Fertility Impact of Donor-Supported Contraceptives in Sub-Saharan Africa

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Short Abstract

A substantial amount of aid for family planning goes to the purchase of contraceptives. To what extent does it help countries manage their fertility? We investigate this in the context of Sub-Saharan Africa (SSA), a region with the highest total fertility rate and relatively-slow contraceptive uptake. We collected data for 34 countries over 13-years from 2003-2016. Fertility behavior was captured with the General Fertility Rate (GFR) for women aged 15-44 using information from 85 Demographic and Health Surveys. Contraceptive supply coverage was estimated with shipment volumes of donated contraceptives. Preliminary results evidence that birth rates are significantly lower after a country receives donated contraceptives. On average, a 5 percentage-point increase in contraceptive supply coverage is associated with a 3.3 percentage-point drop in the GFR. Stratified results suggest that aid for family planning supplies may go further in countries with greater family planning need, but also in countries with more-developed health-systems.

1. Introduction

Sub-Saharan Africa (SSA) has the highest total fertility rate (TFR) in the world [1]. In 2016, the estimated average number of births per women was 4.85, much higher than any other region [2]. SSA has seen increased use of modern contraceptives, but it still has a relatively slow contraceptive uptake. The estimated share of women aged 15-49 using a modern contraceptive method increased from 16% in 2000 to 26% in 2014 [2].

Since the 1960s, family planning programs have been a consistent component of development plans as part of a larger effort to reduce global fertility and increase human capital investments per child [1,3]. A substantial amount of family planning aid goes to the purchase of contraceptives, but the effect of subsidized contraception on fertility is not yet well understood.

Some believe that SSA has been slow in reducing its fertility because of inconsistent availability and unaffordability of contraceptive methods. Bendavid, Avila, and Miller found that a decline in the financial support for family planning may have led to a decline in the use of modern contraception and to substitute induced abortion for contraception in SSA [4]. Another study found that in 25 countries, the cost of access to contraception was a strong cause of discontinuation for any method [5]. Similarly, Salas found that disruptions in the supply of publicly-provided contraceptives had a negative impact on birth rates in the Philippines [3].

Others believe that the limiting factor is fertility desire; SSA will not see a substantial reduction in its fertility rate until countries in the region develop a stronger preference for having smaller families, for which education is a key component. African societies have higher ideal family sizes than non-African societies – they have pronatalist inclinations – but they also have high levels of unmet need. This combination suggests a low level of preference implementation, making it harder for women to achieve their fertility desires [6].

This study aims to examine to what extent subsidized contraception has helped SSA countries manage their fertility, and if this relationship varies by country characteristics.

2. Research Questions and Hypothesis

This study investigates the following research questions:

What is the relationship between birth rates and the quantity of donated contraceptives received by countries in sub-Saharan Africa in the last fifteen years?

We hypothesize that the increased provision of free contraceptive supplies will have a negative effect on the general fertility rate as it reduces the incidence of stock outs and improves the availability of effective birth control options for women.

How does this relationship vary by country characteristics (regional location, GDP per capita, health spending per person)?

We hypothesize that the relationship between the provision of free contraception and the general fertility rate will be different across country characteristics. We expect that countries with greater need will exhibit a stronger response, as well as countries with stronger health systems.

Are women from disadvantaged backgrounds (poorer, less educated, living in rural areas) more likely to be affected by changes in the quantity of donated contraceptives received by their country?

We hypothesize that women from disadvantaged backgrounds rely more on free contraceptive supplies from the public sector for managing their fertility and will be affected more by any positive or negative change in supply.

3. Methodology

Data

Data were obtained for a set of 34 countries in SSA over 13-years from 2003 to 2016 from publicly-available databases.

To capture fertility behavior, we estimated the General Fertility Rate (GFR) for women aged 15-44 using information from Demographic and Health Surveys (DHS). The analysis made use of data from 85 surveys of 34 countries. The DHS Program collects birth histories of representative samples of women of childbearing age [7]. Birth histories are considered of good quality, with little omission of births and deaths [8]. Birth histories collect information on all live births a woman has experienced, including whether the birth was a single or multiple birth, which month did the birth take place, plus other information. Birth histories allow one to estimate quarterly GFRs for five years preceding the survey.

Data on shipments of subsidized contraception were obtained from the Reproductive Health Interchange (RHI) database. RHI provides data on the quantities that were shipped to each country by receipt date and procuring organization. The data is organized by contraceptive method, which allows one to translate shipment volumes to quarterly contraceptive supply coverage by using the couple-years of protection (CYP) for each method.

Analysis was stratified by sub-region, level of Gross Domestic Product (GDP) per capita, and level of health spending per capita. Data on GDP per capita was adjusted by Purchasing Power Parity (PPPs) (in international dollars, fixed 2011 prices) and obtained from Gapminder [9]. Estimates on per capita total expenditure on health were retrieved from the World Health Organization (WHO) [10].

Statistical Analysis

To measure the effect of subsidized contraception on fertility, quarterly GFR was regressed on quarterly CYP coverage and a full set of quarter-year and country fixed effects. The regression analysis accounted for lags in the CYP coverage of up to 3 years to account for the time it takes to distribute contraceptives within each country and to allow for the existence of inventories before stock outs could become an issue. The equation of the fixed effects model is:

$$GFR_{it} = \alpha_i + \beta_1 CYP_{i,t} + \beta_2 CYP_{i,t-3} + \ldots + \beta_k CYPi_{,t-12} + \delta_2 q_2 + \ldots + \delta_4 q_4 + \lambda_{2004} y_{2004} + \ldots + \lambda_{2016} y_{2016} + \varepsilon_{it}$$

Where α_i represents the unknown intercept for each country indexed by "i"; CYP_{it} represents quarterly donor-supported contraceptive supply coverage for *i* countries (*i*=34 countries) in *t* times (*t*=13 years), $\delta_q q_q$ is a dummy variable for quarterly fixed-effects with January-March as the reference, $\lambda_t y_t$ is a dummy variable for time fixed-effects with 2003 as the reference group; and ε_{it} is the error term.

The analysis was performed for all SSA countries, and separately by subgroups. For the subgroup analysis, countries were stratified into two subgroups based on regional location and rank in 2005 (upper or lower half) on health spending per capita and GDP per capita.

Work in progress: We are conducting individual-level analyses to see if women with disadvantaged social and economic backgrounds were more/less affected by national-level changes in supply of free contraceptives from the public sector.

4. Preliminary Results

The right panel in Figure 1 shows that countries from SSA experienced a decline on their annual general fertility rate from 180 live births per 1,000 women in 2003 to 162 in 2015. This decline was accompanied by an increase in the annual supply of publicly-provided contraceptives, from an average quantity that was sufficient to cover the contraception needs of almost 2% of women age 15-44 in 2003 to almost 9% in 2015. The left panel of Figure 1 shows quarterly versions of the same graphs that seem more pronounced than the annual version.

Our preliminary results presented in Table 1 find that birth rates are significantly lower after a country receives donated contraceptives. On average, a 5 percentage-point increase in contraceptive supply coverage (the share of women 15-49 with provisions for contraceptives from the public sector) is associated with a 3.3 percentage point drop in the general fertility rate. This impact corresponds to 7.5% of the average general fertility rate.

This negative association is stronger for countries in West & Central Africa (compared to East & South Africa), those with lower GDP per capita, and those with higher health spending per person. This suggests that aid for family planning supplies may go further in countries with greater family planning need, but also in countries with more-developed health systems.

There is some attenuation in our estimates after the addition of country-specific linear time trends; see Table 2. Since these trends absorb the effect of all slow-moving processes underway in each country that could influence fertility, this is a stringent test of the robustness of estimates. It is remarkable that the sign of the point estimates is intact after these trends are accounted for.

5. Implications

This study provides evidence on the importance of donated contraceptive supplies to reduce fertility in SSA. Findings suggest that greater donor spending on FP commodities will be associated with a decrease in fertility for SSA, and this will go further in countries with greater FP need, as long as those countries continue strengthening their health system.

We also saw substantial fluctuations in shipments of donated contraceptives to SSA countries. This suggests a call for governments to invest in improving their health systems to have a more efficient supply chain system for contraceptives (and other health commodities). Doing this will enable more efficient

downstream distribution of contraceptives, reducing stockouts and leading to improved FP adoption and lower contraceptive discontinuation.

References

1. Sharan M, Ahmed S, May J, Soucat A. Family Planning Trends in Sub-Saharan Africa: Progress, Prospects, and Lessons Learned. Yes Africa Can Success Stories from a Dyn. Cont. Washington: The International Bank for Reconstruction and Development/The World Bank; 2009. p. 445–63.

2. World Bank. World Development Indicators. 2018;

3. Salas JMI. Consequences of withdrawal: Free contraceptives and birth rates in the Philippines. Popul. Assoc. Am. 2013. p. 1–57.

4. Bendavid E, Miller G. United States aid policy and induced abortion in sub-Saharan Africa. Bull. World Health Organ. 2011;89:873–80.

5. Ali MM, Cleland JG, Shah IH. Causes and Consequences of Contraceptive Discontinuation: Evidence from 60 Demographic and Health Surveys. Geneva, Switzerland and Egypt: World Health Organization; 2012.

6. Bongaarts J, Casterline J. Fertility Transition : Is sub-Saharan Africa Different ? Popul. Dev. Rev. 2013;38:153–68.

7. Macquarrie KLD, Program TDHS, Health A, Meijer-irons J. Miscarriages and Terminated Pregnancies : Quality and Consistency of DHS Reproductive Calendars. 2018;

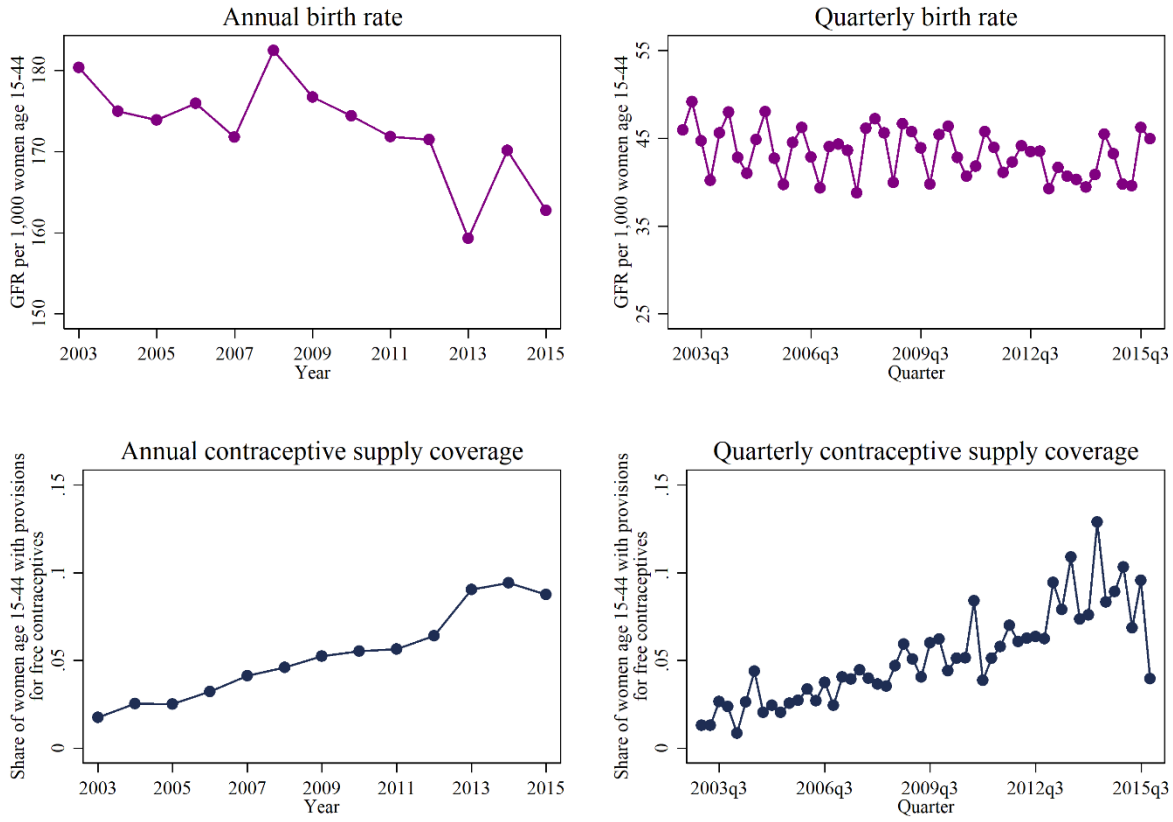
8. Pullum TW, Becker S. Evidence of omission and displacement in DHS birth histories. 2014.

9. Gapminder. GDP per capita, PPP (constant 2011 international $), version 25. [accessed on March, 2018]. 2018.

10. World Health Organization. Per capita total expenditure on health at average exchange rate (US$). [accessed on October, 2017]. 2017;

Tables and Figures

Figure 1: Annual and quarterly trends in donor-supported contraceptive supply coverage and the general fertility rate



Note: Graphs show the average for all SSA countries included in the sample

Table 1: Impact of quarterly fluctuations in supply of donor-supported contraceptives on fertility in Sub-Saharan Africa

	Dep. variable: Quarterly General Fertility Rate						
	Total	Subregion		Health Spending per capita		GDP per capita	
	(1)	(2)	(3)	(4)	(5)	(6)	(7)
Variable	Total	East & South Africa	West & Central Africa	Higher	Lower	Rich	Poor
Quarterly contraceptive supply coverage							
3 quarters behind	-9.777*	-10.07**	-5.167	-17.78**	-2.379	-13.80**	-7.193
	[5.483]	[4.118]	[12.80]	[7.034]	[8.883]	[6.920]	[8.803]
4 quarters behind	-21.00***	-24.06***	-13.91	-34.67***	-8.120	-24.42**	-17.96
	[7.561]	[5.785]	[17.15]	[9.869]	[12.26]	[9.559]	[12.38]
5 quarters behind	-31.14***	-37.68***	-15.61	-50.18***	-12.07	-37.11***	-22.12
	[9.189]	[6.981]	[21.45]	[11.58]	[15.42]	[11.27]	[15.39]
6 quarters behind	-32.72***	-42.67***	-4.062	-55.82***	-7.083	-41.93***	-22.79
	[10.60]	[7.966]	[26.03]	[12.99]	[18.14]	[12.62]	[18.28]
7 quarters behind	-40.07***	-47.90***	-19.30	-62.01***	-19.44	-45.55***	-37.70*
	[11.82]	[8.856]	[29.93]	[14.29]	[20.72]	[13.83]	[21.13]
8 quarters behind	-39.77***	-49.56***	-12.28	-64.30***	-15.79	-43.18***	-38.80
	[12.99]	[9.627]	[34.04]	[15.58]	[23.09]	[15.08]	[23.66]
9 quarters behind	-50.04***	-60.29***	-12.07	-66.15***	-35.37	-43.52***	-61.46**
	[13.91]	[10.19]	[37.78]	[16.36]	[25.18]	[15.80]	[25.88]
10 quarters behind	-57.44***	-59.58***	-38.20	-68.88***	-46.77*	-45.42***	-78.55***
	[14.92]	[10.91]	[41.14]	[17.26]	[27.46]	[16.67]	[28.18]
11 quarters behind	-62.00***	-59.97***	-56.15	-74.56***	-59.03*	-45.96**	-96.91***
	[16.08]	[11.98]	[43.74]	[18.52]	[30.34]	[17.84]	[31.26]
12 quarters behind	-66.80***	-63.32***	-78.66*	-85.58***	-62.37*	-50.93***	-106.5***
	[17.28]	[13.09]	[46.68]	[20.23]	[32.51]	[19.47]	[33.54]
Country fixed effects	Yes	Yes	Yes	Yes	Yes	Yes	Yes
Quarter fixed effects	Yes	Yes	Yes	Yes	Yes	Yes	Yes
Time fixed effects	Yes	Yes	Yes	Yes	Yes	Yes	Yes
Observations	761	358	403	383	378	388	373
R-squared	0.127	0.249	0.164	0.139	0.158	0.108	0.192
Number of Countries	34	14	20	17	17	17	17

Standard errors in brackets

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

Table 2: Impact of quarterly fluctuations in supply of donor-supported contraceptives on fertility in Sub-Saharan Africa

	Dep. variable: Quarterly General Fertility Rate						
	Total	Subregion		Health Spending per capita		GDP per capita	
	(1)	(2)	(3)	(4)	(5)	(6)	(7)
Variable	Total	East & South Africa	West & Central Africa	Higher	Lower	Rich	Poor
Quarterly contraceptive supply coverage							
3 quarters behind	-7.162	-4.651	-8.886	-12.69*	-2.281	-11.94	-5.657
	[5.867]	[4.224]	[14.73]	[7.536]	[9.534]	[7.504]	[9.541]
4 quarters behind	-15.80*	-13.90**	-18.30	-23.69**	-7.985	-19.49*	-15.47
	[8.580]	[6.280]	[21.63]	[11.00]	[14.30]	[10.93]	[14.53]
5 quarters behind	-23.58**	-22.77***	-22.50	-35.80***	-11.25	-30.73**	-17.80
	[10.83]	[7.856]	[29.00]	[13.00]	[19.27]	[13.01]	[19.37]
6 quarters behind	-21.62*	-24.67***	-6.189	-37.62**	-3.394	-33.14**	-13.11
	[12.74]	[9.141]	[37.18]	[14.62]	[23.90]	[14.57]	[24.33]
7 quarters behind	-25.84*	-26.47**	-18.60	-40.46**	-13.11	-35.59**	-21.93
	[14.60]	[10.43]	[45.19]	[16.30]	[28.83]	[16.20]	[29.63]
8 quarters behind	-22.89	-25.22**	-10.72	-40.16**	-6.227	-33.06*	-17.11
	[16.47]	[11.60]	[53.72]	[18.14]	[33.49]	[17.98]	[34.65]
9 quarters behind	-30.11*	-32.89***	-7.772	-39.18**	-22.33	-33.83*	-32.66
	[18.11]	[12.53]	[62.97]	[19.49]	[38.04]	[19.21]	[39.58]
10 quarters behind	-32.67	-28.62**	-25.91	-38.64*	-27.45	-35.50*	-39.99
	[19.88]	[13.70]	[70.75]	[20.86]	[43.07]	[20.57]	[44.89]
11 quarters behind	-32.53	-24.78	-36.73	-38.87*	-35.03	-34.36	-48.80
	[21.86]	[15.23]	[77.64]	[22.88]	[48.29]	[22.66]	[50.46]
12 quarters behind	-32.69	-23.66	-52.93	-44.17*	-33.45	-37.42	-49.42
	[23.98]	[16.87]	[84.42]	[25.49]	[52.86]	[25.39]	[55.17]
Country fixed effects	Yes	Yes	Yes	Yes	Yes	Yes	Yes
Quarter fixed effects	Yes	Yes	Yes	Yes	Yes	Yes	Yes
Time fixed effects	Yes	Yes	Yes	Yes	Yes	Yes	Yes
Country-specific time trends	Yes	Yes	Yes	Yes	Yes	Yes	Yes
Observations	761	358	403	383	378	388	373
R-squared	0.191	0.348	0.215	0.201	0.223	0.180	0.238
Number of Countries	34	14	20	17	17	17	17

Standard errors in brackets

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