Longitudinal Dynamics of Contraceptive Use in Rural Mozambique: The Role of Life Course Changes and Fertility Intentions

Sarah Hayford (*sarah.hayford@asu.edu*) and Victor Agadjanian
Center for Population Dynamics, Arizona State University

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Abstract (149 words): Associations between contraceptive use and age, parity, and marital status are often assumed to be mediated by changes in fertility intentions. However, this pathway is not always empirically tested. This paper will leverage longitudinal data collected over a five-year period in rural southern Mozambique to examine the role of age, parity, marital status, and fertility intentions in explaining changes in women's use of modern contraception. In addition, we test for changes in the associations between fertility intentions and contraceptive use. Initial results show that women's contraceptive use increases over time, but that this increase is largely accounted for by changes in life course factors and fertility intentions. The association between the desire to stop childbearing and contraceptive use weakens over time, contrary to our expectations. The completed paper will refine model specification and conduct a more detailed analysis of change in the relationship between fertility desires and contraceptive behavior.

Extended abstract:

Sub-Saharan Africa has the lowest rates of contraceptive use of any world region, and contraceptive prevalence has increased only slowly over the past several decades (Cleland, Ndugwa, and Zulu 2011; Khan, Mishra, Arnold, and Abderrahim 2007). Contraceptive use is rare in part because desired family size continues to be high in much of the continent, but even net of intentions, contraceptive prevalence is low. The reasons for low prevalence are well-documented: difficult access to contraceptive methods because of weak health care systems and poor transportation infrastructure; unstable supply of contraceptives; fear of side effects; and cultural opposition to the practice of family planning (Sedgh, Hussain, Bankole, and Singh 2007).

While overall contraceptive prevalence is low in sub-Saharan Africa, there is consistent variation in contraceptive use over the life cycle. Rates of use vary by age, parity, and marital status. Much of the evidence for this variation comes from cross-sectional studies, which are not

always able to distinguish between the effects of these three closely-linked factors or to separate age effects from cohort effects. The relationship between contraceptive use and age, parity, and marital status is often assumed to be mediated by changes in fertility intentions associated with these life cycle factors, but this pathway is not always empirically tested. In addition, the possibility that associations between intentions and contraceptive use might change according to life cycle factors has rarely been considered.

This paper will leverage longitudinal data from three waves of a survey conducted over a five-year period in rural southern Mozambique to examine changes over time in women's use of modern contraception and in the association between contraceptive use and the desire to stop or postpone childbearing. In this extended abstract, we assess whether changes in factors related to the demand for children, such as parity and marital status, can account for the general increase in contraceptive use over time in this sample and whether their association with contraceptive use acts through reported fertility desires. We also provide initial tests of how the association of fertility desires and contraceptive use evolves over time. The completed paper will refine the model specification and conduct a more detailed analysis of change in the relationship between fertility desires and contraceptive behavior.

Determinants of contraceptive use

The literature on the determinants of contraceptive use in sub-Saharan Africa is vast; for reviews of important factors, see, e.g., Ainsworth, Beegle, and Nyamete 1996; Cleland, Ndugwa, and Zulu 2011; Khan et al. 2007; Sedgh et al. 2007. Almost all individual-level analyses of contraceptive behavior control for age, and most find significant associations (e.g., Behrman, Kohler, and Watkins 2002; Guilkey and Jayne 1997; Magadi and Curtis 2003; Shapiro and Tambashe 1994). However, age is generally treated as a background factor, and there is little

research directly focused on explaining these associations (but see Bledsoe, Banja, and Hill 1998, for an exception to this rule). In general, contraceptive use is found to increase with age, but the increase can be non-linear and may slow or even reverse in the oldest age groups. This pattern is often attributed to the fact that older women have more children and thus are more likely to want to stop childbearing. However, the association between contraceptive use and age typically persists when controlling for parity, education, and even fertility intentions. Associations with age might also be confounded by cohort change, if older women grew up in a time when education levels were lower and contraceptive use was rare. Thus, a full explanation of these associations requires consideration of the dynamic interactions between life course factors, fertility intentions, and contraceptive use and, ideally, longitudinal data to distinguish age and cohort effects.

Changes over time in women's use of contraception reflect two related processes. First, contraceptive use may change for purely age-related reasons. In addition to changes related to fertility intentions, as described above, the (perceived) impact of childbearing on women's health may increase with age, increasing the demand for contraception (Bledsoe, Banja, and Hill 1998). Furthermore, social norms about appropriate ages for childbearing may lead to higher contraceptive use net of individual intentions. At the same time, reduced risk of conception, either because of lower coital frequency or lower fecundability, might have the opposite effect on contraceptive use. Second, the relationship between fertility desires and contraceptive use may change over time. The desire to stop childbearing might initially be tentative, but strengthen over time; these stronger desires might be more likely to translate into contraceptive behavior. Age-related norms might also interact with individual intentions to strengthen the association

between intentions and contraceptive behavior over time. For instance, family planning nurses might be more likely to recommend contraception for older women than for younger women.

Hypotheses

Based on the above discussion, we propose the following specific hypotheses.

H1: Among a sample of women followed longitudinally, contraceptive use will increase over time.

H2: This increase will be partially explained by life course factors and fertility desires, but age will also show independent associations with contraceptive use.

H3: The association between the desire to stop childbearing and contraceptive use will strengthen over time.

Setting

This analysis uses data from a survey of rural women in four contiguous districts of Gaza province in southern Mozambique. The data are described in more detail in the data and methods section. A former Portuguese colony that gained independence in 1975, Mozambique was battered by a civil war for the first decade and a half of its independent existence. Since the end of the war in 1992 and the deployment of economic structural adjustment programs in the early 1990s, the country has experienced remarkable macroeconomic growth. Yet with an average per capita annual income of $541, life expectancy of 49 years, and adult literacy rate of 56%, Mozambique remains one of the poorest and least economically developed nations in the world (World Bank 2013). Mozambique is also among the world's worst affected countries by the HIV/AIDS epidemic, and infection rates in Gaza province are the highest of all of Mozambique's provinces. Estimates based on antenatal surveillance data show adult prevalence

in Gaza rising from 19% in 2001 to 27% in 2007, and population-based data from the 2009 National AIDS survey show adult prevalence of 25% in the province (Ministry of Health 2010).

The mainstay of the local economy in the study area is subsistence farming, with unstable harvests due to frequent droughts and floods. Fluctuating agricultural yields and scarcity of non-agricultural employment, combined with proximity to South Africa, have produced massive flows of male labor migration to the neighboring country. Although labor migration from southern Mozambique has continued for generations, its nature and outcomes have undergone considerable change in recent times. Once a sure source of income for migrants, most of whom were formally recruited to work in the South African mining sector, and for their left-behind families, today's migration is increasingly informal and its returns are less predictable (Agadjanian, Yabiku, and Cau 2011; De Vletter 2007).

According to the Demographic and Health Surveys (DHS) from 2003 and 2011, fertility transition appears to be underway, but progressing slowly. Virtually all women in Gaza province know at least one modern method of contraception (Ministry of Health, National Institute for Statistics, and ICF International 2011; National Institute for Statistics and Ministry of Health 2005). Contraceptive prevalence increased slightly between 2003 to 2011, from about 15% to about 18% of women of reproductive age, but unmet need remained substantial, at about 29% of women in 2011. Both desired family size and birth rates remained high in Gaza; in 2011, the median desired family size was 4.0 children and the total fertility rate was 5.3 children per woman.

Contraceptive methods are, in theory, readily available in the study area. Modern contraceptives, such as the pill, injectables, the IUD, and condoms, are provided free of charge at public maternal and child health (MCH) clinics, and data from our survey indicate that the

average woman in the sample lives about 5.5 km from the nearest clinic (Yao, Murray, Agadjanian, and Hayford 2012). However, long waits for service at local MCH clinics may dissuade women from seeking contraception, especially if women have heavy responsibilities for household or agricultural labor. In addition, our interviews with nurses suggest that MCH staff may be reluctant to provide some family planning methods to some clients – for example, nurses typically do not recommend injectables for younger women.

Data and methods

Data and sample

Data come from three waves of a population-based survey of rural ever-married women of reproductive age conducted in 56 villages of four contiguous districts (total area 5900 square miles, population 625,000) of Gaza province in southern Mozambique. The survey collected detailed demographic and socioeconomic information, including pregnancy histories, reproductive intentions and desires, husband's migration history, household economic status, and HIV/AIDS awareness and prevention. Questions were largely, but not perfectly, comparable across waves. The first wave of data collection surveyed 1678 married women age 18-40 in June-July 2006. In each district, 14 villages were selected with probability proportional to size, and approximately 30 women were interviewed in each village. Households were randomly selected in each village, with stratified sampling to produce equal numbers of women married to migrants and non-migrants, and eligible women were randomly sampled within households. In June-July 2009, the survey team attempted to relocate and reinterview all women from the original sample, regardless of current marital status or residence. To maximize retention, followup data collection efforts were carried out in October 2009 and in June-July 2010. In all, 1408 women from the original sample (84%) were reinterviewed. A refresher sample was

randomly selected to replace women lost to attrition, for a total sample in 2009 of 1868 women. In 2011, all women interviewed in either 2006 or 2009 – including women from the original sample who were not located in wave 2 as well as women from the wave 2 refresher sample – were eligible for the third wave of data collection. As in 2009, the primary data collection took place in June-July, with followup data collection efforts a few months later and one year later to seek out women not reached in the main data collection. Including additional sample refreshment, a total of 1937 women were interviewed in 2011. Overall, 1239 women from the 2006 sample (74% of the total) were relocated and interviewed in the third wave.

In order to examine change over time, we restrict the analytic sample to women interviewed in the first survey wave and at least one wave after that with no missing data on independent or dependent variables (N=1425). At each survey wave, we exclude women who were pregnant at the time of the interview (N=224, wave 1; N=168, wave 2; N=111, wave 3). Excluding pregnant women creates a biased sample, since pregnant women are disproportionately likely to be non-users. However, since these women are not eligible to be using contraception, it is not appropriate to include them in the analysis. In the final paper, we will assess the sensitivity of results to this exclusion by examining dynamics of contraceptive use among women who were pregnant at one survey wave but not others.

Measures

The dependent variable in this analysis is whether or not a respondent is using a modern method of contraception at the time of the survey. The survey asked all non-pregnant women about contraceptive use and recorded data on use of the pill, injectables, IUD, diaphragm, male and female condoms, sterilization, the rhythm method, withdrawal, and traditional methods such as herbal medicines. Respondents were also asked to report and specify any other methods

besides those listed. Only hormonal methods, barrier methods, the IUD, and sterilization were coded as "modern methods" and included in the dependent variable. Rates of use of other methods were extremely low; less than 1% of the sample reported using the rhythm method, withdrawal, or traditional methods (combined). The most commonly used methods were hormonal methods.

The primary independent variables are measures of life course factors: age, parity, and marital status. In the study area, very few marriages include either legal or religious ceremonies. We define women as married if they report having a husband or permanent partner. Because of the survey design, all women were married in the first wave of the survey, but women were followed subsequently as they divorced or remarried. We also control for whether a woman is in a polygamous or monogamous marriage and whether her husband is currently a migrant. These measures account for sexual frequency ("exposure to risk of conception") and may also be related to the demand for children. We include unmarried women in the sample, even though most of these women are not currently sexually active and thus would not be considered to have demand for contraception, to account for the impact of changes in marital status in the pool of women at risk for unmet need.

We also directly control for whether women wanted to stop childbearing, have a child right away (in two years or less), or have a child later (in two years or more). In all three survey waves, all women were asked "Would you like to have (more) children in the future, even if it is not right away?" (That is, the survey asked about positive desires for more children.) Response options were yes, no, and don't know. Women who responded "no" were considered not to want more children. Women who responded "yes" were asked how long they would prefer to wait before having a child. Response options were right away, within two years, in more than two

years, depends on husband, up to God, and don't know. Don't know, depends on husband, and up to God responses were included with "more than two years."

In the analyses presented in this extended abstract, we control for education and household wealth, since these variables have been found in previous research to be associated with contraceptive use. Education is measured as a three category variable: no education, 1-4 years of education, and 5 or more years of education (completed lower primary school). To account for household wealth, we include both a dichotomous measure of whether the household owns cattle, a traditional medium of wealth in this context, and a constructed index variable based on the possession of durable goods. The index variable takes values from 1 to 4 based on whether the household owns a radio, television, bicycle, and car or motorcycle. We also control for whether a respondent is very worried or not very worried about contracting HIV from her husband or another partner.

In the completed paper, we will also include other measures potentially related to contraceptive decision-making (e.g., age at marriage, spousal characteristics) and contraceptive supply (e.g., distance between the respondent's household and the nearest maternal and child health clinic, average contraceptive use in the community). In addition, we will refine our measures of fertility desires by incorporating dynamics of desires (e.g., measures of stability across waves of wanting to stop childbearing) and reported reasons for wanting to stop childbearing.

Methods

We estimate multilevel logistic regression models to describe the association between individual characteristics and use of modern contraception and change over time in contraceptive use (Singer and Willett 2003). These models pool all observations from all survey waves, using

person-waves as the unit of observation, and treat observations (level 1) as nested within women (level 2). We include dummy variables for survey wave to measure change over time allowing for non-linear trends; the completed paper will assess other specifications for time. Preliminary results in this extended abstract estimate a woman-level random intercept to account for within-individual correlations between contraceptive use at different time points. The completed paper will also test for random slopes for variables measuring trends over time to assess whether change in contraceptive use over survey waves varies across individuals.

Preliminary results

Descriptive results

Table 1 shows the proportion of women using contraception at each survey wave, along with changes over time in parity, marital status, fertility desires, and other sociodemographic characteristics. There was a small but steady increase in contraceptive use over the 5-year period of the survey, from 16.7% of non-pregnant women at wave 1 to 18.1% at wave 2 and 20.1% at wave 3. The proportion of women who would like to stop childbearing increased much more substantially, nearly doubling from 26.7% to 48.7% over the five-year period. The proportion of women who wanted to postpone childbearing declined slightly, but still, the number of women expressing demand for contraception, according to standard definitions, increased steadily over the period of observation. As would be expected, the average number of living children also increased over this time period. Because the first wave of the survey sampled only married women, the proportion of unmarried women necessarily increased over time, to around 10% in both waves 2 and 3. The proportion of women married to a migrant declined slightly, while the proportion in polygamous marriages remained stable.

<Table 1 about here>

Multivariate results

To disentangle the linked effects of changing parity, marital status, fertility desires, and age on contraceptive use, we estimate multi-level growth models. Results are presented in a series of three models in Table 2. The first model contains only measures of age and time trends; the second model adds life course variables (parity, marital status), fertility desires, and sociodemographic controls; and the third model contains an interaction between time and fertility desires to assess whether the association between wanting to stop childbearing and contraceptive use changes over time.

<Table 2 about here>

Model 1 shows no cross-sectional association between age and usage of family planning: in any one survey wave older women are not more likely to use modern methods of family planning. There is evidence of increased contraceptive use across survey waves, consistent with Hypothesis 1. Although only the difference between wave 3 and wave 1 is statistically significant, the magnitude of the coefficient for wave 2 is consistent with a steady increase between wave 1 and wave 3. Model 2, however, shows that this time trend is completely accounted for by life course factors, fertility desires, and sociodemographic characteristics. Hypothesis 2 is thus not supported. The fact that time trends are accounted for by controlling for individual characteristics suggest that these trends are probably not explained by changes in external factors, such as contraceptive supply.

Unmarried women are less likely to use contraception than married women, and polygamously married women are less likely to be contracepting than women in monogamous marriages, although this association is only marginally statistically significant (p=.08). These associations are presumably because unmarried women and polygamously married women have

lower coital frequency and are thus at less risk of pregnancy. As expected, women who want to postpone or stop childbearing are much more likely to be using contraception than women who want children in the near future. Women who have more children are also more likely to be using contraception. Both associations are statistically significant and relatively strong, even when included in a model together; fertility desires do not simply mediate life course factors, but provide additional explanatory power.

Model 3 introduces an interaction between the desire to stop childbearing and the survey wave. The interaction terms are relatively large and negative for both survey waves, although the interaction term for wave 3 is only marginally statistically significant (p=.08). Taken together, these interactions show a weakening of the association between fertility desires and contraceptive use over time, contrary to Hypothesis 3. These interactions are consistent with the bivariate results, which show a much larger increase in the desire to stop childbearing than in contraceptive use (Table 1). It is possible that contraceptive behavior lags behind fertility preferences in the individual life course: women may not begin using contraception until they are certain that their fertility preferences will not change. The completed paper will explicitly test for this possibility by incorporating measures of past as well as current fertility preferences.

In all three models, the variance in the level-2 intercept is large and statistically significant, indicating that there is statistically significant variation across individuals in the intercept (contraceptive use at wave 1), the impact of this variation persists across survey waves, and this variation is not explained by the individual characteristics included in the model. That is, some women are more likely than others to be using contraception at the time of the first interview, even net of controls for age, parity, fertility desires, and sociodemographic characteristics, and these women are also more likely to be using contraception at subsequent

waves. The completed paper will explore the role of other individual characteristics, including age at first marriage, spousal characteristics, distance from the nearest health clinic, and community-level contraceptive prevalence in explaining this inter-individual variation.

Discussion and next steps

In this extended abstract, we show that contraceptive use increases over a five-year period among rural women in Gaza province, Mozambique. The increase in contraceptive use is largely accounted for by changes in marital status, parity, and fertility desires. Although the desire to stop having children increases over time in this sample, the association between this desire and contraceptive behavior weakens.

As described in the methods section, the completed paper will incorporate additional individual and contextual variables that may contribute to change over time in contraceptive use and the relationship between fertility desires and contraceptive use. In addition, we will refine model specification to test for random slopes for the measures of time trends and to test interactions between time trends and the intention to postpone childbearing as well as stop childbearing.

The completed paper will also discuss our results in terms of their implications for understanding the dynamics of contraceptive use as well as the concept of "unmet need." Unmet need, or the proportion of women who report wanting to stop or postpone childbearing but are not currently using contraception, is an important policy measure. But the concept is often problematic when applied at the individual level: both fertility desires and reasons for non-use are complex and multidimensional. Reducing any non-use of contraception to "unmet need" obscures the nuances of fertility intentions and begs the question of what women see as a real "need" to be met. By examining how the correspondence between intentions and contraceptive

behavior changes over time, we help better understand the complexities of contraceptive demand in contemporary sub-Saharan settings.

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Table 1. Contraceptive use and sociodemographic characteristics in three survey waves

	Wave 1 (2006)	Wave 2 (2009)	Wave 3 (2011)
N (with no missing data)	1425	1329	1154
Number of women pregnant at survey	224	168	111
N (analytic sample)	1201	1162	1043
Percent of women:			
Using contraception	16.7	18.1	20.1
Who want more children within two years	49.3	36.1	33.8
Who want more children in more than two years	24.0	21.2	17.5
Who want to stop childbearing	26.7	42.7	48.7
Married	100	90.1	89.6
Polygamously	21.6	19.5	21.9
To a migrant	40.5	36.8	29.4
Not married	0	9.9	10.5
Very worried about HIV	80.7	48.0	30.4
With no education (measured wave 1)	27.0	--	--
With primary education (measured wave 1)	45.6	--	--
With more than primary education (measured wave 1)	27.2	--	--
Living in a household with cattle	31.9	33.2	38.2
Average:			
Age (measured wave 1)	27.6	--	--
Number of living children	2.4	3.2	3.6
Household wealth index (1-4)	2.1	2.0	2.0

Data: women interviewed in wave 1 and at least one additional wave, non-missing data on dependent and independent variables. Pregnant women are excluded from the analytic sample. Percentages may not sum to 100 because of rounding.

Table 2. Random effects models of contraceptive use across three survey waves

	b	SE		b	SE		b	SE	
Intercept	-1.95	1.10	+	-2.61	1.15	*	-2.83	1.15	*
Time trend (omitted=wave 1)									
Wave 2	0.10	0.11		-0.04	0.12		0.28	0.16	+
Wave 3	0.23	0.11	*	0.02	0.14		0.17	0.18	
Age at wave 1	0.04	0.08		0.00	0.08		0.00	0.08	
Age at wave 1 squared	0.00	0.00		0.00	0.00		0.00	0.00	
Number of living children				0.19	0.04	***	0.19	0.04	***
Unmarried				-0.78	0.25	**	-0.75	0.25	**
Polygamous marriage				-0.22	0.13	+	-0.23	0.13	+
Married to a migrant				-0.16	0.11		-0.15	0.11	
Fertility intentions (omitted=want a child within two years)									
Want more children in more than two years				0.67	0.14	***	0.66	0.14	***
Want to stop childbearing				0.74	0.14	***	1.17	0.20	***
Want to stop x wave 2							-0.80	0.24	***
Want to stop x wave 3							-0.43	0.24	+
1-4 years of education (wave 1)				0.32	0.14	*	0.32	0.14	*
5 or more years of education (wave 1)				0.83	0.15	***	0.84	0.15	***
Household wealth index				0.22	0.05	***	0.22	0.05	***
Household owns cattle				-0.08	0.11		-0.08	0.11	
Very worried about contracting HIV				0.12	0.11		0.12	0.11	
Level two (woman-specific) variance	0.83	0.12	***	0.66	0.12	***	0.67	0.12	***

Data: Non-pregnant women interviewed at least once after wave 1, with non-missing data on dependent and independent variables. N=3406 observations. *: p<.05; **: p<.01; ***: p<.001. Two-tailed tests.