

Decomposing Trends in the Components of Unmet Need for Family Planning in Sub-Saharan Africa

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Nearly 1 in 4 women of reproductive age are estimated to have an unmet need for family planning in Sub-Saharan Africa, the largest proportion of any region globally. Yet, trends in unmet need are less aligned with observed fertility trends, relative to other regions, indicating potential issues with the measurement of fertility preferences and family planning behaviors in Sub-Saharan Africa. This study seeks to address the complex reasons for a lack of close correspondence in the population measures by unpacking the compositional trends in the components of unmet need and population composition of women of reproductive age in 16 African countries. Using an extension of the Blinder-Oaxaca technique, we perform two decompositions using logit model estimates to study changes in women's behavior (*contraceptive non-use*) and preferences (*desire to avoid or postpone childbearing*) over time. We find that changes in the population composition, particularly the growing number of young women aged 15-24, have a strong effect on the change in fertility preferences over time, driving the summary measure to a greater extent than changes in family planning behavior. These findings represent a critical first step in diagnosing possible measurement concerns and identifying anomalies in patterned behaviors and preferences warranting further study.

Keywords: Family Planning and Contraception, Decomposition analysis, Fertility, Data and Methods

Introduction

Between 20-25% of women of reproductive age in Sub-Saharan Africa are estimated to have an unmet need for family planning (Ahinkorah, Ameyaw, and Seidu 2020). According to Ahinkorah et al., the majority of these approximately 50 million women are between the ages of 15-24. Precisely identifying the universe of women with an unmet need has become increasingly important to demographers concerned with the growing population of women of reproductive age across the region. At the same time, trends in unmet need are less aligned with observed fertility trends in Sub-Saharan Africa, relative to other regions, indicating potential issues with the measurement of fertility preferences and family planning behaviors (Casterline and El-Zeini 2014). Casterline and El-Zeini attribute this variation to the fundamentally different nature of fertility decline in African countries and the measurement issues associated with unmet need, which warrant further study.

This research seeks to address the complex reasons for a lack of close correspondence in the population measures by unpacking the compositional trends in the components of unmet need among women in Sub-Saharan Africa. The measure places women aged 15-49 who are fecund and sexually active in the denominator to capture the population at risk of pregnancy. The numerator includes women who are not using a method of contraception and want to avoid or delay childbearing in the next two years (DHS Program n.d.).

$$\text{Unmet Need} = \frac{\text{Component 1: Family Planning Behavior}}{\text{women who are not currently using contraception}} \text{ and } \frac{\text{Component 2: Fertility Preferences}}{\text{women who wish to avoid/delay childbearing in the next 2 years}}$$

$$\text{Population Composition: Population at Risk}$$

Despite its prominence in global family planning, researchers have questioned the extent to which a population-level measure like unmet need can accurately capture the complexity of individual women's fertility preferences and family planning behavior across space and time (Bradley and Casterline 2014; Senderowicz 2020; Senderowicz and Maloney 2022). Varying trends in the components of unmet need may indicate, and be related to, cultural and social variation in women's and families' approaches to managing their family planning. If the numerator (*behavior and preferences*) and the denominator (*the population at risk*) are changing in different ways, then the summary measure may mask important social dynamics that are temporally and spatially specific. To help diagnose these measurement issues, we use an extension of the Blinder-Oaxaca technique (Blinder 1973; Oaxaca 1973) to conduct decomposition analyses of women's family planning behavior and fertility preferences in 16 African countries. We hypothesize that challenges with defining the population at risk lead the measure to miss complex dynamics at play in the region.

Data and Research Methods

This project uses data from the Demographic and Health Surveys (DHS) to decompose trends in the components of unmet need. The DHS generally samples based on a stratified two-stage cluster design. Using design-based inference, we apply survey weights using the *survey* package in R (Lumley and Lumley 2020), which accounts for the sampling design. This allows us to produce weighted estimates and standard errors for each country by outcome variable and time period. We also account for stratification by residence type and region in addition to nested nature of clusters within strata.

Our study sample includes 255,943 women of reproductive age in 16 African countries: Benin, Chad, Ethiopia, Ghana, Guinea, Kenya, Malawi, Mali, Namibia, Niger, Rwanda, Senegal, Togo, Uganda, Zambia, and Zimbabwe. A women's questionnaire was conducted in each country during the first period (1992-2000) and the second period (2012-2020) of observation. The first period (T1) represents the onset of fertility transition in many African countries while the second (T2) includes the most recently available DHS data. These countries also represent a range of fertility transition stages (Figure 1).

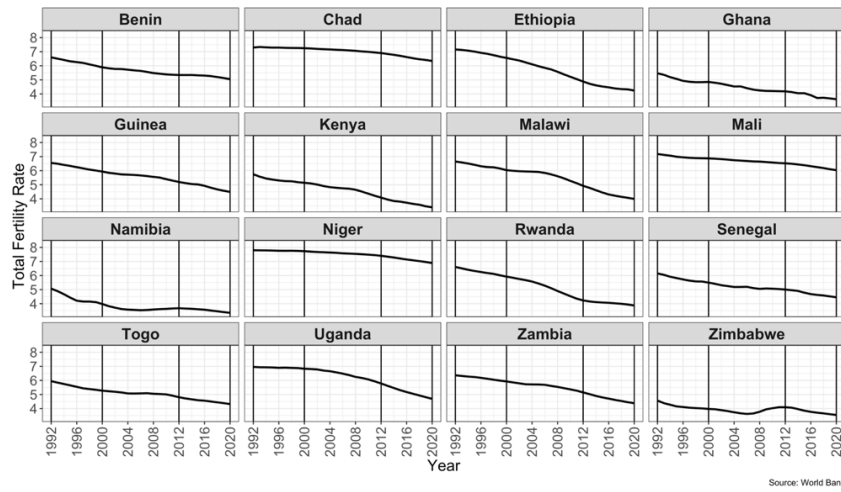


Figure 1. Total fertility rate (TFR) by country and year

Our analysis includes two outcome variables, which represent our components. The first component deals with family planning behavior, specifically contraceptive non-use. We construct a binary variable where 'NONUSE' = 1 for women not contracepting with all other responses set to zero. The second component reflects fertility preferences. We set 'AVOIDDELAY' = 1 for women who do not seek to have a child soon (i.e. within the next two years). Consistent with the revised definition of unmet need, the latter outcome (AVOIDDELAY) includes women who 1) want a child after two years, 2) want a child but are unsure of the timing, 3) are undecided, or 4) want no more children in the future (Bradley et al. 2012). Among those women, we classified 71.7% as non-users (NONUSE = 1) and 77.7% as having the desire to avoid or delay childbearing within the next two years (AVOIDDELAY = 1).

We first conduct a descriptive analysis to assess changes in our outcome variables over time as well as the five covariates included in our models: age, educational attainment, employment status, parity, and residential location. Next, we use an extension of the Blinder-Oaxaca technique (Fairlie 1999, 2005) to perform two separate decompositions using logit model estimates. We apply the non-linear decomposition technique to each component to study changes between our two time periods. Fairlie (2005) defines the decomposition for nonlinear equations $Y = F(X^T \beta)$ as:

$$\bar{Y}_{t_2} - \bar{Y}_{t_1} = \underbrace{\left[\sum_{i=1}^{N^{T_2}} \frac{F(X_{t_2,i}^T \hat{\beta}^{T_2})}{N^{T_2}} - \sum_{i=1}^{N^{T_1}} \frac{F(X_{t_1,i}^T \hat{\beta}^{T_2})}{N^{T_1}} \right]}_{\text{Endowments}} + \underbrace{\left[\sum_{i=1}^{N^{T_1}} \frac{F(X_{t_1,i}^T \hat{\beta}^{T_2})}{N^{T_1}} - \sum_{i=1}^{N^{T_1}} \frac{F(X_{t_1,i}^T \hat{\beta}^{T_1})}{N^{T_1}} \right]}_{\text{Coefficients}}$$

$$\text{where } F(X^T \theta) = \frac{\exp[X^T \theta]}{1 + \exp[X^T \theta]}$$

The regression equation represents the difference in the average outcomes between periods. The *endowments* term refers to the contribution of differences in explanatory variables (*covariates*) across periods. The *coefficients* term is the part of the outcome difference between groups attributable to variations in the coefficients (*effects*) of the explanatory variables. We use the expit function $F(X^T\beta)$ to transform the log-odds of these decompositions to a probability with values ranging from 0 to 1 (Fairlie 2005).

Preliminary Findings

To understand changes in the composition of our sample population, we first present descriptive statistics of the covariates included in our models at T1 and T2 (Table 1). The average age of our sample decreased by 1.1 years from 28.1 in T1 to 27.0 in T2. This change appears to be largely driven by an increase in the proportion of the youngest group (15-24). We attribute the changes in parity over time to the large population of younger women in our sample. We also observe a larger percentage of women completing secondary education by T2. At the same time, we see a decrease in the percentage of currently employed women over time despite an increase in women living in urban areas, where there may be more access to job opportunities.

	T1	T2	Δ
Age Group			
15-24	0.414 (0.002)	0.467 (0.002)	+5.28%
25-34	0.316 (0.002)	0.297 (0.001)	-1.82%
35-49	0.270 (0.002)	0.235 (0.001)	-3.46%
Education			
None	0.384 (0.003)	0.285 (0.002)	-9.81%
Primary	0.381 (0.002)	0.326 (0.002)	-5.49%
Secondary+	0.236 (0.003)	0.389 (0.002)	+15.30%
Employment			
Currently working	0.597 (0.003)	0.537 (0.002)	-6.02%
Parity			
0 children	0.296 (0.002)	0.385 (0.002)	+8.91%
1-2 children	0.301 (0.002)	0.264 (0.001)	-3.63%
3-4 children	0.202 (0.002)	0.190 (0.001)	-1.25%
5+ children	0.201 (0.002)	0.161 (0.001)	-4.03%
Residence			
Urban Residence	0.320 (0.003)	0.416 (0.003)	+9.55%

Table 1. Weighted mean differences in covariates between time periods

Next, we examine changes in our outcome variables between time periods ($\bar{Y}_{T1}, \bar{Y}_{T2}$). Figure 2 presents the weighted mean differences in contraceptive non-use on the left by country and period. We find a statistically significant decrease in the percentage of non-users from T1 to T2 in nearly half of the countries studied, with the largest changes observed in Ethiopia, Malawi, Namibia, Uganda, and Zambia. Four countries – Benin, Rwanda, Togo, and Zimbabwe – saw a significant increase in non-use between T1 and T2. Chad was the only country to see no change over time. We then explore differences in fertility preference over time.

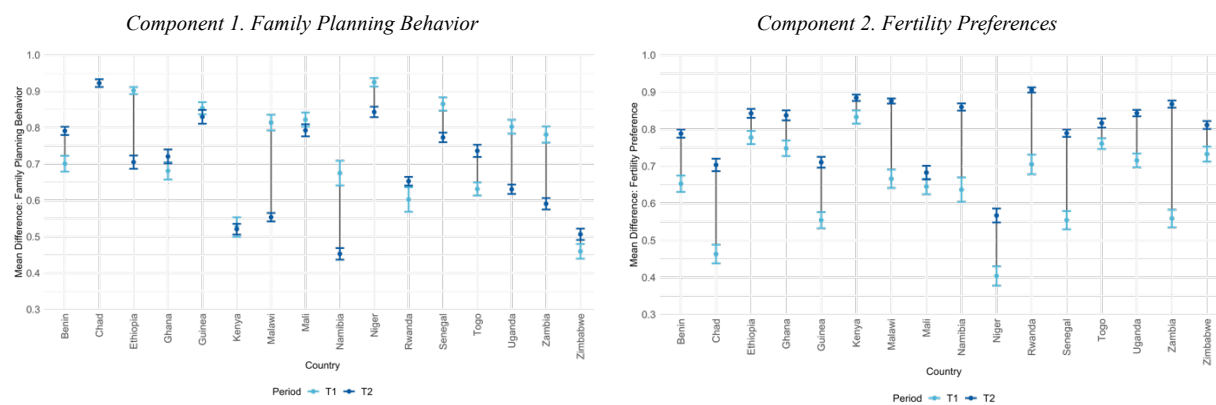


Figure 2. Weighted mean differences in outcome variables (i.e., components) between time periods by country

The right side of Figure 2 shows the weighted mean differences in the desire to avoid or delay childbearing by country and period. Unlike contraceptive non-use, we observed increases in all countries studied between T1 and T2. These changes were statistically significant in each setting except for Mali. Changes in Chad, Senegal, and Zambia were among the largest observed. By T2, nine of the sixteen countries studied had 80% or more of women of reproductive age expressing a desire to avoid or postpone childbearing compared to just one country (Kenya) in T1. The highest percentage of women with this fertility preference was found in Rwanda, while the lowest were in Niger. Overall, these results suggest that family planning behaviors are much more heterogeneous than fertility preferences. We further investigate the drivers of changes in the two outcome variables in the decomposition analysis.

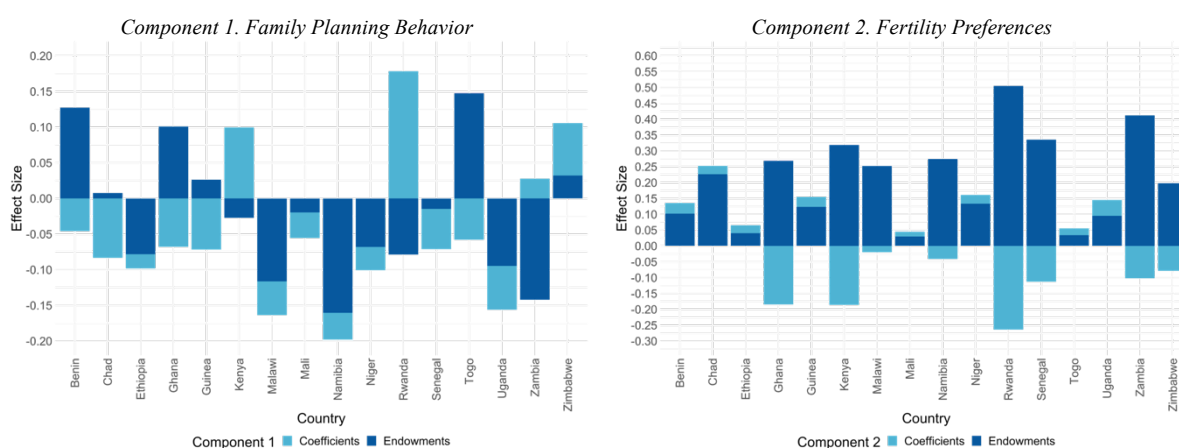


Figure 3. Decomposition results by component and country

The results from our decomposition analysis illustrate the differences in outcome variables attributable to changes in the endowments and coefficients. Figure 3 presents our first set of results for family planning behavior on the left and our second set of results for fertility preferences on the right. In three counties – Benin, Ghana, and Togo – we find large, positive effect sizes from endowments terms and smaller negative coefficient effects. In these three settings, contraceptive non-use was greater at T2 than at T1. These findings suggest that changes in the population composition of women appear to be driving changes in non-use more than changes in the effect of the covariates on the outcome variable. This differs from Kenya, Rwanda, and Zimbabwe, where the coefficient effect sizes were greater than the endowment terms effect sizes. It is worth noting, however, that changes in these three settings were not statistically significant. The remaining countries all saw a decrease in the percentage of non-users between time periods largely driven by changes in the endowments terms based on the effect sizes.

Unlike the behavior outcome, the patterns observed for fertility preference were much more consistent. The effect sizes of the endowment terms for the second component were greater and positive for every country included in our study. In half of the countries – Benin, Chad, Ethiopia, Guinea, Mali, Niger, Togo, and Uganda – the coefficient terms were also positive, suggesting that both terms were driving changes in fertility preferences in the same direction. In the second set of countries – Ghana, Kenya, Malawi, Namibia, Rwanda, Senegal, Zambia, and Zimbabwe – the coefficients terms were negative, countering the effects of the endowments terms. Still, the relative effect sizes of the coefficient terms were not large enough to change the direction of the overall effect for any of the countries.

These findings illustrate that trends in the fertility preference outcome are more consistent compared to the family planning outcome. Additionally, the effect sizes suggest that the desire to avoid or postpone childbearing appears to have a greater impact on the summary measure of unmet based on changes in the population composition of women of reproductive age. In the next phase of this work, we will quantify how each covariate contributes to the relative effect sizes. This requires us to account for the non-linearity of the regression technique applied to the data. Van Hook and co-authors (2004) have developed an approach to address this issue by dividing the composition component into parts associated with changes in the population composition related to particular covariates, which will be adapted for this work. Overall, this project seeks to improve our understanding of the changing needs and preferences of women, particularly young women, that impact the measurement of unmet need and shape family planning policies across Sub-Saharan Africa.

References

- Ahinkorah, Bright Opoku, Edward Kwabena Ameyaw, and Abdul-Aziz Seidu. 2020. "Socio-Economic and Demographic Predictors of Unmet Need for Contraception among Young Women in Sub-Saharan Africa: Evidence from Cross-Sectional Surveys." *Reproductive Health* 17(1):163. doi: 10.1186/s12978-020-01018-2.
- Blinder, Alan S. 1973. "Wage Discrimination: Reduced Form and Structural Estimates." *Journal of Human Resources* 436–55.
- Bradley, Sarah E. K., and John B. Casterline. 2014. "Understanding Unmet Need: History, Theory, and Measurement." *Studies in Family Planning* 45(2):123–50. doi: 10.1111/j.1728-4465.2014.00381.x.
- Bradley, Sarah E. K., Trevor N. Croft, Joy D. Fishel, and Charles F. Westoff. 2012. "Revising Unmet Need for Family Planning."
- Casterline, John B., and Laila O. El-Zeini. 2014. "Unmet Need and Fertility Decline: A Comparative Perspective on Prospects in Sub-Saharan Africa." *Studies in Family Planning* 45(2):227–45.
- DHS Program. n.d. "Need and Demand for Family Planning." *Guide to DHS Statistics DHS-8*. Retrieved (https://dhsprogram.com/data/Guide-to-DHS-Statistics/Need_and_Demand_for_Family_Planning.htm).
- Fairlie, Robert W. 1999. "The Absence of the African-American Owned Business: An Analysis of the Dynamics of Self-Employment." *Journal of Labor Economics* 17(1):80–108.
- Fairlie, Robert W. 2005. "An Extension of the Blinder-Oaxaca Decomposition Technique to Logit and Probit Models." *Journal of Economic and Social Measurement* 30(4):305–16.
- Oaxaca, Ronald. 1973. "Male-Female Wage Differentials in Urban Labor Markets." *International Economic Review* 693–709.
- Senderowicz, Leigh. 2020. "Contraceptive Autonomy: Conceptions and Measurement of a Novel Family Planning Indicator." *Studies in Family Planning* 51(2):161–76. doi: 10.1111/sifp.12114.
- Senderowicz, Leigh, and Nicole Maloney. 2022. "Supply-Side Versus Demand-Side Unmet Need: Implications for Family Planning Programs." *Population and Development Review* 48(3):689–722. doi: 10.1111/padr.12478.
- Van Hook, Jennifer, Susan L. Brown, and Maxwell Ndigume Kwenda. 2004. "A Decomposition of Trends in Poverty among Children of Immigrants." *Demography* 41(4):649–70. doi: 10.1353/dem.2004.0038.