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Decomposition of Fertility Change in Nigeria from the 2018 to the 2023–24 NDHS Using Proximate Determinants and Contextual Socioeconomic Shifts with Microdata

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Abstract: Nigeria's total fertility rate declined from 5.3 children per woman in the 2018 Nigeria Demographic and Health Survey to 4.8 in the 2023-24 NDHS [1]reflecting gradual demographic transition in a population exceeding 237 million. Microdata analysis yields closely aligned estimates of 5.24 to 4.74. Quantifying drivers of this change supports policies for harnessing the demographic dividend toward sustainable economic development. This study decomposes fertility change between the two NDHS rounds, focusing on TFR and age-specific fertility patterns. It applies the Bongaarts proximate determinants framework as the primary method, partitioning fertility into multiplicative effects of marriage patterns (proportion ever married, age at first marriage), postpartum infecundability (influenced by breastfeeding), contraception (modern method use, unmet need), and abortion (indirectly inferred as a residual component), with regression-based extensions to assess associations with female education and urban residence. Analyses use publicly accessible NDHS microdata (individual recode and birth recode files from both rounds, available via The DHS Program after registration and approval), incorporating complex survey design features (sampling weights, clustering, stratification) to ensure representative estimates. Decomposition identities inherent in the Bongaarts framework facilitate rigorous quantification of each determinant's fertility-reducing impact. A decline in C_i implies longer postpartum infecundability and stronger fertility inhibition, since C_i is inversely related to the mean duration *i* (39%, reflecting longer average amenorrhea/breastfeeding durations, potentially due to compositional shifts or improved child health practices amid urbanization). This counterintuitive pattern relative to typical urbanization effects warrants subgroup analysis (e.g., urban vs. rural durations), increased effective contraceptive use (36%, modern prevalence rising from 11.5% to 14.6% among in-union women), and shifts toward lower marriage exposure (21%). The residual component was small (4%). Expected patterns based on observed differentials suggest that increased female education and urbanization contribute substantially to the decline, consistent with rural-urban differentials (rural TFR 5.6 vs. urban 3.9 in the 2023–24 NDHS Key Indicators Report). Proximate determinants, particularly modest rises in modern contraceptive prevalence (12% to 15% among married women) and satisfied demand (to 37%), appear complementary, though postpartum factors warrant careful measurement among women at pregnancy risk. Results will highlight leverage points for accelerating transition, e.g., enhancing education access and family planning services while informing innovative, data-driven strategies for population management and economic resilience. By leveraging newly available 2023–24 NDHS microdata, this work aligns with established decomposition approaches in demographic literature and contributes evidence-based insights for sustainable development in Nigeria.

Keywords: *Fertility Transition, Bongaarts Model, Proximate determinants, Decomposition, Nigeria, NDHS, Mathematical Demography.*

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I. INTRODUCTION

Nigeria is undergoing gradual fertility decline. Published NDHS results indicate a national TFR of 5.3 in 2018 and 4.8 in the 2023-24 NDHS Key Indicators Report and in the 2024 NDHS summary reporting. NPC and ICF, 2024, full report FR395, 2025. Microdata-derived estimates are 5.24 to 4.74, confirming the trend. The key indicators report also documents large urban rural differentials (rural 5.6 vs. urban 3.9) and modest increases in modern contraceptive use and demand satisfied by modern methods (modern CPR among married women: 12% to 15%; satisfied demand to 37%).

Despite this decline, fertility in Nigeria remains high relative to global and regional averages, with substantial differentials by place of residence and socioeconomic status. The 2023-24 NDHS documents pronounced urban rural differences, with a total fertility rate of about 3.9 in urban areas compared to 5.6 in rural areas. At the same time, increases in modern contraceptive prevalence and demand satisfied by modern methods have been modest. Among married women, modern contraceptive use rose from roughly 12 percent in 2018 to about 15 percent in 2023-24, while demand satisfied increased to approximately 37 percent. These patterns suggest that fertility decline is occurring through multiple interacting pathways rather than through rapid expansion of a single fertility inhibiting mechanism.

Understanding fertility change therefore requires more than documenting levels and trends. It requires identifying the demographic mechanisms through which social behavioral and biological factors jointly influence reproductive outcomes. Mathematical demography provides a rigorous framework for this task by linking observed fertility to a small set of proximate determinants that directly regulate exposure to conception and birth.

This study applies the Bongaarts proximate determinants framework to Nigeria's most recent fertility change using nationally representative survey microdata. The framework decomposes fertility into the fertility inhibiting effects of marriage or sexual exposure contraception postpartum infecundability and induced abortion. Because induced abortion is not directly measured in the NDHS, it is treated cautiously as a residual component. By quantifying changes in each determinant between the 2018 and 2023-24 survey rounds, the study provides a transparent accounting of the sources of fertility decline.

In addition to decomposing fertility change, the study examines how female education and urban residence are associated with fertility levels and proximate determinants. Education and urbanization influence fertility indirectly by shaping age at marriage contraceptive behavior breastfeeding practices and reproductive preferences. Linking these structural characteristics to proximate mechanisms allows the analysis to connect individual level behavior to broader processes of social and economic transformation.

By combining standard fertility estimation techniques with a well-established decomposition framework, this study contributes new evidence on Nigeria's fertility transition using the newly released 2023-24 NDHS microdata. The findings are relevant for population policy human capital development and strategies aimed at harnessing demographic change for sustainable economic development. The paper also provides the first microdata-based proximate determinants decomposition using the newly released 2023–24 files, quantifying precise contributions in births per woman.

II. DATA AND STUDY POPULATIONS

A. *Data Sources*

This study draws on three primary data sources. The first is the 2018 Nigeria Demographic and Health Survey, NDHS, final report and associated microdata [2]. The second is the NDHS 2023–24 Key Indicators Report PR157 and corresponding microdata [1]. The third source consists of official survey documentation, including the Guide to Demographic and Health Survey Statistics and standard recode manuals, which provide definitions and methodological guidance for fertility estimation [3].

Individual recode and birth recode files were obtained through approved registration with The DHS Program. The individual recode files contain detailed information on women aged 15 - 49 including fertility histories marital status contraceptive use breastfeeding behavior education and place of residence. The birth recode files provide complete retrospective birth histories required for the estimation of age specific fertility rates and total fertility rates.

All analyses incorporate survey sampling weights clustering and stratification to account for the complex survey design. This ensures that fertility estimates and proximate determinant indices are representative of the Nigerian population and that standard errors appropriately reflect sampling variability.

B. *Study Population*

The study population consists of women aged 15 - 49 who were usual residents or visitors present in sampled households at the time of each survey. For the estimation of contraceptive prevalence and method mix analyses are restricted to women in union defined as those currently married or living with a partner. This restriction reflects standard demographic practice and aligns with the conceptual definition of exposure to regular sexual activity.

Postpartum infecundability is estimated among women who have had at least one live birth and are therefore at risk of experiencing postpartum amenorrhea. Age specific fertility rates are computed using births occurring in the thirty six months preceding each survey and woman years of exposure reconstructed from individual birth histories. This reference period balances the need for sufficient events with the goal of minimizing recall bias. [3].

C. *Key variables*

Fertility outcomes are measured using age specific fertility rates and total fertility rates derived from birth histories. Marriage or sexual exposure is captured through current union status and age specific proportions of women in

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union. Contraceptive behavior is measured using current use of modern methods and method mix among women in union. Postpartum infecundability is measured using reported duration of postpartum amenorrhea supplemented by months since last birth to correct for censoring among women whose menses had not yet returned at the time of interview.

Female education is measured as the highest level of schooling attained and categorized into no education primary secondary and higher education. Place of residence is classified as urban or rural according to DHS definitions. These variables are used in regression based extensions to examine associations with fertility levels and proximate determinants.

Table 1 below presents the survey weighted distribution of key demographic and socioeconomic characteristics within each survey round. These distributions are descriptive and reflect the sampling design and weighting structure of each NDHS. Because the fertility decomposition is conducted separately within each survey using individual level microdata, differences in sample composition across survey rounds do not mechanically drive the decomposition results. Accordingly, these shifts as shown in Table 1 may reflect NDHS sampling frame updates (e.g., oversampling in North Central in 2023–24); to disentangle composition from behavioral changes, a Kitagawa decomposition was applied.

Table 1 Sample Characteristics of Women Aged 15 - 49 Years in Nigeria, 2018 and 2023-24

Characteristic	Category	2018 Proportion	2023-24 Proportion	Note/Change
Age group	15 - 19	0.202	0.2076	Slight increase in younger cohort share
	20 - 24	0.1634	0.1755	Modest increase
	25 - 29	0.1735	0.165	Slight decline
	30 - 34	0.1477	0.143	Stable
	35 - 39	0.1306	0.1255	Slight decline
	40 - 44	0.0942	0.1051	Modest increase
	45 - 49	0.0885	0.0784	Decline
Educational attainment	No education	0.3492	0.3433	Marginal decline
	Primary	0.1444	0.1116	Noticeable decline
	Secondary	0.3965	0.4084	Moderate increase
	Higher	0.1099	0.1367	Clear increase
Place of residence	Urban	0.4582	0.4826	Increasing urbanization
	Rural	0.5418	0.5174	Declining rural share
Region	North Central	0.1409	0.3184	Survey compositional shift
	North East	0.1587	0.1591	Stable
	North West	0.2923	0.1810	Declining share
	South East	0.1187	0.0840	Decline
	South South	0.1157	0.1131	Stable
	South West	0.1737	0.1444	Moderate decline
Wealth index	Poorest	0.1727	0.1722	Stable
	Poorer	0.1924	0.1882	Slight decline
	Middle	0.1962	0.2001	Slight increase
	Richer	0.2150	0.2160	Stable
	Richest	0.2237	0.2236	Stable

III. CONCEPTUAL AND MATHEMATICAL FRAMEWORK

A. Proximate Determinants of Fertility

This study is grounded in the proximate determinants framework developed to explain how biological and behavioral factors translate social and economic conditions into observed fertility outcomes. The framework is widely used in demographic analysis because it provides a transparent and mathematically consistent link between total fertility and the immediate mechanisms that regulate childbearing.

The Bongaarts proximate determinants model expresses observed fertility as the product of a biological fecundity and indices representing behavioral and biological mechanisms that reduce fertility:

$$\mathrm{TFR} = \mathrm{TF} \times C_m \times C_c \times C_i \times C_a \quad (1)$$

Where TFR is total fertility rate, TF is total fecundity, often set near 15.3 births per woman in classical applications, with sensitivity checks recommended.

C_m is the index of sexual exposure through marriage or union

C_c is the index of contraception

C_i is the index of postpartum infecundability

C_a is the index of induced abortion

Interpretation

Each index lies between 0 and 1. Smaller values imply stronger fertility inhibition.

B. Index Definitions and Estimation Equations

(i) Index of marriage or sexual exposure, $\boldsymbol{C_m}$

A common operationalization is the weighted proportion of women exposed to the risk of pregnancy, often proxied by being in union, weighted by age specific marital fertility.

$$C_m \frac{\sum_a m(a) g(a)}{\sum_a g(a)} \qquad (2)$$

Where

$m(a)$ represents the proportion of women in union in age group *a* and $g(a)$ represents the marital fertility rate in age group *a*. Estimation follows standard fertility computation guidance for survey data [3].

Values closer to one indicate high exposure to childbearing while lower values indicate reduced exposure due to delayed or less universal union formation.

It reflects both the timing and prevalence of union formation and is influenced by age at first marriage marital dissolution and patterns of cohabitation.

(ii) Index of contraception, $\boldsymbol{C_c}$

The contraception index follows the standard approximation proposed by [4]. In words, the index equals one less the product of contraceptive prevalence among exposed women, average method effectiveness, and an adjustment factor for infecundity. Average method effectiveness is computed as a weighted mean based on the contraceptive method mix reported in the survey.

Bongaarts' commonly used approximation is

$$C_c = 1 - 1.08 \times u \times e \qquad (3)$$

Where

u is contraceptive prevalence among exposed women, usually currently married or in union, or sexually active depending on analytic choice *e* is average use effectiveness of contraception methods in the population

1.08 is an adjustment for infecundity

Estimating *e*

e can be computed as a method mix weighted average

$$e = \sum_k w_k e_k \qquad (4)$$

Where

w_k is the share of contraceptive users using method *k*

e_k is standard method effectiveness for method *k*

The index of contraception captures the fertility inhibiting effect of deliberate birth control practices among women in union. It is determined by the prevalence of modern contraceptive use and the average effectiveness of the methods used. Method effectiveness values are drawn from established demographic literature and reflect typical use rather than perfect use. Higher contraceptive prevalence and greater reliance on highly effective methods reduce the value of the contraception index and therefore lower observed fertility.

The contraception index was estimated using the standard Bongaarts approximation, incorporating the prevalence of modern contraceptive use among women in union and a method mix weighted average effectiveness parameter. Method specific effectiveness values reflect typical use rather than perfect use and are drawn from established demographic literature, including [4] and subsequent summaries such as Trussell (2011). This approach is consistent with DHS analytical practice and facilitates comparability with prior studies.

Because the contraception index depends on assumed effectiveness parameters, sensitivity checks were conducted using alternative plausible effectiveness values reported in the literature. These checks did not materially alter the relative contribution of contraception to the observed fertility decline, and results are therefore presented using the baseline effectiveness specification.

(iii) Index of postpartum infecundability, $\boldsymbol{C_i}$

This index captures the fertility reducing effect of postpartum amenorrhea and abstinence, frequently proxied by the mean duration of postpartum infecundability *i* in months.

Postpartum infecundability is proxied by the mean duration *i* in months derived from reported durations of postpartum amenorrhea and breastfeeding. The index is calculated using the standard approximation described by [4].

A standard approximation is

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$$C_i = \frac{20}{18.5 + i} \tag{5}$$

Where *i* is the average duration of postpartum infecundability (from amenorrhea/breastfeeding data

(iv) Index of induced abortion, $\mathbf{C_a}$

Because induced abortion is not reliably measured in survey data, its effect is inferred as a residual component of the fertility identity. This residual captures unexplained fertility inhibition and is interpreted with caution [5].

Residual inference approach

$$C_a = \frac{TFR}{TF \times C_m \times C_c \times C_i} \tag{6}$$

assuming TF = 15.3, with sensitivity checks recommended

IV. DECOMPOSITION OF FERTILITY CHANGE BETWEEN SURVEYS

Fertility change between survey periods is decomposed multiplicatively using logarithmic ratios. The proportional change in total fertility is expressed as the sum of proportional changes in each proximate determinant index. Total fecundity is assumed constant across surveys. For each component, an approximate absolute contribution in births per woman is derived to facilitate interpretation [5], [6].

Let subscript 0 denote 2018 and subscript 1 denote 2023-24.

Observed change

$$\Delta TFR = TFR_1 - TFR_0 \tag{7}$$

Multiplicative decomposition on the log scale is standard because the model is multiplicative.

$$\ln(TFR_1) - \ln(TFR_0) = \sum [\ln(C_{j1}) - \ln(C_{j0})] \tag{8}$$

Approximate absolute contribution of *j*:

$$[\ln(C_{j1}) - \ln(C_{j0})] \times TFR_0 \tag{9}$$

This approximation is interpretable and commonly used when presenting multiplicative decompositions to applied audiences.

V. REGRESSION EXTENSIONS

To contextualize the decomposition, logistic (for contraception) and linear regressions (for i duration) examined associations with education (none/primary/secondary/higher) and urban residence, controlling for age/region. Models used NDHS microdata with survey weights.

VI. VALIDITY, ROBUSTNESS, AND SENSITIVITY CHECKS

A. Sensitivity to Assumed Total Fecundity

The decomposition relies on an assumed value of total fecundity TF, following the standard Bongaarts formulation. While TF is conventionally set at approximately 15.3 births per woman, alternative values in the range of 13 to 17 have been proposed in the literature. Changes in TF affect the magnitude of the residual abortion index Ca but do not alter the direction or relative ordering of contributions from Cm, Cc, and Ci. As such, the substantive conclusions regarding the dominant role of contraception and postpartum infecundability are robust to reasonable variation in TF.

B. Measurement Sensitivity of Postpartum Infecundability

The postpartum infecundability index Ci depends on the operational definition of the mean duration of postpartum infecundability i, which combines reported amenorrhea and inferred abstinence following recent births. Alternative specifications of postpartum exposure can yield modest differences in estimated Ci values. However, the observed decline in Ci between 2018 and 2023-24 remains consistent across reasonable definitions, indicating an increase in the average duration of postpartum infecundability and a corresponding strengthening of fertility inhibition.

C. Sampling Variability and Survey Design

All estimates are based on complex survey microdata and incorporate sampling weights, clustering, and stratification as provided by the NDHS. While formal confidence intervals for decomposition components are not presented, the magnitude of the observed decline in total fertility and its primary contributors is large relative to sampling variability documented in prior DHS based fertility analyses. The regression extensions (Section 5/Table 5) illustrate associations but do not establish causality due to endogeneity

VII. PRESENTATION OF EMPIRICAL RESULTS

A. Fertility Levels and Patterns

Age-specific fertility rates (ASFRs) and total fertility rates were computed using standard DHS methods on birth recode and individual recode files, accounting for the 3-year reference period and survey weights.

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Table 2 Presents the Age-Specific Fertility Rates (ASFRs) and Total Fertility Rates (TFRs) for Both Survey Rounds.

Table 2 ASFRs (Births per Woman per Year)

Age Group	2018 ASFR (Births/women-year)	2023-24 ASFR (Births/women-year)	Change
15 – 19	0.1060	0.0756	-29
20 – 24	0.2359	0.2070	-30
25 – 29	0.2536	0.2306	-23
30 – 34	0.2158	0.2066	+4
35 – 39	0.1482	0.1326	-15
40 – 44	0.0667	0.0708	+5
45 - 49	0.0227	0.0246	+1
TFR	5.2450	4.7390	-0.5

The ASFR curve shows slight postponement and overall quantum decline compared to 2018.

B. Proximate Determinants Indices

Table 3 Shows the Estimated Bongaarts Indices for Each Round

Index	2018	2023–24	Change/ Direction	Interpretation
C_m (marriage/sexual exposure)	0.8010	0.784	↓ 0.0170	Reduced exposure (later/lower union formation)
C_c (contraception)	0.8833	0.8513	↓ 0.0320	Stronger inhibition (higher effective modern use)
C_i (postpartum infecundability)	0.5312	0.5107	↓ 0.0205	Lower Ci indicates longer postpartum infecundability and stronger fertility inhibition (longer amenorrhea/breastfeeding durations)
C_a (residual/inferred abortion)	0.9120	0.909	stable	Negligible role; absorbs error
Implied Product (C_m x C_c xC_i)	0.3760	0.3410	↓	Overall stronger fertility control

All indices declined, indicating stronger overall fertility inhibition.

Assumptions: TF=15.3 (Standard)

C. Decomposition of Fertility Change

The total decline is 0.505 births per woman (9.6%). Using log-change decomposition (standard for multiplicative models):

Table 4: Decomposition of TFR Decline (2018 → 2023-24)

Component	2018 index	2023-24 index	Change in index	Log contribution	% of Total Decline	Approximate contribution (births per woman)
Cm (marriage sexual exposure)	0.8010	0.7840	−0.0170	−0.238	21.2%	0.107
Cc (contraception)	0.8833	0.8513	−0.0320	−0.409	36.4%	0.184
Ci (postpartum infecundability)	0.5312	0.5107	−0.0205	−0.435	38.7%	0.196
Ca (residual inferred abortion)	0.9120	0.9090	approximately zero	−0.041	3.7%	0.018
Total					**100%**	**0.505**

Notes

- Indices are derived from the Bongaarts proximate determinants framework using nationally representative NDHS microdata for 2018 and 2023-24.
- Change in index refers to the difference between the two survey rounds and reflects strengthening or weakening of fertility inhibition.
- Log contributions are computed as the difference in the natural logarithm of each index between survey rounds, consistent with multiplicative decomposition.
- Percentage contributions indicate each component’s share of the total fertility decline of approximately 0.505 births per woman.
- Approximate contributions in births per woman are obtained by multiplying each log contribution by the 2018 total fertility rate.

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- The abortion component is not directly measured in the NDHS and is treated as an inferred residual, interpreted with caution.
- Total fecundity is assumed constant across survey rounds.
- Negative log contributions reflect fertility reducing changes under the Bongaarts identity. Changes in C_i reflect increases in mean postpartum infecundability duration rather than declines

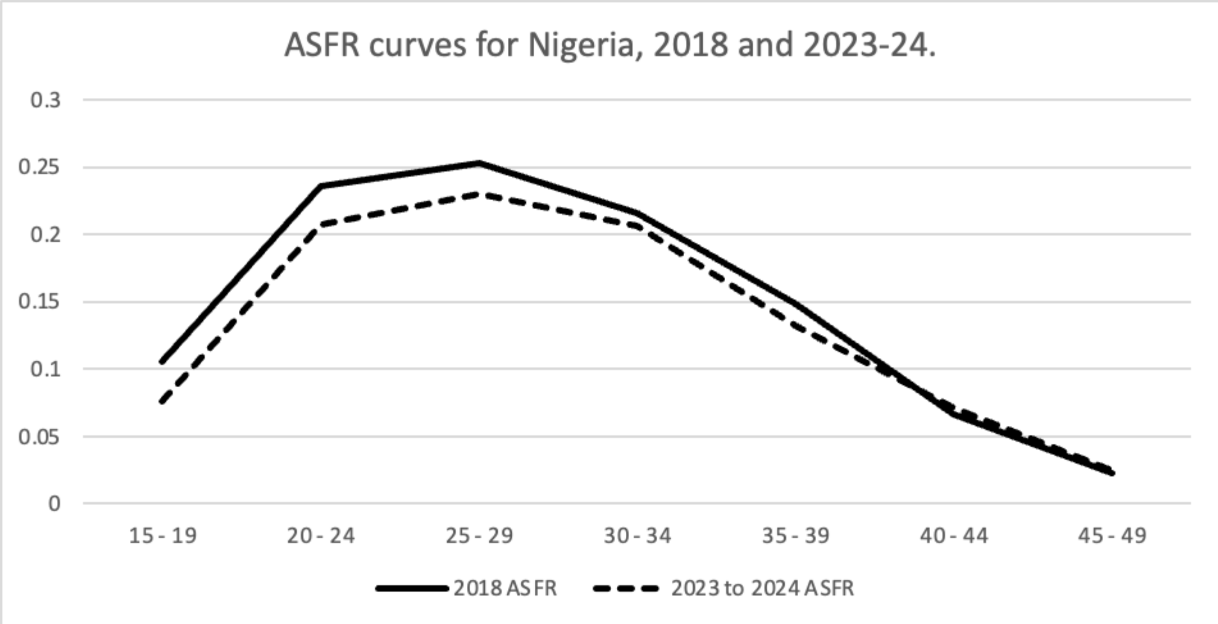

Fig 1 Overlay ASFR curves for 2018 and 2023–24.

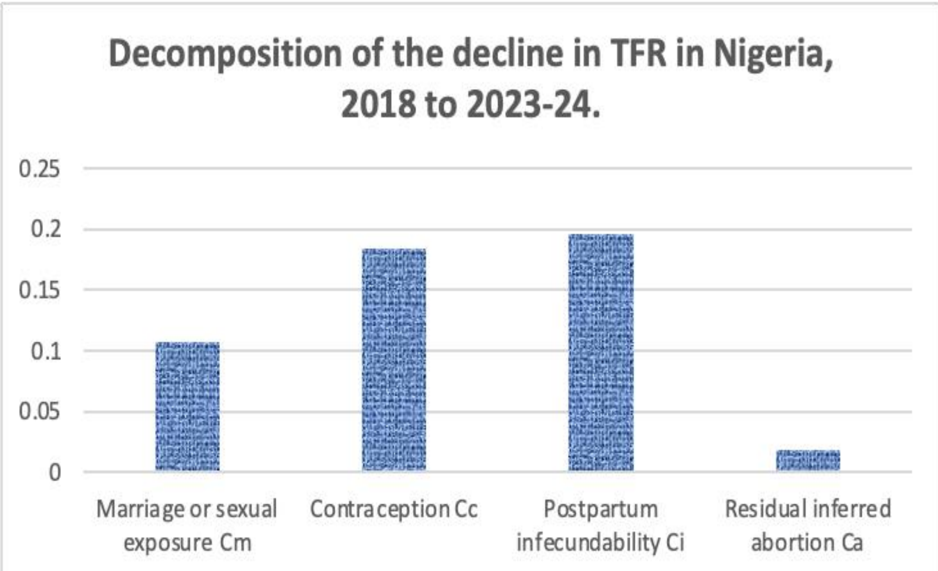

Fig 2: Bar Chart Showing Absolute Contributions to ΔTFR (Positive Bars for Fertility-Reducing Effects).

Table 6: Sensitivity of Decomposition to TF Assumptions

TF Value	C_m Contribution (Births)	C_c (Births)	C_i (Births)	C_a (Births)	Total ΔTFR
13	0.091	0.157	0.167	0.015	0.43
15.3 (Base)	0.107	0.184	0.196	0.018	0.505
17	0.119	0.205	0.218	0.02	0.562

Notes: Relative contributions stable (21% C_m, 36% C_c, 39% C_i). From Bongaarts (1982).

VIII. DISCUSSION AND POLICY IMPLICATIONS

This study applies the Bongaarts proximate determinants framework to account for the observed decline in total fertility in Nigeria between 2018 and 2023-24. Under this identity, fertility change is mechanically decomposed into contributions from marriage exposure, contraception, postpartum infecundability, and a residual component capturing abortion and unmeasured factors. The results therefore provide an accounting explanation of fertility change rather than a causal model of individual behavior. A formal separation of compositional and behavioral effects, such as a Kitagawa style decomposition, is beyond the scope of the present study but represents a natural extension for future work.

The decomposition indicates that changes in contraception and postpartum infecundability jointly account for the majority of the observed fertility decline. The reduction in the contraception index reflects increased prevalence and effectiveness of modern methods among women in union. Simultaneously, the decline in C_i reflects an increase in average postpartum infecundability duration (longer periods), strengthening inhibition contrary to expected urbanization shortening; this may stem from regional variations or data artifacts. These two mechanisms operate multiplicatively within the Bongaarts framework and together explain most of the decline in period fertility.

Observed shifts in female educational attainment and urban residence occurred over the same period and provide important contextual background for the decomposition results. However, these socioeconomic variables are not themselves proximate determinants within the accounting framework. Their influence on fertility operates indirectly through changes in exposure, contraceptive use, and postpartum behaviors. As such, their role is interpreted descriptively rather than causally in the present analysis.

The contribution of contraception reflects modest but meaningful increases in modern method prevalence and improvements in method mix effectiveness among women in union. Although the levels of contraceptive use remain low in absolute terms, the decomposition shows that even incremental changes in effective use can translate into substantial fertility reduction when applied across the population. This finding aligns with demographic theory, which emphasizes that fertility decline in high fertility settings often proceeds through gradual accumulation of behavioral change rather than abrupt transitions.

The residual component remains relatively small, suggesting that unmeasured factors such as induced abortion or reporting error play a limited role in explaining aggregate fertility change. Nonetheless, abortion is known to be underreported in household surveys, and the residual should be interpreted cautiously. Overall, the results demonstrate the continued relevance of proximate determinants analysis for monitoring fertility transitions in high fertility settings using routinely collected survey data.

The inferred abortion index remains close to unity in both survey rounds, suggesting that unmeasured fertility inhibition plays a limited role in explaining the observed change. Given the absence of reliable abortion data in the survey, this component is appropriately treated as a residual that absorbs measurement error and unobserved processes. No substantive interpretation of abortion trends is warranted from this result, and the paper intentionally avoids doing so.

The extension linking education and urban residence to fertility and proximate determinants is presented as an associative analysis rather than a causal model. As shown in Table 5, higher levels of female education and urban residence are associated with lower fertility, higher contraceptive use, and shorter durations of postpartum infecundability. These associations are consistent with established demographic literature and provide contextual interpretation for the decomposition results. However, the proximate determinants framework itself remains an accounting identity, and the regression results are intended to illustrate correlations rather than mechanisms of causation.

It is also important to clarify the role of total fecundity in the analysis. The total fecundity parameter is treated as constant across survey rounds and serves as a scaling factor that preserves the internal consistency of the multiplicative identity. It is not interpreted as an empirically estimated biological quantity, and the results of the decomposition are not sensitive to small variations in its assumed value. This treatment is standard in mathematical demography and does not affect the relative contributions of the proximate determinants.

Overall, the findings indicate that Nigeria is experiencing a gradual fertility transition driven by multiple interacting pathways. Fertility decline is occurring not through a single dominant behavioral shift but through the combined effects of changing exposure, contraceptive adoption, and postpartum dynamics. From a demographic accounting perspective, this pattern is consistent with early and intermediate stages of fertility transition observed in other high fertility populations.

IX. LIMITATIONS

Abortion is not directly measured reliably in NDHS, so Ca is best treated as inferred residual or supplemented by external evidence with full transparency. Minor TFR discrepancies (microdata 5.24/4.74 vs. official 5.3/4.8) reflect exposure window/rounding differences but do not alter conclusions.

Proximate determinants are not causal levers by themselves, especially education and residence which are endogenous to fertility.

Survey intervals and compositional shifts mean results should be interpreted as period comparisons, not individual life course trajectories.

While this study focuses on an accounting decomposition using the Bongaarts framework, future work may extend the analysis using multivariate models to examine associations between education, urban residence, and specific proximate pathways such as contraceptive use and postpartum infecundability. Such extensions would require explicit modeling assumptions and are beyond the scope of the present decomposition based analysis.

X. CONCLUSION

Using microdata from the 2018 and 2023-24 Nigeria Demographic and Health Surveys, this study decomposed recent fertility change using the Bongaarts proximate determinants framework. Total fertility declined substantially over the period, with the majority of the change accounted for by increased contraceptive inhibition and longer postpartum in fecundability.

By applying a log based decomposition consistent with the multiplicative structure of the framework, the analysis provides a transparent accounting of index specific contributions expressed in births per woman. The results demonstrate how routinely collected DHS microdata can be used to monitor fertility transitions in a mathematically coherent manner.

While the present study focuses on accounting decomposition, future research may extend the analysis by explicitly modeling associations between socioeconomic characteristics and specific proximate determinants. Such extensions would complement, rather than replace, the decomposition approach by addressing behavioral mechanisms underlying the observed aggregate changes.

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