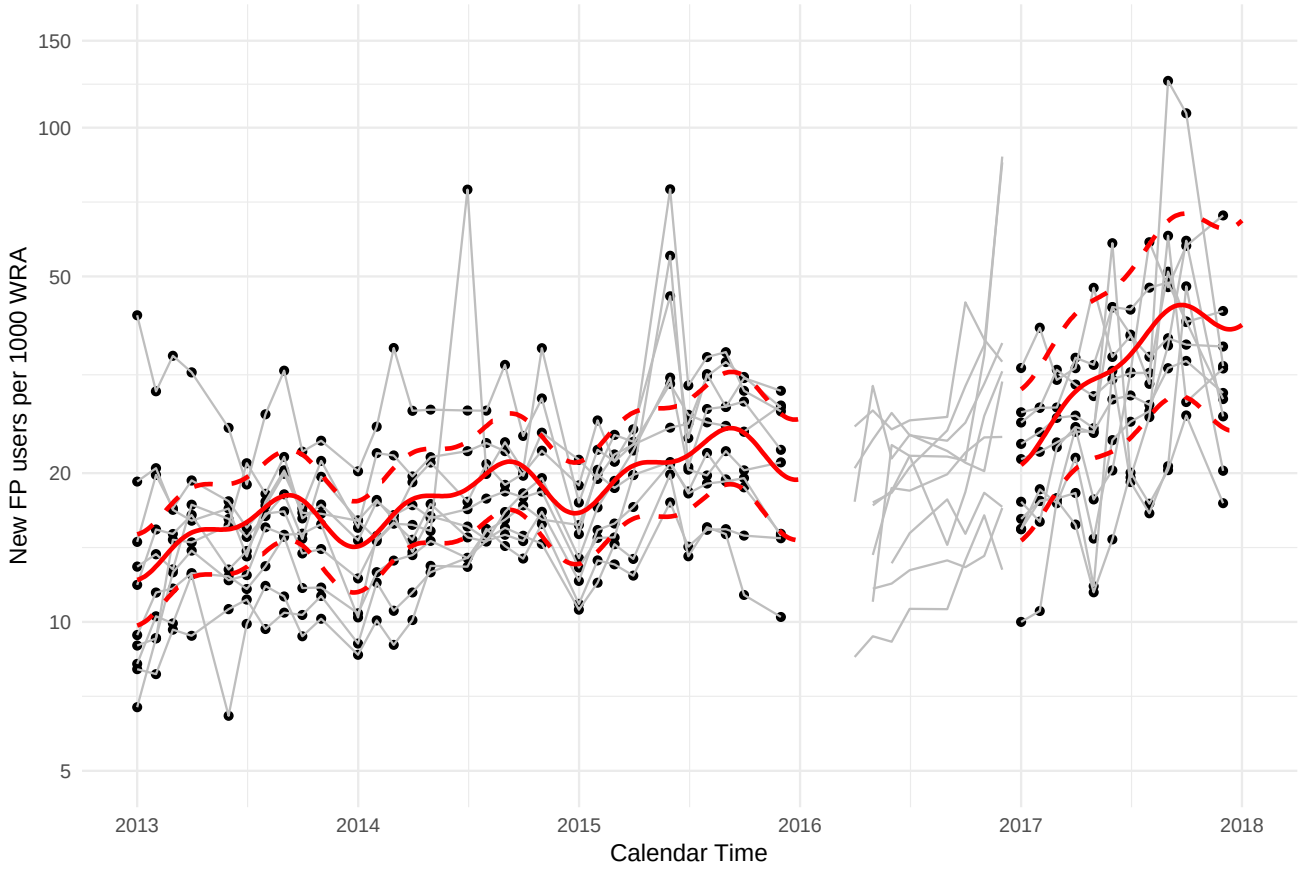



Figure 2 represents the time series plot of the ratio of new users of family planning (FP) per 1000 women at reproductive age (WRA). The solid red line represents the national average of the ratio of new users of FP and the dashed red lines are the confidence intervals. The gray lines and points are the provincial means. In the period 2016-2017 we visualize raw data, were we can see that in the first three months, there were an empty space representing  missing data.

## Provincial trend

In January, 2013 all ten provinces had different levels of the number of new users of FP per 1000 WRA (Table 3). Tete province had the highest figure with [25.49 (95% CI: 21.90-29.67)] new users per 1000 WRA whereas Nampula had the lowest [9.21 (95%CI: 7.79-10.90)]. In the pre-intervention period, five provinces, namely, Gaza, Inhambane, Manica, Nampula and Sofala, had a significant 2% relative increase in the slope of monthly number of new users per 1000 WRA.

If we look for the differences in slope pre and post 2016 only three provinces had a statistically significant changes in the monthly number of new users: Cabo Delgado, Manica and Nampula. Cabo Delgado reached the highest difference of 13% [1.13 (95% CI 1.09-1.17)], followed by Manica with 7% [1.07 (95% CI 1.03-1.11)] and Nampula with 6% [1.06 (95% CI 1.02-1.09)]. When we look to the actual slope of the period post 2016, we found that five provinces (Cabo Delgado, Gaza, Manica, Maputo and Sofala) had positive increase in the monthly number of new users: The highest increase is 14% in Cabo Delgado [1.14 (1.10-1.18)] and the lowest increase is 4% in both Maputo Province [1.04 (1.01-1.08] and Tete [1.04 (1.01-1.08)].

In terms of the immediate relative change in the ratio of new user of FP, none province had a statistically significant result.

Table 4 presents the results of the deviation of the random effects of the provinces in relation to the nation average of new users of FP. As we can see from the results, almost all the provinces have a none satatistical significant results meaning that the theirs estimates are pure much close of the national average. The only exceptions is the intercept in Tete province that is 81% [1.81( 1.40-2.33)] greater than the national average and the diffence in slope in Cabo Delgado Province that is 8% [1.08 (1.04-1.13)] higher than the national average.

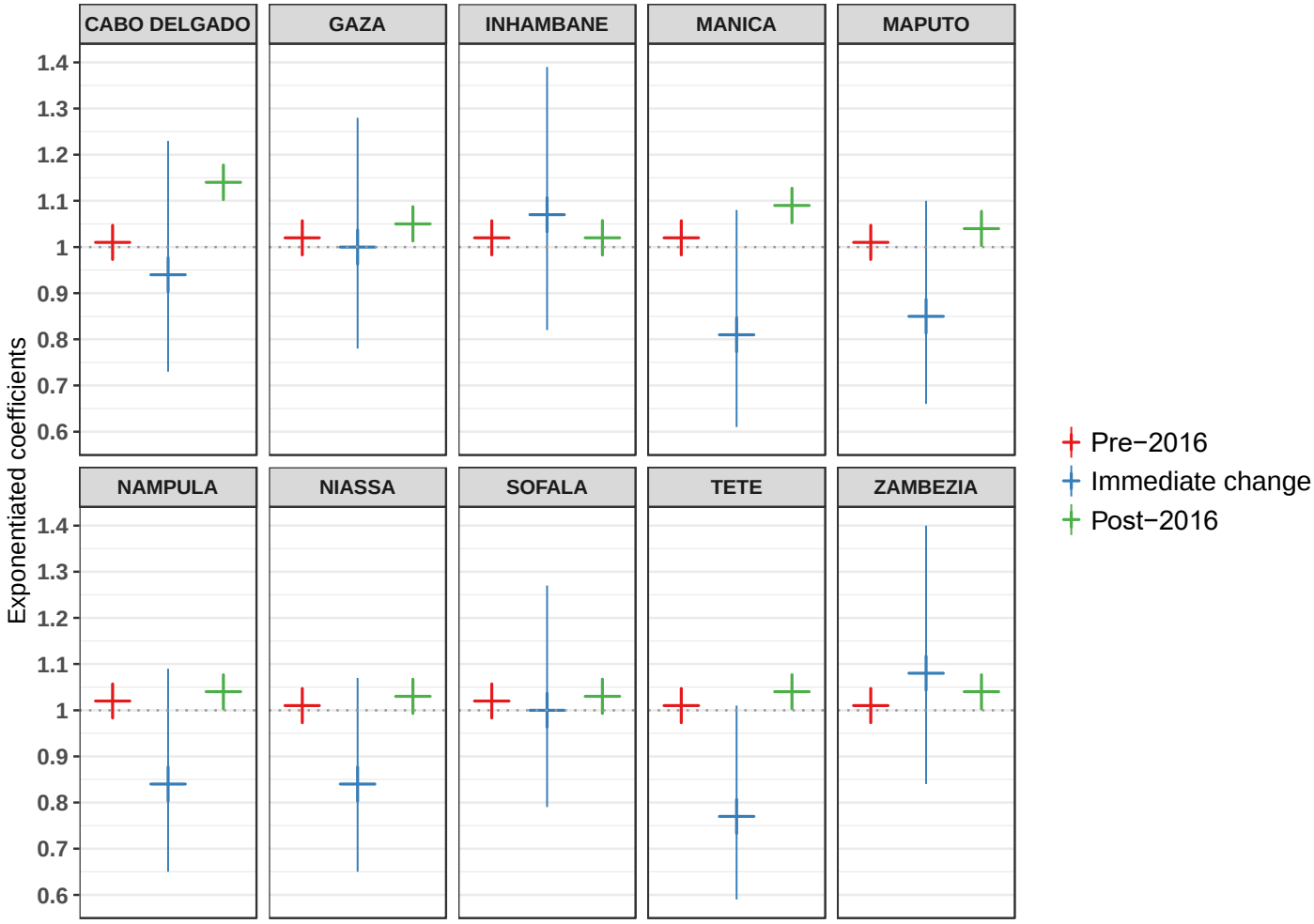
*Table 3: Results from the estimates from the negative binomial mixed effects by province*

| Provinces | Intercept | Slope pre-2016 | Difference in slope pre and post 2016 | Slope post-2016 | Immediate change |
|---|---|---|---|---|---|
| Cabo Delgado | 13.19 (10.29-16.90) | 1.01(0.99-1.02) | **1.13 (1.09-1.17)** | **1.14 (1.10-1.18)** | 0.94 (0.73-1.23) |
| Gaza | 14.87 (12.83-17.23) | **1.02 (1.01-1.03)** | 1.04(1.00-1.07) | **1.05 (1.02-1.09)** | 1.00 (0.78-1.28) |
| Inhambane | 16.55 (13.98-19.60) | **1.02 (1.01-1.02)** | 1.00 (0.97-1.04) | 1.02 (0.98-1.06) | 1.07 (0.82-1.39) |
| Manica | 14.02 (11.62-16.92) | **1.02 (1.01-1.03)** | **1.07 (1.03 -1.11)** | **1.09 (1.05-1.13)** | 0.81 (0.61-1.08) |
| Maputo Province | 10.47 (8.40-13.07) | 1.01 (1.00-1.02) | 1.03 (1.00-1.07) | **1.04 (1.01-1.08)** | 0.85 (0.66-1.10) |
| Nampula | 9.21 (7.79-10.90) | **1.02(1.01-1.03)** | **1.06 (1.02-1.09)** | 1.04 (1.00-1.07) | 0.84 (0.65-1.09) |
| Niassa | 15.86 (13.36-18.83) | 1.01(1.00-1.01) | 1.03(0.99-1.06) | 1.03 (1.00-1.07) | 0.84 (0.65-1.07) |
| Sofala | 11.31 (9.72-13.17) | **1.02(1.01-1.03)** | 1.01 (0.98-1.05) | 1.03 (1.00-1.07) | 1.00 (0.79-1.27) |
| Tete | 25.49 (21.90-29.67) | 1.01(1.00-1.01) | 1.04 (1.00-1.08) | **1.04 (1.01-1.08)** | 0.77 (0.59-1.01) |
| Zambezia | 15.62 (9.98-24.46) | 1.01 (1.00-1.01) | 1.03 (0.99-1.07) | 1.04 (1.00-1.07) | 1.08 (0.84-1.40) |

*Table 4: Deviation of the random effects of the provinces in relation with the national average*

| Provinces | Intercept | Slope pre-2016 | Difference in slope pre and post 2016 | Immediate change |
|---|---|---|---|---|
| Cabo Delgado | 0.93 (0.68-1.29) | 0.99 (0.98-1.00) | **1.08 (1.04-1.13)** | 1.03 (0.80-1.33) |
| Gaza | 1.05 (0.81-1.38) | 1.00 (0.99-1.01) | 0.99(0.96-1.03) | 1.09 (0.85-1.40) |
| Inhambane | 1.17 (0.89-1.55) | 1.00 (0.99-1.01) | 0.96 (0.92-1.00) | 1.17 (0.89-1.53) |
| Manica | 0.99 (0.75-1.32) | 1.01 (1.00-1.02) | 1.02 (0.99 -1.06) | 0.88 ( 0.69-1.12) |
| Maputo Province | 0.74 (0.53-1.04) | 1.00 (0.99-1.01) | 0.99 (0.95-1.03) | 0.93 (0.72-1.21) |
| Nampula | 0.65 (0.51-0.84) | 1.01(1.00-1.02) | 1.01 (0.98-1.05) | 0.92 (0.74-1.14) |
| Niassa | 1.12 (0.84-1.49) | 0.99( 0.98- 1.00) | 0.99 (0.94-1.03) | 0.91 (0.70-1.19) |
| Sofala | 0.80 (0.61-1.05) | 1.01(1.00-1.02) | 0.97 (0.93-1.01) | 1.10(0.86-1.40) |
| Tete | **1.81( 1.40-2.33)** | 0.99(0.98-1.00) | 1.00 (0.96-1.03) | 0.84 (0.65-1.08) |
| Zambezia | 1.11(0.70- 1.76) | 0.99 (0.99-1.00) | 0.99 (0.95-1.02) | 1.19 (0.94-1.49) |

***Figure 3: Estimates of the slopes from the negative binomial mixed effects models fitted per each province.***




Note: The horizontal lines represent the estimate and the vertical lines represents the confidence intervals.

# DISCUSSION

We found a significant increase of the ratio of new users of FP to WRA from the periods pre-2016 to post-2016 that could be attributed to introuduction of FP activities among the APEs

We choose to parametrize our variable of time with the a variable that captures the immediate level of change post intervention. Howeverm, we did not find a statistically-significant level change result, suggesting that this intervention did not have an immediate impact in overall number of new users of family planning.

Our findings show that there was large heterogeneity between the provinces in January 2013, regarding the number of women in registered as new users of family planning services. The range of this number varies from 9.21 in Nampula to 25.49 new user of FP per thousand women in reproductive age in Tete. Adjusting our model, we were capable to reduce the variance of the intercept only by 15%, meaning that there are other unknown factors that contribute to these differences.

Overall in the country, between January 2013 and December 2015, that is the period before the intervention, there was already 1% monthly increase of ratio of new users of FP. Between January to December 2017 – that is the period after the intervention – we found that the slope was significantly larger, meaning that there was a faster growth of 6% monthly increase in the ratio of new user of FP in this period. Those results suggest that between 2013 to 2015 the family planning program was already observing improvements in capturing new users into the program and this might be attributed to the existing strategies such as national health weeks and mass media campaigns to promote the use of contraceptives, among others.

When we look to provincial level trends, the province of Cabo Delgado, Maputo, Niassa, Tete and Zambezia did not register a significant increase in the number of new users between January 2013 to December 2015. Howver, in the period post intervention, Cabo Delgado had the highest 14% monthly increase in the ratio of new users followed by Manica (9%), Gaza (5%), Maputo (4%) and Tete (4%). Our study did not have explanatory factors regarding the heterogeneity of the results that we found. Neverthless, our best guess is that differences in local funding for family planning, level of prioritization of activities related to FP promotion and availability of human resources may have large influences on provincial outcomes.

Different study designs, different FP indicators, and different definitions of the CHW program make challenging to compare this study with other available evidence. *Niamh Cahill et al* (2017) conducted an analysis of the trend of contraceptive use in the countries that are in FP2020 initiative which includes Mozambique for the period of 2012-2017.[8] They showed that Mozambique increased by 31.4% the use of contraceptive between the time period, however, their analysis are not comparable with ours because they used a Family Planning Estimation Tool (FPET) to produce estimates and projections of FP over time and their indicators of interest where different, they did not assess the provincial level and they did not evaluate any particular program. In a systematic review that included a total of 56 studies from low-middle-income countries, 50 of them demonstrated that CHWs programs can effectively increase the use of modern contraceptive in a variety of settings, include Bangladesh, Ghana and Uganda.[23] In Pakistan, the evaluation of the Lady Health Worker Program (LHWP) after 6 years of implementation, provided strong evidence of increasing modern contraceptive use among rural women (OR=1.50, 95% CI 1.04-2.16).[24]

Our results must be interpreted cautiously for some considerable reasons. First, we can consider that this intervention was in is begging stage in 2017. As we mention previously, the training and the scale up of this strategy occurred between 2015 and 2016 and the provinces started this intervention in different periods of time. We did not have assess of the information regarding when exactly each province begins the intervention to took into account t in our analysis. In general we consider that the truly impact of this intervention is more likely to be detected in a medium to long term and this can be one reason for not observing an immediate level of change. Additionally, we believe that data for just one year of implementation does not have enough power to detect robust changes, although we manage to find differences in the slopes between pre and post intervention period. We did not have available data from 2018 and our intention for future analysis is to add more data from the period post intervention so that we can have better picture of what is happening. Second, there was concurrent events that took place in the health system during the period of implementation of this program. For instance, in 2016 there was a change of maternal and child (MCH) registers instruments in the public health system. This was a huge event that most likely influenced most of the routine process of data collection and report and might be one of the potential reasons for the missing that observed in the begging of 2016. Additionally, the definition of new user of family planning were changed in the same period. Before, if a client returned to hospital after months without taking contraceptives, was considered new user. So, one client could be new user multiple times. With the new definition, new user of family planning is that client that never ever use any modern contraceptive method. With this new definition we expected a decrease of the new users captured by the system as the new definition is more restrictive, however our findings contradict that expectation. Furthermore, in 2015-2016 the national data base was

changed from "*modulo básico*" to "*SIS-MA*" creating many difficulties regarding data reporting in all of the provinces and this fact might also contributed to the missing data observed in 2016.

The findings in the provinces demonstrated the differences that mark them. We found distinct improvement in Cabo Delgado where the slope post intervention is 8% greater that a national average. This can be explained by the socio-economic events that are happening in this particular province, that is receiving huge investments for gas production and potentially more health financing by local industry. However, we do not have evidence of this assumption. Inhambane and Sofala were the first provinces to train the APEs and to start the intervention and we expected to see some great results in those provinces, however, we did not find statistically significant results.

Besides all the limitations mentioned above, we consider this study is extremely relevant because is the first to our knowledge that describes the trend of new users of family planning and the effect of provision by community health workers in Mozambique using the routine health information data. We believe that this kind of data can and must be used to assess the effectiveness of health programs using appropriated statically approaches. Additionally, the study describes with numbers the amount of heterogeneity within the country and this can be used in planning process. Furthermore, this analysis is an example of how the events in the health system can influence the program performance and progress and this must be taken into account in the evaluation process. We believe that a more extend period of implementation of the intervention would have more encouraging results and we plan to continue this analysis in near future.

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