Determinants of Persistently High Fertility in Sudan

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Working Paper No. 1706

May 2024

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Abstract

The Total Fertility Rate (TFR) in Sudan has fluctuated around five births per woman since the early 1990s. New data from the Sudan Labor Market Panel Survey (SLMPS) 2022 demonstrate that this trend has continued, with TFR in 2022 at 4.9 births per woman. Using the SLMPS data, this paper provides a descriptive update, after nearly two decades, to previous literature on the determinants of persistently high fertility in Sudan. The analysis addresses both selected proximate and background determinants of fertility. In addition to rural/urban differentials, there is a strong negative educational gradient in fertility. The TFR is 3.2 births lower among women with some secondary education than those with no schooling. The difference in Children Ever Born among women aged 40-49 is 1.6 births between the same two educational groups. Age at marriage and contraceptive use, two key proximate determinants of fertility, are likewise strongly associated with women's education. Attending at least some secondary school is a particularly important factor in marriage delay. Internally Displaced Persons generally follow the fertility and marriage patterns of Darfur, the region from which most of this population originates and is hosted. Overall, contraceptive prevalence remains low and fertility desires high. There is thus little to suggest that fertility rates in Sudan are likely to decline in the near future. However, the impacts of the conflict that began in mid-2023 on fertility can be unpredictable.

Keywords: Fertility, marriage, displacement, women's education, contraception
**JEL Classifications:** J11, J12, J13, I24, I12

ملخص

تذبذب معدل الخصـوبة الإجمالي في السـودان حوالي خمس ولادات لكل امرأة منذ أوائل التسـعينيات. تظهر البيانات الجديدة من المسـح التتبعي لسـوق العمل السـوداني (SLMPS) 2022 أن هذا الاتجاه قد اسـتمر، حيث بلغ معدل الخصـوبة الإجمالي في عام 2022 يكون 4.9 ولادة لكل امرأة. باسـتخدام بياناتSLMPS ، تقدم هذه الورقة تحديثًا وصـفيًا، بعد ما يقرب من عقدين، للأدبيات السـابقة حول محددات الخصـوبة المرتفعة باسـتمرار في السـودان. يتناول التحليل كلا من المحددات القريبة والخلفية المختارة للخصـوبة. وبالإضـافة إلى الفوارق بين الريف والحضرـ، هناك تدرج تعليمي سـلبي قوي في الخصـوبة. معدل الخصـوبة الإجمالي هو 3.2 ولادة بين النساء الحاصلات على بعض التعليم الثانوي أقل من أولئك الذين ليس لديهم تعليم. الفرق في الأطفال الذين ولدوا على الإطلاق بين النسـاء اللائي تتراوح أعمارهن بين 40 و 49 عامًا هو 1.6 ولادة بين نفس المجموعتين التعليميتين. وبالمثل، فإن السـن عند الزواج واستخدام وسـائل منع الحمل، وهما محددان رئيسـيان للخصـوبة، يرتبطان ارتباطا وثيقا بتعليم المرأة. يعد الالتحاق ببعض المدارس الثانوية على الأقل عاملاً مهمًا بشــكل خاص في تأخير الزواج. ويتبع النازحون داخليا عموما أنماط الخصـوبة والزواج في دارفور، وهي المنطقة التي ينحدر منها معظم هؤلاء السكان وتستضيفهم. وعموما، لا يزال معدل انتشار وسـائل منع الحمل منخفضـا، كما أن معدل الخصـوبة مرتفع. لذلك لا يوجد ما يشـير إلى أن معدلات الخصـوبة في السـودان من المرجح أن تنخفض في المسـتقبل القريب. ومع ذلك، فإن آثار الصرـاع الذي بدأ في منتصـف عام 2023 على الخصـوبة يمكن أن تكون غير متوقعة.

1. Introduction

Sudan has experienced high fertility rates since global population projections and national household survey programs have made information on fertility widely available. Based on the earliest available national household surveys, the small literature on fertility in Sudan emphasized the near 'natural' fertility regime of the 1970s (Khalifa 1986), which was followed by a substantial decline in the Total Fertility Rate (TFR) through the early 1990s (Eltigani 2000). The fertility decline observed in household surveys during this period followed the trend of United Nations Population Division (UNPD) (2022) modeled estimates, albeit at a lower level of fertility. Still, even at its lowest point, the TFR in Sudan was around 4.5 births per woman in 1993 (Figure 1).[1]

While UNPD models continued to estimate a moderate pace of TFR decline over subsequent decades, after a considerable time gap[2] more recent survey-based estimates suggest that this decline has not in fact occurred. TFR in both the 2010 and 2014 Multiple Indicator Cluster Surveys (MICS) was well over 5 births per woman (National Ministry of Health and Central Bureau of Statistics (Sudan) 2011; CBS and UNICEF Sudan 2016). The apparent stagnation of the fertility rate in Sudan during this period stands in contrast to the fertility decline experienced in much of the Middle East and North Africa (MENA) region, particularly during the 1990s, leaving Sudan as the country with the highest TFR in the region (United Nations Population Division 2022).

Figure 1. World Population Prospects median variant TFR estimate, with 95% confidence bounds, compared with national household survey estimates of TFR, Sudan
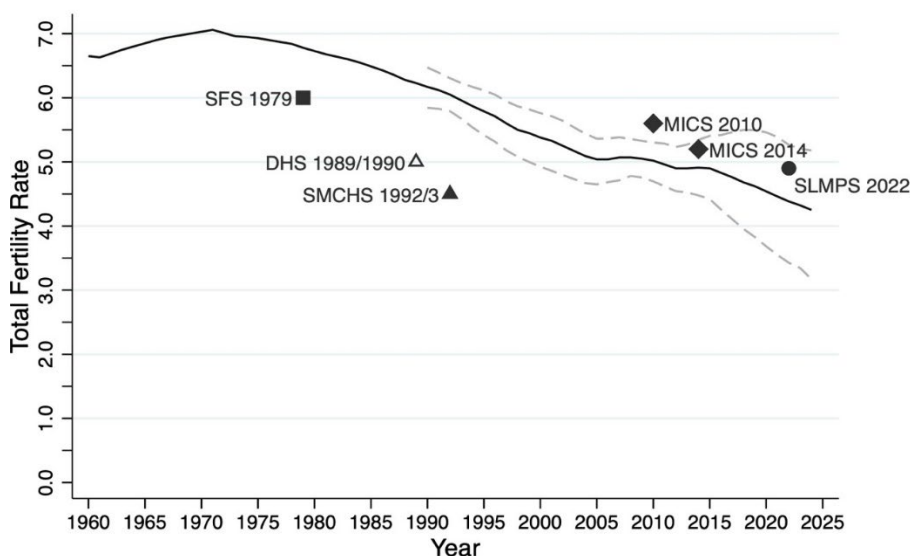
Notes: World Population Prospects (WPP) median variant TFR estimate (solid line) and 95% upper and lower confidence bounds (dashed lines, for years available) obtained from the WPP 2022 Revision online database (United Nations Population Division 2022). Sudan Fertility Survey (SFS) 1979 estimate from Eltigani (2000). Demographic and Health Survey (DHS) 1989/1990 estimate from Department of Statistics (Sudan), Ministry of Economic and National Planning (Sudan) and Macro International (1991). Sudan Maternal and Child Health Survey (SMCHS) 1992/3 estimate from Population Council (1995). MICS 2010 estimate from National Ministry of Health and Central Bureau of Statistics (Sudan) (2011) and MICS 2014 estimate from Central Bureau of Statistics (Sudan) and UNICEF Sudan (2016). Author's estimate for SLMPS 2022.

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[1] The TFR estimate from the SMCHS survey report is 4.5 (Population Council 1995) whereas Eltigani (2000) obtained a TFR of 4.6 using the same data.

[2] Mahfouz (2009) presents a TFR estimate of 4.9 based on the 1999 Sudan Safe Motherhood Survey. However, the original survey report and data are not publicly available to assess the survey data or TFR estimate quality. While this estimate is consistent with the trends shown in Figure 1, it is therefore not included in the figure.

The Sudan Labor Market Panel Survey (SLMPS) 2022, the first national household survey since 2014 to allow for the calculation of the TFR, confirms that fertility rates have still not declined substantially, and remain at 4.9 births per woman (see also Krafft et al. 2023). The new survey data provide an opportunity to better understand why fertility has remained so persistently high in Sudan, which is important for several reasons. First, a country's fertility rate is the key determinant of its demographic structure, and as such has important implications for the structure of the (future) labor force, economic growth and the potential for a "demographic dividend" (Bloom, Kuhn, and Prettner 2017). Second, the fertility rate and current population structure (i.e. the number of women currently of reproductive age) interact to determine the number of children born each year. The size of these birth cohorts has important implications for immediate needs for investment in children, including health and education. Given the political instability experienced by Sudan in recent years, which may have disrupted investments in human capital in an already fragile context (Krafft et al. 2023), it is all the more important to consider how the country's demographic structure affects these needs. Fertility rates are most immediately shaped by the proximate determinants of fertility, which are the biological and behavioral factors that determine exposure to conception. In the classic framework proposed by Bongaarts (1978; 2015), the proximate determinants are marriage (or being in a union), contraceptive use, postpartum infecundability and induced abortion. The limited literature on fertility in Sudan, which relies primarily on the surveys conducted between the late 1970s and early 1990s, has focused on the proximate determinants (Khalifa 1986; Eltigani 2000; 2001). These studies demonstrated that postpartum infecundability – primarily due to prolonged breastfeeding – was the primary factor limiting fertility in a context where modern contraceptive use was extremely limited (Khalifa 1986; Eltigani 2000). However, Eltigani (2000; 2001) also demonstrated that the decline in the fertility rate between the late 1970s and early 1990s was driven primarily by increases in the age at marriage.

There is little literature on the background determinants of fertility in Sudan, or the broader social and economic patterns that act through the proximate determinants to shape fertility levels (Bongaarts 2015). One important background determinant of fertility is women's education. The global literature shows a robust relationship between women's education and lower fertility – both at the aggregate and individual levels (Martin 1995; Shapiro and Tenikue 2017). Lack of progress in expanding women's education has also been identified as a potential contributor to fertility stalls, or periods during which a country's fertility rate remains stagnant after having begun the fertility transition (Goujon, Lutz, and KC 2015; Kebede, Goujon, and Lutz 2019; Grimm et al. 2022). The TFR trend shown in Figure 1 is broadly consistent with a fertility stall over quite a long period.

Previous surveys in Sudan have shown a negative educational gradient in the TFR, i.e. that more educated women tend to have fewer children (Eltigani 2000; CBS and UNICEF Sudan 2016) and one small study in Gezira state argued that women's education is associated with lower fertility (Sid Ahmed 2010). Given new evidence from the SLMPS that progress on educational attainment has largely stalled for cohorts born since the 1980s (Krafft et al. 2023), which includes the majority of the current population of reproductive-age women, it is important to revisit the relationship between education and fertility in this context.

Another background determinant of fertility that has been unexamined in Sudan is conflict and forced displacement, which likewise takes on increasing importance given the recent political turmoil experienced by the country. The global evidence on conflict and fertility is mixed and generally concludes that impacts are context specific. During some conflicts fertility rates declined, at least temporarily (e.g. Lindstrom and Berhanu 1999; Blanc 2004; Clifford,

Falkingham, and Hinde 2010). Yet during other conflicts, fertility rates increased among specific sub-populations, such as adolescents (Khawaja and Randall 2006; Cetorelli 2014) and those most directly affected by the conflict (Torrisi 2020). Similarly, fertility among populations forcibly displaced by conflict may increase or decrease at different stages of displacement (Abbasi-Shavazi, Mahmoudian, and Sadeghi 2018).

This paper provides a descriptive update, after nearly two decades, to previous literature on the determinants of high fertility in Sudan. Given the lack of recent studies on fertility, the paper begins by examining fertility differentials by key background characteristics of reproductive age women. In addition to rural/urban and regional differentials, there is a strong negative association between women's education and fertility rates. Internally Displaced Persons generally follow the fertility patterns of Darfur, the region from which most of this population originates and is hosted. To explore the potential mechanisms behind these fertility differentials, the paper then turns to two key proximate determinants of fertility: age at marriage and contraceptive use. Both are likewise strongly associated with women's education; attending at least some secondary school is a particularly important factor in marriage delay. Contraceptive prevalence remains low and fertility desires high, even among women at higher parities. Overall, there is little to suggest that fertility rates in Sudan are likely to decline in the near future. However, the impacts of the conflict that began in mid-2023 on fertility can be unpredictable.

2. Methods

This paper relies on the Sudan Labor Market Panel Survey 2022, which was conducted by the Economic Research Forum and the Sudan Central Bureau of Statistics (OAMDI 2023). The SLMPS consists of a nationally representative sample of 25,442 individuals in 4,878 households (Krafft, Assaad, and Cheung 2023). The survey over-sampled areas with high concentrations of displaced populations, both inside and outside of camps, to allow for separate analysis of these groups. Weights are provided with the survey data to account for the complex survey design and non-response (Krafft, Assaad, and Cheung 2023) and are used throughout the analyses.

The analytical sample for the paper consists of the 5,803 women of reproductive age (15-49) in the SLMPS. The primary measure of interest is the Total Fertility Rate (TFR), which is calculated using the Stata tfr2 package (Schoumaker 2013). The TFR is a synthetic rate that calculates the total number of children a woman would have if she experienced current age-specific fertility rates throughout her entire reproductive years. The TFR is estimated using birth history data, which was collected from all ever-married women of reproductive age. Birth histories collect information on every live birth over the course of the woman's life, regardless of whether the child is still alive at the time of the survey.

The calculation of the TFR relies on accurate reporting of the date of birth of both mothers and children (Pullum and Staveteig 2017). In this respect, there are several points to note about the SLMPS data. Womens' date of birth was reasonably complete. Year of birth was reported for all reproductive age women but month of birth was missing for 355 women (6% of the sample). In these cases, a random birth month was imputed and added to the woman's completed age in years.

The women in the sample reported a total of 13,452 births.[3] Of these, 227 (about 2%) were missing birth year and were dropped from the analysis. An additional 672 births (5%) with complete birth year were missing birth month. An assessment of month of birth data indicated that reporting of this variable was quite poor; 43% of births were recorded as occurring in January, suggesting that this is likely equivalent to a "don't know" response. For those births with year available but no month, month of birth was therefore imputed simply by generating a random month.

Previous analyses of the SLMPS have also shown that there was an issue with displacement of children aged five at the time of the survey to age four, likely due to enumerators wanting to avoid completing the lengthy individual questionnaire for individuals aged five and above (Krafft, Assaad, and Cheung 2023). So that this issue does not artificially inflate the TFR, all TFRs are estimated for the three-year period prior to the survey, which is also the standard used in the Demographic and Health Surveys (DHS) program.[4]

As a complement to the TFR, the total number of Children Ever Born (CEB) to women aged 40-49 is presented. CEB is a cohort measure of fertility that captures actual completed fertility among women who are near the end of their reproductive years. The CEB is thus less subject to short-term fluctuations in the birth rate and is not subject to misreporting of children's birth dates (only to misreporting of the total number of children). However, it is reflective of the fertility behaviors of older women only and therefore does not capture recent trends in fertility. This is a particular concern in contexts where fertility rates are changing rapidly, which does not appear to be the case in Sudan overall but may be a concern for specific population subgroups.

The paper then turns to a more detailed analysis of the proximate determinants of fertility that are captured in the SLMPS, namely marriage and contraceptive use. For marriage, the analysis focuses on early marriage, or marriage prior to age 18 according to international definitions (UNICEF, n.d.).7[5] The percentage of women who married before reaching different ages, from age 15 through 25, is presented. As this analysis is subject to censoring (i.e. marriage is not observed for all women, who may marry at a date after the survey), Kaplan-Meier failure estimates are also presented. These estimates allow for the calculation of the median age at marriage, accounting for censoring, for all women and for different subpopulations.

The final section of the paper turns to current contraceptive use. Due to the very low rate of contraceptive use found in the SLMPS, use is treated simply as a binary measure of not/contracepting. A brief discussion of the method mix is presented in the text.

Throughout the paper, differences in fertility, marriage and contraceptive patterns are explored by several background characteristics of women. Education is coded broadly as the highest level of schooling attended, categorized as never attended, primary, and secondary or above. While it would be preferable to distinguish between those with incomplete versus completed

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[3] The DHS program, for example, conducts extensive correction and imputation of dates in the birth histories (Croft 1991). The data cleaning approach adopted for the SLMPS was much more limited. No corrections or imputation were made for illogical time intervals between births or date of marriage and first birth.

[4] https://dhsprogram.com/data/Guide-to-DHS-Statistics/index.htm#t=Current_Fertility.htm%23

[5] When possible, age at marriage was imputed based on age at first birth for ever married women (n=3,773) who reported an age at marriage below 8 years old (n=31) or for whom age at marriage was missing or recoded as "don't know" (n=185) (i.e. for about 6% of ever married women overall). First, the distribution of months between age at marriage and age at first birth was calculated for women with complete data whose first birth occurred in the five complete years prior to the survey (2017-2021). Based on this distribution, a random number of months was pulled and subtracted from women's age at first birth to generate their age at marriage.

primary education, as well as those with secondary versus tertiary education, the smaller sample sizes for more detailed educational groupings lead to imprecise estimates of the key measures of interest.

The other background characteristics examined are region of residence, rural vs. urban residence and displacement status. The latter applies only to the population of Sudanese nationals and reflects status as an Internally Displaced Person (IDP) versus non-displaced. The definition of IDP applied follows Assaad, Krafft and Wahba (2024); this is a broad definition that includes all those who have ever moved due to violence or a natural disaster or are registered as IDPs, and have not returned to their original place of residence.[6]

For analyses of contraceptive use, two additional covariates are considered: parity (a woman's total number of previous live births) and fertility intentions. Fertility intentions were measured through a question about whether the respondent wanted to have (a)nother child in the three years following the survey. The response options were "yes", "no", "as God wills it," and "don't know." Due to the small number of "don't know" responses, these were coded to missing. As a robustness check to the descriptive results, a multivariate logistic regression model of the correlates of contraceptive use is presented in the Appendix.

Throughout the chapter, results are compared with key indicators from the 2014 MICS, which was the most recent survey prior to the SLMPS to provide detailed data on fertility, marriage and reproductive health (CBS and UNICEF Sudan 2016). However, given the long time period between the two surveys, differences in the sample composition (Krafft, Assaad, and Cheung 2023) and the descriptive nature of the analysis, these comparisons should be interpreted with caution.

3. Characteristics of women of reproductive age

Table 1 presents the characteristics of women of reproductive age in Sudan. To give some context to the numbers, selected characteristics are compared with the population of women of reproductive age in Egypt based on the Egypt Labor Market Panel Survey (ELMPS) 2018 (OAMDI 2019). While Egypt neighbors Sudan to the North, the total fertility rate is considerably lower, at 3.1 births per woman in the ELMPS 2018 (Krafft, Assaad, and Keo 2022).

Consistent with the very young age structure of the Sudanese population (Krafft et al. 2023), younger women are over-represented in the reproductive age population. This contrasts with Egypt, a lower fertility setting, where reproductive age women are correspondingly more distributed across the age distribution. About 70% of reproductive age women in Sudan had ever been married, a basic proxy for ever exposure to childbearing. Rates of both divorce and widowhood were low, such that two-thirds of women were in a marital union at the time of the survey. This was quite similar to the pattern in Egypt, where a slightly lower percentage of women had never been married.

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[6] While the SLMPS also captured refugees, the subpopulation of refugee women of reproductive age is too small to analyze for the measures presented in this paper.

Table 1: Characteristics of reproductive age women in Sudan (SLMPS 2022) and Egypt (ELMPS 2018)

	Sudan 2022	Egypt 2018	Sudan 2022	Egypt 2018
	Col %	Col %	No.	No.
Age group				
15-19	21	17	1,192	2,561
20-24	20	15	1,186	2,227
25-29	17	15	1,012	2,314
30-34	14	18	808	2,636
35-39	12	15	668	2,241
40-44	10	11	583	1,723
45-49	6	9	354	1,296
Marital status				
Never				
married	29	26	1,685	3,879
Married	66	69	3,840	10,300
Divorced	3	3	163	428
Widowed	2	2	108	371
Highest education level attended				
Never				
attended	42	20	2,431	2,702
Primary	26	14	1,520	1,871
Secondary+	32	67	1,850	9,122
Currently in school				
Yes	14	16	820	2,420
No	86	84	4,981	12,561
Residence				
Urban	33	40	1,914	5,984
Rural	67	60	3,889	9,015
Region				
Khartoum	19		1,117	
Darfur	26		1,532	
Kordofan	12		681	
Central	23		1,321	
North	5		289	
East	15		864	
IDP (Sudanese)				
No	92		5,107	
Yes	8		426	
Total	100	100	5,803	14,999

Source: Author's calculations from the SLMPS 2022 and ELMPS 2018

The most notable difference between Sudan and Egypt comes in the educational profile of reproductive age women.[7] In Sudan, fully 42% of reproductive age women had never attended school, compared to 20% in Egypt. A further 26% of women in Sudan attended primary school and only 32% attended secondary education or higher. In Egypt, by contrast, two-thirds of reproductive age women had attended secondary education or higher. In Sudan, 14% of reproductive age women were still in school at the time of the survey. While this level was similar to Egypt (16%), since reproductive age women in Egypt are on average older, this is consistent with completing higher average levels of schooling.

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[7] Educational levels are also an important difference between the SLMPS and MICS 2014 samples of reproductive age women. Although the MICS report categorizes women by educational level completed, a considerably smaller percentage (32%) had no schooling. The percentage of women with primary school was higher than in the SLMPS. The distributions of women by marital status, rural/urban residence and age group were quite similar across the two surveys (CBS and UNICEF Sudan 2016).

In terms of the geographic distribution of the population, two-thirds of reproductive age women in Sudan resided in rural areas. This was slightly higher than in Egypt, but the difference was not very large. The regional distribution of reproductive age women was consistent with the distribution of the population overall (Krafft et al. 2023). Finally, turning to displacement status, 8% of Sudanese women of reproductive age were IDPs. IDPs were concentrated in the Darfur region of the country (Assaad, Krafft, and Wahba 2024).

4. Total and age-specific fertility

The TFR for Sudan in the SLMPS was 4.9 births per woman. The mean Children Ever Born among women aged 40-49 was very similar, at 4.8 children (Table 2). This is consistent with Figure 1 in indicating a largely unchanging fertility rate over the last several decades.

The overall fertility rate masks substantial differentials by women's characteristics. Women in rural areas had a considerably higher TFR than those in urban areas (5.8 versus 3.2, respectively) (see also Krafft et al. 2023). However, the gap in CEB was considerably smaller, at only half a birth. Previous studies have also found a rural-urban gap in TFR, but on the order of 1.2-1.4 births per woman (Eltigani 2000; CBS and UNICEF Sudan 2016). It may be that the large rural-urban gap in TFR seen in the SLMPS was caused by period-specific postponement of births in urban areas at the time that the SLMPS was fielded. It is also possible that rural-urban differentials in fertility are increasing over time.

Table 2: Total Fertility Rate and mean Children Ever Born (women aged 40-49) by selected background characteristics, SLMPS 2022

	TFR	CEB (women aged 40-49)
Residence		
Urban	3.2	4.5
Rural	5.8	5.0
Region		
Khartoum	3.0	4.2
Darfur	6.8	6.2
Kordofan	4.5	5.3
Central	4.4	4.5
North	4.6	3.6
East	5.3	4.8
Highest education level attended		
Never attended	6.4	5.2
Primary	4.9	4.9
Secondary+	3.2	3.6
IDP (Sudanese)		
No	4.9	4.6
Yes	6.1	6.4
Total	4.9	4.8

Source: Author's calculations from the SLMPS 2022

There were also strong regional differentials in fertility. It should be cautioned that the TFR estimates for some regions, especially the East, have wide confidence intervals and should be interpreted carefully. However, the TFR and CEB are broadly consistent in showing that Khartoum, the North and Central regions had somewhat lower fertility rates, whereas fertility in Darfur was the highest in the country. These patterns are also broadly consistent with the MICS 2014 in terms of the regions that have higher and lower fertility (CBS and UNICEF Sudan 2016).

A similarly strong gradient in fertility is seen by women's education. The TFR dropped from 6.4 births per woman among women who never attended school to 4.9 among those who

attended primary school and 3.2 among those who attended secondary or higher. This gradient is fairly consistent with the 2014 MICS, which found a TFR of 6.4, 5.4, 4.2 and 3.2 among women with no, primary, secondary and higher education, respectively (CBS and UNICEF Sudan 2016).

The education gradient in TFR is likely affected by the fact that women who achieve higher levels of education are more likely to be in school and unmarried, and thus begin childbearing later than women with less education. The CEB suggests that these tempo effects may have some influence on the TFR; the educational difference in the CEB is not as large. However, even at the end of their reproductive careers, women with secondary education have 1.3-1.6 fewer births than those with less education. Since the CEB captures the fertility of older cohorts it is also possible that the educational gradient in fertility is increasing (hence resulting in the larger gap in TFR).

Further insights into educational differences in fertility can be gained by examining age-specific fertility rates by education (Figure 2). There is evidence for education being associated with a later initiation of childbearing; women who never attended school have much higher adolescent fertility (age 15-19) than women who attended school.

Women with primary schooling experience a sharp increase in age-specific fertility in the age group 20-24. Between ages 25-35, they experience about 50 fewer births per 1,000 women than women with no schooling. From age 35, the ASFRs of the two groups decline considerably and converge. Women with at least some secondary education see a sharp increase in ASFR only at ages 25-29 and the ASFRs remain lower than those of women with less education through the 30s. There is thus evidence both for a later fertility schedule among women with at least some secondary education and overall lower fertility rates.

Figure 2: Age-Specific Fertility Rates (ASFRs) by highest level of education attended, SLMPS 2022
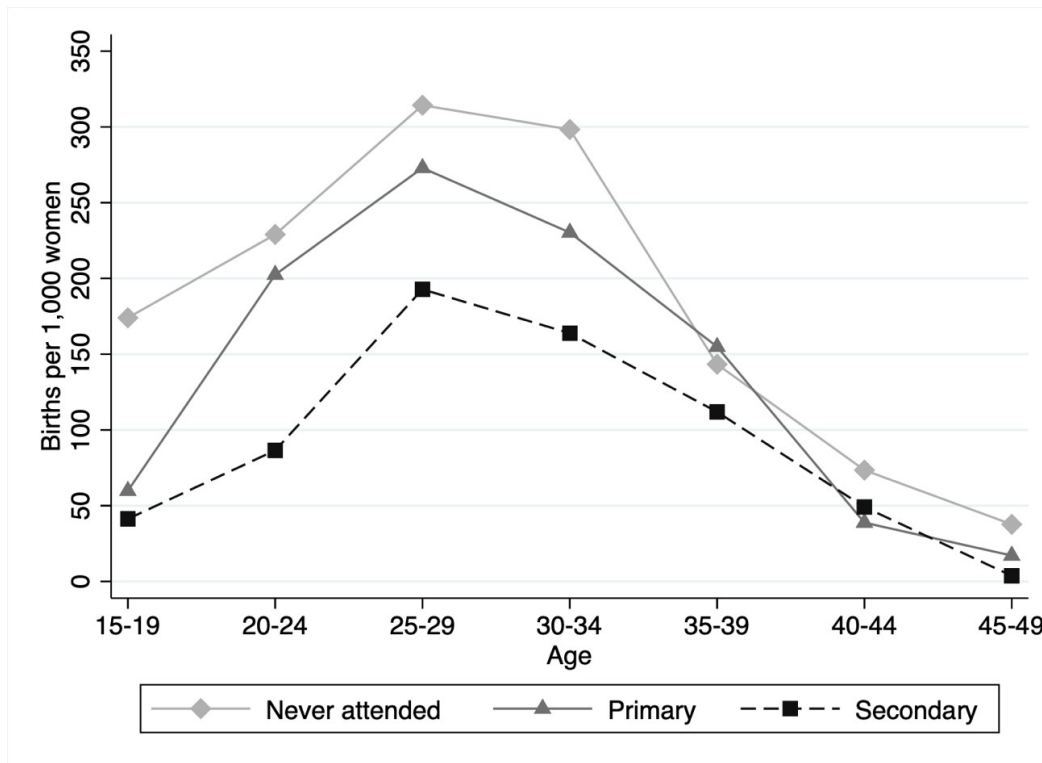
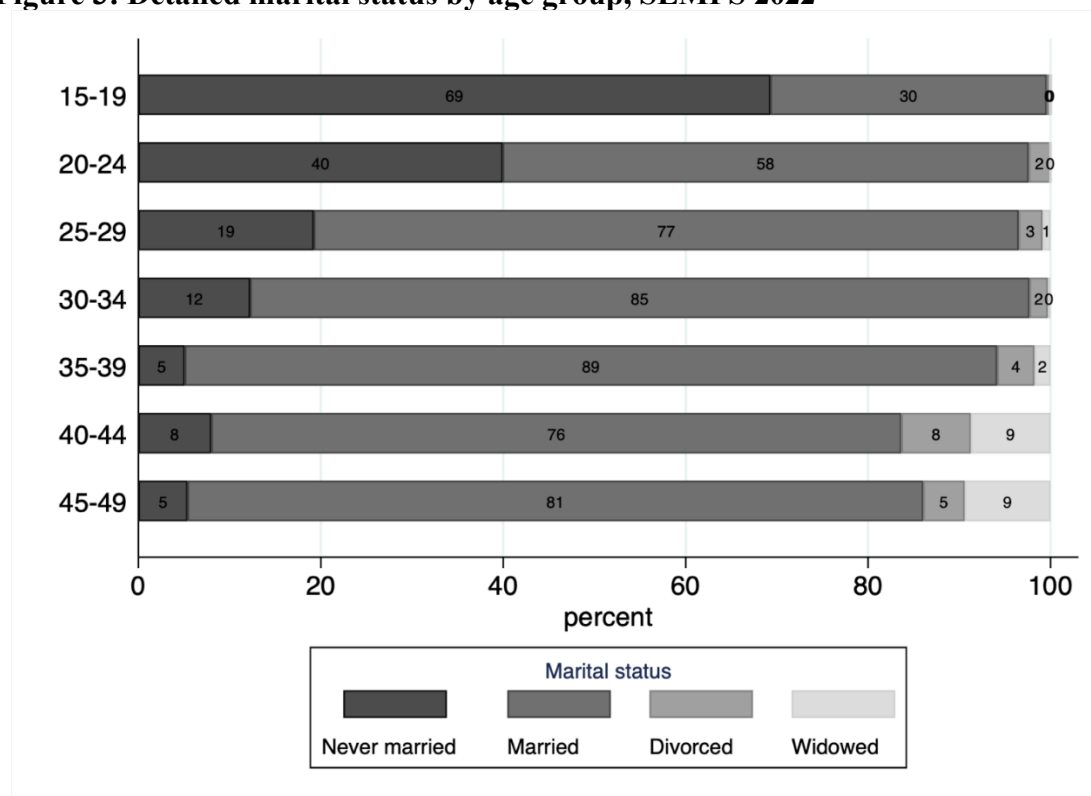Source: Author's construction from the SLMPS 2022

IDPs also had somewhat higher fertility rates than non-IDPs according to both the TFR and CEB measures (Table 2). However, the TFR among IDPs was very similar to that of Darfur overall, the region from which the majority of IDPs originate and where they are hosted (Assaad, Krafft, and Wahba 2024). It is thus likely that the overall fertility differential by displacement status is driven primarily by the selectedness of IDPs based on region. Analysis within the population of Darfur would be needed to further assess how displacement experience is associated with fertility.

5. Marriage patterns

Marriage is a key determinant of fertility in contexts where contraceptive prevalence is low. As shown in Figure 3, marriage is universal among women in Sudan, with only 5- 8% in the age groups 35-39 and above having never married. Marriage is also early, with 30% of adolescent girls aged 15-19 having ever married and 60% of those in the 20-24 age group. Divorce is uncommon, with only 3% of women of reproductive age currently divorced (noting that women may have been divorced and remarried).

Widowhood, as expected, increases somewhat with age, reaching around 9% of women aged 40 and above. In sum, the majority of women are married throughout their reproductive years.

Figure 3: Detailed marital status by age group, SLMPS 2022

Source: Author's construction from the SLMPS 2022

Table 3 presents a more detailed picture of early marriage among reproductive age women, focusing on the proportion who were married before reaching ages 15, 16, 18 and older. Very early marriage, before age 15, was experienced by 11% of reproductive age women and marriage before age 18 by 29% of women. Using the Sustainable Development Goals indicators of the proportion of 20-24-year-olds who married prior to age 15 and age 18, 8% of women in Sudan married very early and 30% married early. Even among the majority of women who do not marry early, the transition to marriage is quite compressed, with 44% having married before age 20 and over half before age 22. Two-thirds of women marry before age 25.

The patterns of early marriage fluctuate across age groups. Women aged 30-34 in 2022 (i.e. birth cohorts 1988-1992) seem to have experienced a slower transition to marriage, particularly compared to those aged 25-29 in 2022 (i.e. birth cohorts 1993-1997). It is possible that some of this pattern is due to age misreporting around age 30. What is clear from the data is the absence of a trend towards lower rates of early marriage. Turning to the median age at marriage, which can be calculated for the age groups in which at least 50% of women were married at the time of the survey, it in fact appears that median ages at marriage increased somewhat before possibly declining again.

Table 3: Proportion of women who married before ages 15,16,18, 20, 22, 25 and median age at marriage, by age group, SLMPS 2022

Age group	Married before age						Median age at marriage	N
	15	**16**	**18**	**20**	**22**	**25**		
15-19	11	-	-	-	-	-	-	1,198
20-24	8	18	30	48	-	-	-	1,189
25-29	19	26	40	53	63	75	17	924
30-34	7	12	19	33	43	64	21	744
35-39	12	20	26	39	50	56	21	672
40-44	12	19	29	46	56	70	19	622
45-49	10	15	22	38	53	68	20	454
Total	11	19	29	44	54	67	20	5,803

Source: Author's calculations from the SLMPS 2022

To better assess trends in early marriage, Figure 4 presents the Kaplan-Meier failure function for ever marriage by birth cohort. This method of examining age at marriage accounts for censoring of those who have not yet married. The shift to the left in the curves across successive birth cohorts, and particularly among those born in the 1990s and 2000s, suggests a slight trend towards younger marriage and higher rates of early marriage. Among women born in the 1970s and 1980s, the 25th percentile of marriage was age 18, whereas among those born in the 1990s it was age 16 and in the 2000s, age 17. Similarly, the 50th percentile of ever marriage was age 21 among those born in the 1970s and 1980s, whereas it declined to age 20 among women born in the 1990s and 2000s.

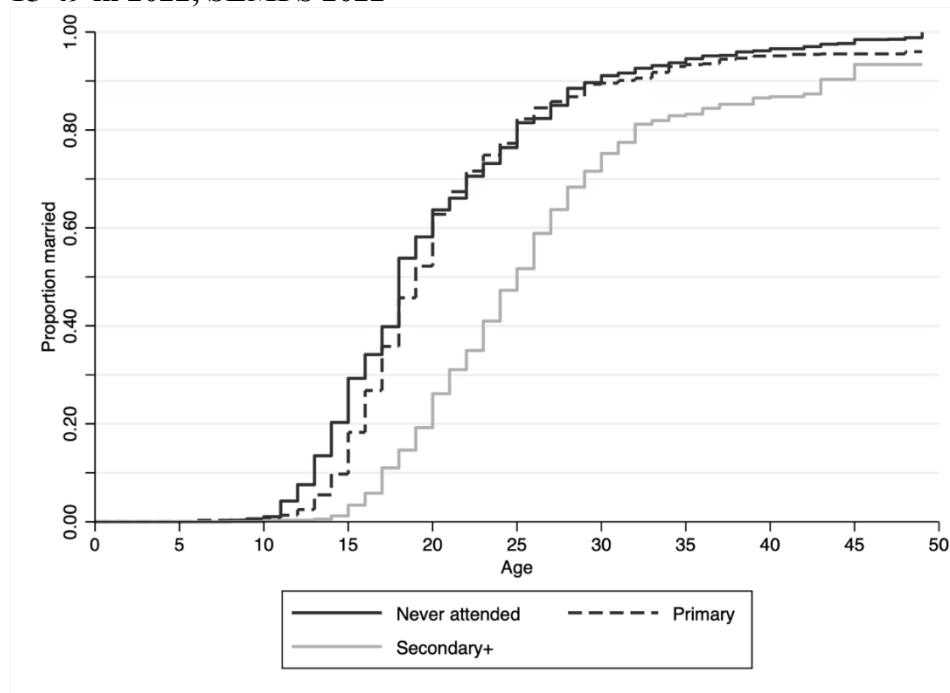**Figure 4: Proportion ever married by birth cohort, women aged 15-49 in 2022, SLMPS 2022**
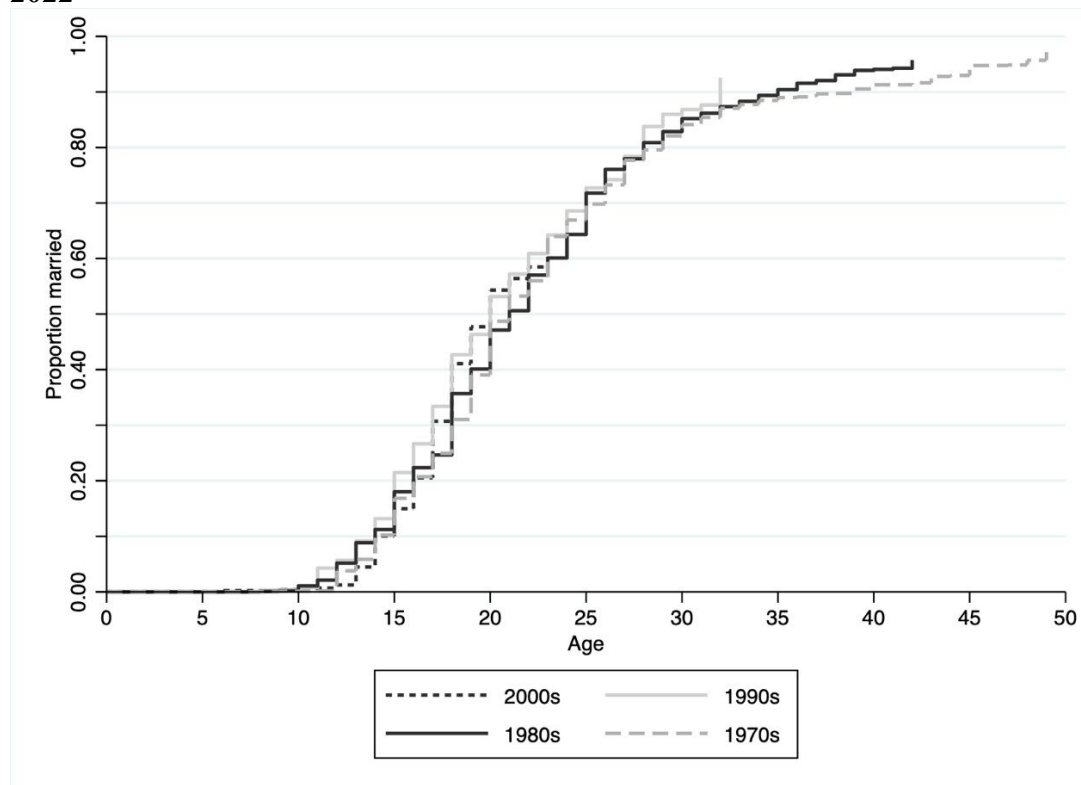
Source: Author's construction from the SLMPS 2022
Notes: Kaplan-Meier failure function, proportion ever married.

Figure 5 examines the transition to marriage by women's education level to assess the degree to which lower fertility rates among the more educated may be due to later exposure to the initiation of childbearing. There is a clear association between higher educational attainment and later marriage, particularly among women who attended at least some secondary school. Among women who never attended school the 25th percentile of age at marriage was 15 and the median age 18. Among women who attended at least some primary school the respective figures are slightly older, at age 16 and 19. By contrast, among women with at least some secondary schooling, the 25th percentile was age 20 and the median age 25.

Figure 5: Proportion ever married by highest level of education attended, women aged 15-49 in 2022, SLMPS 2022
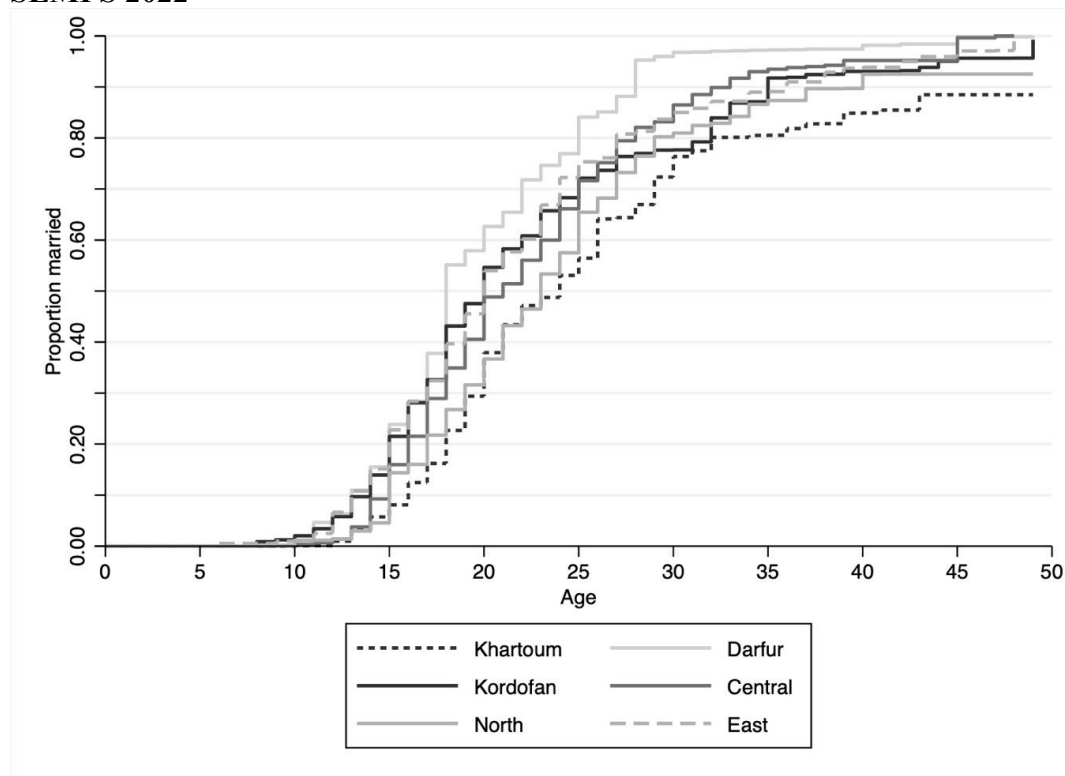

Source: Author's construction from the SLMPS 2022
Notes: Kaplan-Meier failure function, proportion ever married.

As with fertility, there are regional differences in the transition to marriage. Women in Khartoum generally experienced the slowest transition to marriage, along with those in the North region (Figure 6). The 25th percentile of marriage in Khartoum was 19 and in the North 18, indicating that even in these regions a substantial proportion of women marry early. The median age at marriage was 24 and 23 in the two regions, respectively. On the other hand, women in Darfur experienced the earliest transition to marriage, folowed by those in Kordofan and the East region. The transition to marriage in Darfur was especially compressed; the 25th percentile of marriage was age 16 and the median age 18. In Kordofan and the East, whereas the 25th percentile was also age 16, the median age at marriage was 20. The Central region lay between these two groupings of earlier and (somewhat) later marriage patterns.

Figure 6: Proportion ever married by region of residence, women aged 15-49 in 2022, SLMPS 2022

Figure 7 turns to the marriage patterns of IDPs. While this analysis does account for censoring, it is important to note that it does not consider whether women married before or after displacement and therefore may, like the analysis of fertility above, be related to the characteristics of the IDP population rather than the experience of displacement itself. There does not appear to be a differential pattern of marriage by displacement status. The median age at marriage among both groups was 20, and the 25th percentile was 17 among the non-displaced as compared to 18 among IDP women. Looking only at Darfur, where most IDPs are located, the 25th percentile of marriage was 16 for both IDPs and non-IDPs. The median age at marriage for IDPs was somewhat older, at 20 years, than for non-IDPs, at 18 years (data not shown).

Figure 7: Proportion ever married by displacement status (Sudanese only), women aged 15-49 in 2022, SLMPS 2022
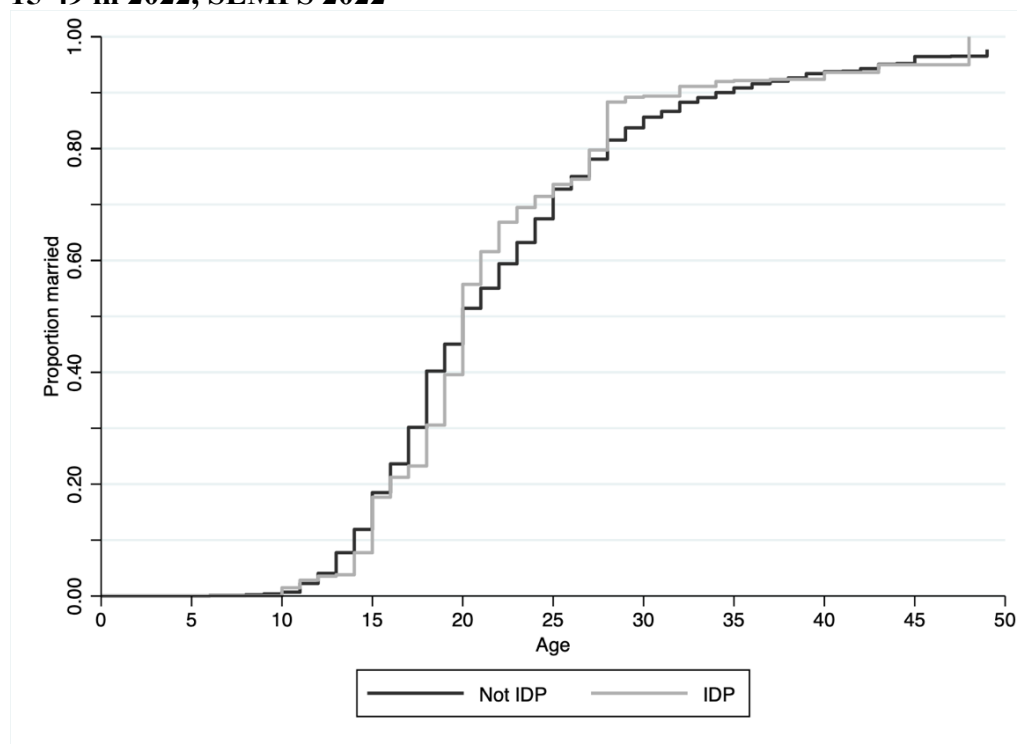
Source: Author's construction from the SLMPS 2022
Notes: Kaplan-Meier failure function, proportion ever married.

6. Contraceptive use

Contraceptive prevalence among currently married women in Sudan was very low, with only 6.5% of reproductive age women using contraception at the time of the survey.

This was a considerably lower contraceptive prevalence than in the 2014 MICS, which found that 12.2% of currently married women were using contraception (CBS and UNICEF Sudan 2016). Contraceptive prevalence was 9.9% in the SMCHS 1992/93 (Population Council 1995) and 8.7% in the 1989/1990 DHS (Department of Statistics (Sudan), Ministry of Economic and National Planning (Sudan), and Macro International Inc. 1991). In short, along with the fertility rate, contraceptive use has largely plateaued in Sudan over recent decades.

While cell sizes are too small to examine the contraceptive method mix in detail, it is apparent that the oral contraceptive pill was the predominant method. Seventy percent of contracepting women were using pills, compared to 26% using a long-acting reversible contraceptive method (LARC) and 4% using another method. The 2014 MICS similarly found that contraceptive pills were by far the most commonly used method among contracepting women (CBS and UNICEF Sudan 2016). Very few women reported lactational amenorrhea as a contraceptive method either in the SLMPS or the MICS. Given previous evidence that lactational amenorrhea is an important factor in fertility limitation in Sudan (Khalifa 1986; Eltigani 2000), it may be that women do not think of this as a form of contraception. Unfortunately, the SLMPS did not include direct questions on breastfeeding or postpartum infecundability to be able to assess this question, but the MICS did show that 55% of infants under 6 months were exclusively breastfed (CBS and UNICEF Sudan 2016).

Table 4: Contraceptive prevalence rate (married women aged 15-49), by <u>background characteristics</u>, SLMPS 2022

	Col %	No.
Age group		
15-19	1.0	188
20-24	7.9	586
25-29	6.4	634
30-34	12.2	590
35-39	3.5	558
40-44	5.7	516
45-49	4.2	347
Highest education level attended		
Never attended	0.9	1,381
Primary	9.6	1,037
Secondary+	15.4	1,001
Residence		
Urban	10.4	1,731
Rural	5.1	1,688
Region		
Khartoum	13.3	476
Darfur	0.5	964
Kordofan	4.3	558
Central	11.7	707
North	11.3	258
East	4.4	456
IDP (Sudanese)		
No	6.9	2,971
Yes	2.6	303
Parity		
0	0.3	358
1	4.3	448
2-3	8.7	966
4-6	8.7	1,153

Source: Author's calculations from the SLMPS 2022

While overall contraceptive prevalence was low, there were differences in contraceptive use by women's characteristics (Table 4). Married adolescents had lower rates of contraceptive use than older age groups, with only 1.0% of married women aged 15-19 using contraception. The multivariate logistic regression results (see Appendix) suggest a U-shaped relationship between age and contraceptive use; as compared to women in the peak fertility ages of 25-29 (see Figure 2), 15-19 year olds were less likely to use contraception, but the result was not significant. Women aged 35 and above were significantly less likely to use contraception.

As with marriage, education was also strongly associated with contraceptive use. Whereas only 1 percent of women who never attended school were contracepting at the time of the survey, this rose to 9.6% of women with at least some primary schooling and 15.4% of those with at least some secondary education. The multivariate results confirm that education was a significant predictor of contraceptive use, controlling for women's other characteristics. These patterns are also consistent with the 2014 MICS, although the levels are different (CBS and UNICEF Sudan 2016).

Contraceptive prevalence in urban areas was double that in rural areas, but the multivariate results suggest that this pattern was driven largely by regional differences. As compared to Khartoum, the region in which contraceptive prevalence was highest (13.3%), women in Darfur (where contraceptive prevalence was only 0.5%) were significantly less likely to be using contraception, as were those in Kordofan. Once accounting for region, urban residence was not significantly associated with contraceptive use, nor was IDP status. The lower rate of

contraceptive use among IDPs as compared to non-IDPs is again likely related to the concentration of this population in Darfur, where contraceptive prevalence is very low.

Contraceptive use also showed a U-shaped pattern by parity. Whereas contraceptive use among currently married women with no children was almost zero, 4.3% of women with one child used contraception. Women at these lower parities were significantly less likely to be contracepting than those with 2-3 children, who had the same contraceptive prevalence rate as women with 4-6 children (8.7%). Among women with 7 children or more, 4.1% were using contraception, but the difference between this parity and women with 2-3 children was not statistically significant in the multivariate model.

We would expect women who do not want to have a(nother) child in the near future to be more likely to use contraception. While this is the case (Figure 8), 88% of women who said that they did not want another child in the next three years were not using contraception (as compared to 94% of those who did want another child in this period). The SLMPS does not have all the variables necessary to calculate unmet need for contraception, but this finding suggests that unmet need is high. The 2014 MICS, which found a higher contraceptive prevalence, found that unmet need was 26.6% (CBS and UNICEF Sudan 2016). By comparison, unmet need in the 2014 Egypt DHS was 12.6%.[8]

Figure 8: Contraceptive prevalence by desire to have (a)nother child in the three years following the survey, currently married women age 15-49, SLMPS
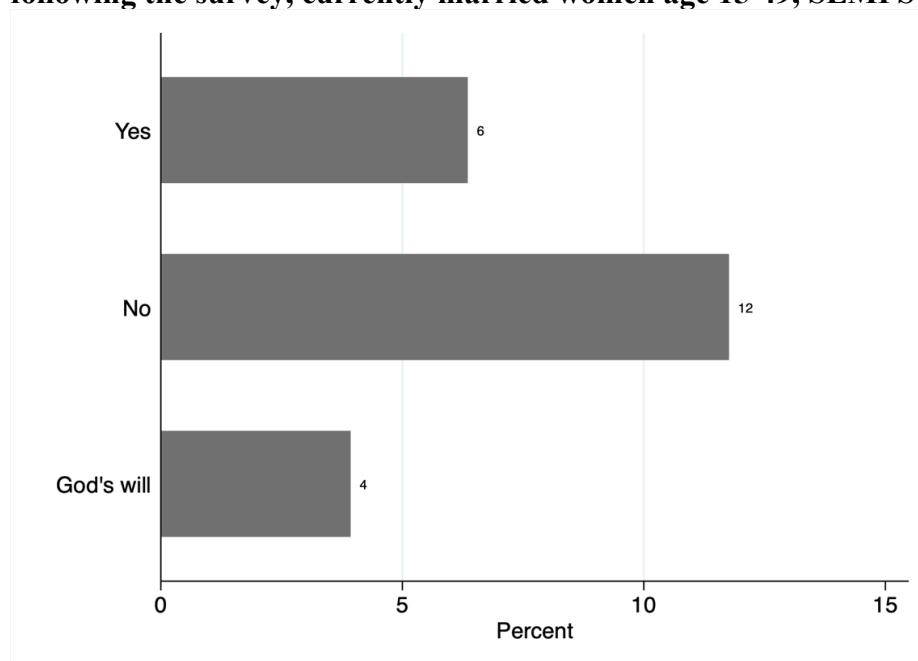
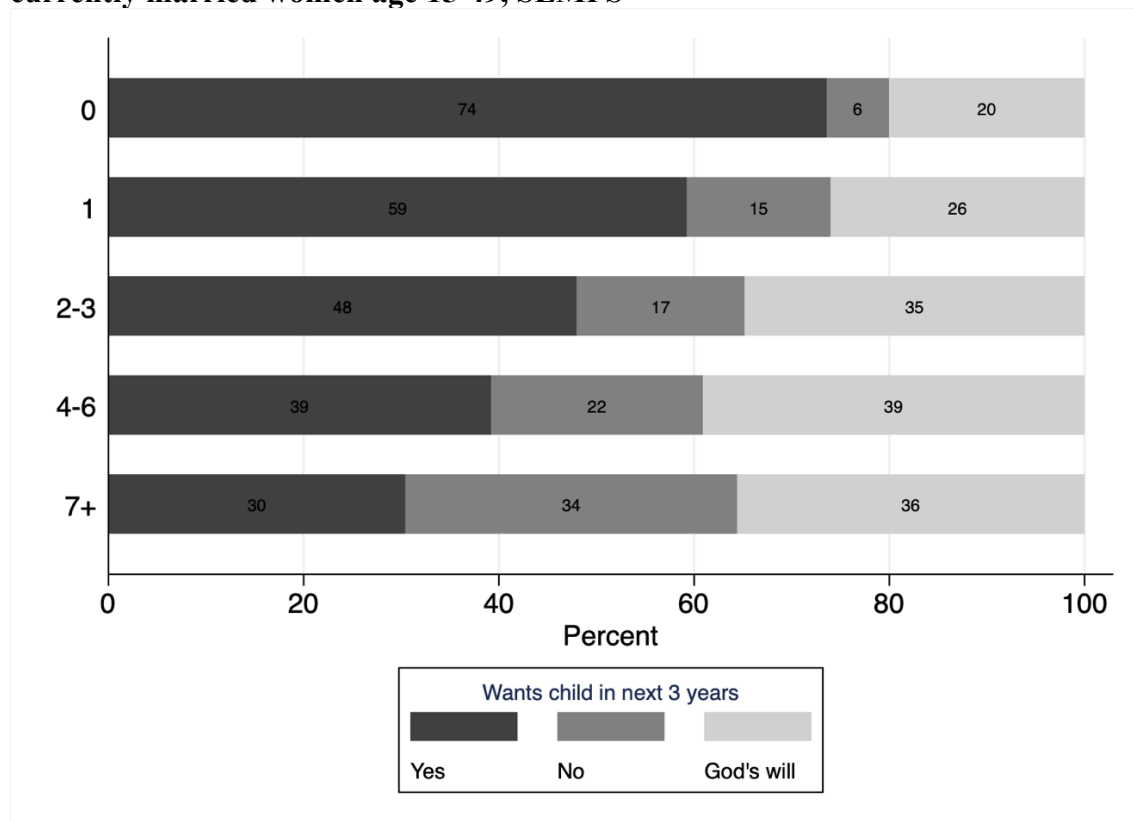Source: Author's construction from the SLMPS 2022

Interestingly, contraceptive prevalence was lowest among women who said that they left the decision of whether to have another child up to "God's will" (this result was also significant in the multivariate). Fully a third of currently married women in the SLMPS replied "up to God's will" to the fertility intentions question, compared to 48% who said that they wanted another child in the next three years and 18% who did not want another child. This high rate of saying

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[8] Obtained from DHS Statcompiler. https://www.statcompiler.com/en/

"God's will" is particularly striking given the global decline in such non-numeric responses to questions about ideal family size (i.e. the total number of children women would like to have in their lives) (Frye and Bachan 2017).

To further explore this finding, Figure 9 examines women's fertility intentions by their current parity. The perspective of leaving future fertility up to God was expressed by women across the parity distribution and was even more prevalent among women with larger numbers of children. Among women with no or only one child, the majority expressed the desire to have (a)nother child within three years and 20-26% said this was up to God. The desire for another child within three years decreased with parity and the "God's will" response increased, yet even among women with seven children or more, 30% said that they wanted another child within three years.

Figure 9: Desire to have another child in the three years following the survey, by parity, currently married women age 15-49, SLMPS

Source: Author's construction from the SLMPS 2022
Notes: Fertility intention measured as desire to have (a)nother child in the three years following the survey.

7. Discussion

In the late 1990s, Eltigani (2000) wrote of the beginning of the fertility transition in Sudan. He concluded that since fertility decline between the late 1970s and early 1990s was driven almost entirely by increases in age at marriage, possibly due to adverse economic conditions, a reversal in the marriage trend could similarly reverse the start of fertility decline. This indeed appears to be what has happened in the ensuing decades.

The SLMPS, together with the MICS surveys conducted in 2010 and 2014, provides consistent evidence that fertility rates in Sudan have remained persistently high, fluctuating around five births per woman since the early 1990s.[9] Along with this stall in the TFR, Sudan has experienced concurrent plateaus in both the rate of early marriage and in contraceptive use. It appears that marriage has even shifted to earlier ages among women in the youngest cohorts, with large proportions marrying before age 18 and even before age 16. This is of concern not only because of the implications for fertility rates in a context where marriage is a key determinant of exposure to conception, but also because of the extensive literature that documents the negative effects of early marriage on girls' educational, health and other outcomes (Malhotra and Elnakib 2021).

Within marriage, use of contraception has also remained fairly constant since the early 1990s. Further research is needed on the supply- and demand-side factors that influence contraceptive use in Sudan, including the availability of family planning services. However, it does seem from the SLMPS results that one important factor is high desired fertility, given that substantial percentages of women at higher parities express the desire for another child. This is consistent with a recent qualitative study among men in Khartoum that found strong valoration of fertility and high ideal family sizes (Badri, Krumeich, and van den Borne 2023). Non-numeric responses, such as 'God's will,' to questions about fertility intentions have also traditionally been read in the demographic literature as indicative of a "pre-transition" mindset about fertility in which parity-specific fertility limitation is not widely practiced (see discussion in Frye and Bachan 2017). The high level of this response in the SLMPS is therefore another important area for further exploration in terms of understanding interlinkages between fertility preferences and low contraceptive prevalence.

A key finding of this paper is that age at marriage and contraceptive use are strongly correlated with education and especially having attended at least some secondary school. This is consistent with the global literature on the role of women's schooling in fertility decline, although the exact relationship between women's education and fertility varies considerably across time and place (Martin 1995; Shapiro and Tenikue 2017; Grimm et al. 2022). It is also a finding that is particularly concerning given that progress in educational attainment has stalled for younger cohorts in Sudan (Krafft et al. 2023). Beyond human capital development, this trend has negative implications for early marriage, adolescent childbearing and the prospects for fertility decline in the future.

The SLMPS also captured displaced populations, which allowed this paper to make a preliminary investigation into the marriage and fertility patterns of the internally displaced prior to the conflict that began in mid-2023. The results show that IDPs generally follow the patterns of Darfur, the region from which most IDPs originate and where the majority are

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[9] While one analysis categorizes Sudan as not even having begun the fertility transition due to this lack of decline in the TFR (Grimm et al. 2022), the authors begin their observation period in the 1990s and so miss the decline that took place between the late 1970s and that point.

hosted. As Darfur has the highest fertility rates, earliest marriage ages and lowest rates of contraceptive use, IDPs follow this pattern when compared to the national population. However, the fertility rates of IDPs are lower than those of Darfur overall and they may experience a slightly later transition to marriage. Once accounting for other factors, IDP status was not a significant predictor of contraceptive use.

Overall, there is little in these findings from the SLMPS to suggest that fertility rates in Sudan are likely to resume declining in the short-term. The broader demographic implications of this trend are that dependency ratios will remain high and there will be large cohorts of young people who are entering school and then the labor market.

Investments in the human capital of these young cohorts is central to the overall development of the country, which is extremely challenging but all the more important in the ongoing context of conflict and political instability. The conflict that began in mid- 2023 is also a shock that could cause the fertility rate to shift upward or downward; in this context continued research on determinants of fertility is critical.

References

Abbasi-Shavazi, Mohammad Jalal, Hossein Mahmoudian, and Rasoul Sadeghi. 2018. "Family Dynamics in the Context of Forced Migration." In Demography of Refugee and Forced Migration, edited by Graeme Hugo, Mohammad Jalal Abbasi-Shavazi, and Ellen Percy Kraly, 155–76. Cham, Switzerland: Springer International Publishing.

Assaad, Ragui, Caroline Krafft, and Jackline Wahba. 2024. "The Lives and Livelihoods of the Displaced in Sudan: Internally Displaced Persons and Refugees." Economic Research Forum Working Paper. Cairo: Economic Research Forum (ERF).

Badri, Dina, Anja Krumeich, and H. W. van den Borne. 2023. "Fertility Intentions and Family Size among Married Men in Khartoum, Sudan." Culture, Health & Sexuality 0 (0): 1–10. https://doi.org/10.1080/13691058.2023.2260453.

Blanc, Ann K. 2004. "The Role of Conflict in the Rapid Fertility Decline in Eritrea and Prospects for the Future." Studies in Family Planning 35 (4): 236–45. https://doi.org/10.1111/j.0039-3665.2004.00028.x.

Bloom, David E., Michael Kuhn, and Klaus Prettner. 2017. "Africa's Prospects for Enjoying a Demographic Dividend." Journal of Demographic Economics 83 (1): 63–76. https://doi.org/10.1017/dem.2016.19.

Bongaarts, John. 1978. "A Framework for Analyzing the Proximate Determinants of Fertility." Population and Development Review 4 (1): 105–32.

———. 2015. "Modeling the Fertility Impact of the Proximate Determinants: Time for a Tune-Up." Demographic Research 33: 535.

CBS and UNICEF Sudan. 2016. "Multiple Indicator Cluster Survey 2014 of Sudan, Final Report." Khartoum: UNICEF and Central Bureau of Statistics (CBS).

Cetorelli, Valeria. 2014. "The Effect on Fertility of the 2003–2011 War in Iraq." Population and Development Review 40 (4): 581–604.

Clifford, David, Jane Falkingham, and Andrew Hinde. 2010. "Through Civil War, Food Crisis and Drought: Trends in Fertility and Nuptiality in Post- Soviet Tajikistan." European Journal of Population / Revue Européenne de Démographie 26 (3): 325–50.

Croft, Trevor. 1991. "DHS Data Editing and Imputation." Rockville, M.D.: Macro International. https://www.dhsprogram.com/pubs/pdf/DHSG3/DHS_Data_Editing.pdf.

Department of Statistics (Sudan), Ministry of Economic and National Planning (Sudan), and Macro International Inc. 1991. "Sudan Demographic and Health Survey 1989/1990." Khartoum: Department of Statistics (Sudan) and Macro International.

Eltigani, Eltigani E. 2000. "Understanding Fertility Decline in Northern Sudan: An Analysis of Determinants." Genus 56 (1/2): 115–32.

———. 2001. "Childbearing in Five Arab Countries." Studies in Family Planning 32 (1): 17–24. https://doi.org/10.1111/j.1728-4465.2001.00017.x.

Frye, Margaret, and Lauren Bachan. 2017. "The Demography of Words: The Global Decline in Non-Numeric Fertility Preferences, 1993–2011." Population Studies 71 (2): 187–209. https://doi.org/10.1080/00324728.2017.1304565.

Goujon, Anne, Wolfgang Lutz, and Samir KC. 2015. "Education Stalls and Subsequent Stalls in African Fertility: A Descriptive Overview." Demographic Research 33
(47): 1281–96. https://doi.org/10.4054/DemRes.2015.33.47.

Grimm, Michael, Isabel Günther, Kenneth Harttgen, and Stephan Klasen. 2022. "Slowdowns of Fertility Decline." Demographic Research 46: 737–66.

Kebede, Endale, Anne Goujon, and Wolfgang Lutz. 2019. "Stalls in Africa's Fertility Decline Partly Result from Disruptions in Female Education." Proceedings of the National Academy of Sciences 116 (8): 2891–96. https://doi.org/10.1073/pnas.1717288116.

Khalifa, M. A. 1986. "Determinants of Natural Fertility in Sudan." Journal of Biosocial Science 18 (3): 325–36. https://doi.org/10.1017/S0021932000016291.

Khawaja, Marwan, and Sara Randall. 2006. "Intifada, Palestinian Fertility and Women's Education." Genus 62 (1): 21–51.

Krafft, Caroline, Ragui Assaad, and Ruby Cheung. 2023. "Introducing the Sudan Labor Market Panel Survey 2022." Economic Research Forum Working Paper 1647.

Cairo: Economic Research Forum (ERF).

Krafft, Caroline, Ragui Assaad, Adriana Cortes-Mendosa, and Isabel Honzay. 2023. "The Structure of the Labor Force and Employment in Sudan." Economic Research Forum Working Paper 1648.

Krafft, Caroline, Ragui Assaad, and Caitlyn Keo. 2022. "The Evolution of Labor Supply in Egypt, 1988–2018: A Gendered Analysis." In The Egyptian Labor Market: A Focus on Gender and Economic Vulnerability, edited by Caroline Krafft and Ragui Assaad, 13–48. Oxford: Oxford University Press.

Lindstrom, David P., and Betemariam Berhanu. 1999. "The Impact of War, Famine, and Economic Decline on Marital Fertility in Ethiopia." Demography 36 (2): 247–61. https://doi.org/10.2307/2648112.

Mahfouz, Mohamed Salih. 2009. "Fertility in Northern Sudan (1979–1999): Levels, Trends and Determinants." In Proceedings of the 26th International Population Conference of the IUSSP. PU Office of Population Research. https://www.academia.edu/download/50641308/Fertility_in_Northern_Sudan 19 79-199920161130-6603-1ept3w.pdf.

Malhotra, Anju, and Shatha Elnakib. 2021. "20 Years of the Evidence Base on What Works to Prevent Child Marriage: A Systematic Review." Journal of Adolescent Health 68 (5): 847–62. https://doi.org/10.1016/j.jadohealth.2020.11.017.

Martin, Teresa Castro. 1995. "Women's Education and Fertility: Results from 26 Demographic and Health Surveys." Studies in Family Planning 26 (4): 187–202. https://doi.org/10.2307/2137845.

National Ministry of Health and Central Bureau of Statistics (Sudan). 2011. "Sudan Household Health Survey Second Round 2010: Summary Report." Khartoum: National Ministry of Health and Central Bureau of Statistics (Sudan).

OAMDI. 2019. "Labor Market Panel Surveys (LMPS)." Version 2.1 of Licensed Data Files; ELMPS 2018. Egypt: Economic Research Forum. http://erf.org.eg/data- portal/.

———. 2023. "Labor Market Panel Surveys (LMPS). Version 2.2 of Licensed Data Files; SLMPS 2022- Central Bureau of Statistics, Sudan (CBS)." Cairo: Economic Research Forum (ERF).

Population Council. 1995. "Sudan 1992/93: Results from the PAPCHILD Survey."Studies in Family Planning 26 (2): 116–20. https://doi.org/10.2307/2137937.

Pullum, Thomas, and Sarah Staveteig. 2017. "An Assessment of the Quality and Consistency of Age and Date Reporting in DHS Surveys, 2000-2015." DHS Methodological Reports 19. Rockville, M.D.: ICF.

Schoumaker, Bruno. 2013. "A Stata Module for Computing Fertility Rates and TFRs from Birth Histories: Tfr2." Demographic Research 28: 1093–1144.

Shapiro, David, and Michel Tenikue. 2017. "Women's Education, Infant and Child Mortality, and Fertility Decline in Urban and Rural Sub-Saharan Africa." Demographic Research 37: 669–708.

Sid Ahmed, Hanaa Mahmoud. 2010. "Non-Market Returns to Women Education in Sudan: Case of Fertility." Journal of Comparative Family Studies 41 (5): 783–98. https://doi.org/10.3138/jcfs.41.5.783.

Torrisi, Orsola. 2020. "Armed Conflict and the Timing of Childbearing in Azerbaijan." Population and Development Review 46 (3): 501–56.

UNICEF. n.d. "Child Marriage." Accessed April 4, 2020.

https://www.unicef.org/protection/child-marriage.

United Nations Population Division. 2022. "World Population Prospects: The 2022 Revision."
    New York: United Nations.

Appendix table

Table A1: Multivariate logistic regression results for correlates of current <u>contraceptive use, currently married women aged 15-49, SLMPS 2022</u>

Age group (ref: 25-29)	
15-19	0.73
	[0.09,6.23]
20-24	1.49
	[0.68,3.25]
30-34	1.17
	[0.53,2.56]
35-39	0.28*
	[0.08,0.98]
40-44	0.37+
	[0.12,1.16]
45-49	0.22**
	[0.09,0.57]
Education (ref: never attended)	
Primary	7.48***
	[2.88,19.45]
Secondary+	12.58***
	[4.79,33.02]
Residence (ref: urban)	
Rural	1.11
	[0.54,2.27]
Region (ref: Khartoum)	
Darfur	0.07**
	[0.01,0.39]
Kordofan	0.36+
	[0.11,1.18]
Central	0.92
	[0.39,2.20]
North	0.47
	[0.16,1.33]
East	0.65
	[0.28,1.53]
IDP	1.28
	[0.31,5.38]
Parity (ref 2-3)	
0	0.02***
	[0.01,0.10]
1	0.31*
	[0.12,0.83]
4-6	1.21
	[0.66,2.22]
7+	1.36
	[0.45,4.08]
Want another child w/in 3 years (ref: yes)	
No	2.06+
	[0.93,4.54]
God's will	0.51+
	[0.24,1.05]
Observations	3,204
Pseudo R^2	0.289

Exponentiated coefficients (odds ratios); 95% confidence intervals in brackets
+ p<0.1, * p<0.05, ** p<0.01, *** p<0.001