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REGIONAL DISPARITIES AND GENDER DIFFERENTIALS IN LIFE EXPECTANCY ACROSS AFRICAN NATIONS: A COMPARATIVE STATISTICAL ANALYSIS

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ABSTRACT

This study examines life expectancy patterns across 54 African countries, utilizing secondary data from the World Health Organization (WHO) and Statista. Employing descriptive statistics, a paired sample t-test, and a Wilcoxon signed-rank test, the analysis reveals pronounced regional disparities: North Africa records the highest average life expectancy (73.2 years), followed by Southern Africa (65.9 years), East Africa (64.1 years), West Africa (63.3 years), and Central Africa (61.9 years). A statistically significant female longevity advantage of 4.40 years ($t = 19.18$, $p < 0.001$; Wilcoxon $Z = 6.1$, $p < 0.001$) is observed consistently across all regions, with the widest gender gap in Southern Africa (6.2 years) and the narrowest in East Africa. Eritrea is a notable anomaly, where male life expectancy marginally exceeds female by 0.3 years. These findings underscore the need for gender-sensitive health policies and targeted regional interventions to address persistent health inequities across Africa.

Keywords: *Life Expectancy, Gender Disparities, African Regions, Comparative Statistical Analysis, Health Inequities, Sub-Saharan Africa*

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INTRODUCTION

Life expectancy at birth is a composite indicator of population health, reflecting the cumulative effect of mortality rates across all age groups. It serves as a primary metric for monitoring progress toward sustainable development goals, evaluating health system performance, and guiding evidence-based resource allocation in public health (WHO, 2023). Globally, life expectancy has improved substantially over recent decades, yet marked geographic disparities persist. African countries continue to lag behind other world regions, with considerable internal heterogeneity driven by differences in epidemiological profiles, socioeconomic conditions, and health system capacity (Cao *et al*., 2020).

Africa's epidemiological landscape is shaped by the coexistence of communicable and non-communicable diseases alongside persistent structural challenges, including poverty, political instability, and inequitable access to healthcare (Mouteyica & Ngepah, 2025). These conditions produce highly heterogeneous longevity patterns that differ sharply across the continent's five geographic regions. Health financing arrangements, urbanization, environmental quality, and disease burden each contribute to this variation (Apeagyei *et al.,* 2024; Zeng & Niu, 2023).

A persistent and well-documented feature of African demographic data is the female longevity advantage: women consistently survive longer than men across nearly all countries and regions. This gender gap reflects a complex interplay of biological, behavioral, and structural factors. Biologically, female hormonal profiles confer cardiovascular protection, while men face higher age-specific mortality from injuries, occupational hazards, and risk-taking behaviors (Pinho-Gomes *et al.,* 2023). Structurally, improvements in maternal health services have reduced female mortality, while male HIV/AIDS burden in parts of Southern Africa has widened the longevity differential (Talifu *et al.,* 2024; Chang *et al.,* 2025).

Despite the relevance of these patterns, systematic multi-country comparative analyses across Africa's regions remain limited. Much of the existing literature focuses on isolated determinants such as environmental quality (Kur, 2024), health expenditure (Irandoust *et al.,* 2025), or income inequality, without integrating regional and gender perspectives (Asongu & Odhiambo, 2023). Subnational disparities are especially pronounced in sub-Saharan Africa, which stands out among low- and middle-income regions for persistent inequality despite rising average life expectancy (Kyriacou *et al.,* 2025). This study addresses this gap by providing an analytical framework that remains rooted in relatively basic statistical analysis of life expectancy across all 54 African countries, with particular attention to regional differentials and gender disparities.

The study is organized around two interconnected objectives. First, it characterizes regional differences in life expectancy by computing descriptive statistics for each of Africa's five subregions and comparing gender-disaggregated means using appropriate statistical tests. Second, it investigates the gender differential in life expectancy at the continental and regional levels, quantifying the female longevity advantage and identifying countries with the largest and smallest gender gaps. Together, these objectives aim to generate evidence that can inform context-sensitive, gender-responsive health policies across the continent (Osei-Kusi *et al.,* 2024; Li *et al.,* 2025).

MATERIALS AND METHODS

Data Sources and Study Design

This study employs a cross-sectional descriptive and inferential design based on secondary data for all 54 recognized African countries. The primary data source is the World Health Organization's Global Health Observatory, which publishes nationally representative life expectancy estimates disaggregated by sex (WHO, 2023). Supplementary figures are drawn from Statista, which compiles WHO and national statistical agency data for comparative country profiles. Both sources apply standardized methodological protocols and undergo independent validation, making them appropriate for cross-national comparative analysis. Life expectancy estimates refer to the most recent reporting cycle (2023-2024), stratified by sex (male, female, and both sexes combined) and aggregated according to Africa's five standard geographic subregions as defined by the United Nations: North Africa, West Africa, Central Africa, East Africa, and Southern Africa (United Nations, 2023).

Paired t-Test

To determine whether mean life expectancy differs significantly between males and females, a paired-samples t-test was applied because the male and female observations were measured on the same set of countries. The test evaluates the null hypothesis H_0: $\mu_D = 0$ against the alternative hypothesis H_1: $\mu_D \neq$

0 where μ_D denotes the population mean of the paired differences in life expectancy between females and males (Moore *et al.*, 2021). The paired difference was defined as

$$D_i = X_{Fi} - X_{Mi}$$

where X_{Fi} and X_{Mi} represent female and male life expectancy, respectively, for the i^{th} country. The test statistic is expressed as:

$$t = \frac{\overline{D} - \mu_{D_0}}{S_D/\sqrt{n}} \sim t_{n-1}$$

where $\overline{D}$ is the mean paired difference, S_D is the standard deviation of the paired differences, $\mu_{D_0} = 0$ = 0 under the null hypothesis, and n is the number of paired observations.

In addition, Cohen's dz was computed as an effect size measure to assess the practical magnitude of the observed gender difference in life expectancy. Cohen's paired effect size was obtained as:

$$d_z = \frac{\overline{D}}{S_D}$$

A statistically significant result was concluded when the computed p-value was less than 0.05.

Wilcoxon Signed-Rank Test

Given that male and female life expectancy estimates are recorded for the same 54 countries, a Wilcoxon signed-rank test was applied as a non-parametric complement (Hollander *et al.*, 2014). This test ranks the absolute differences between paired values and evaluates whether the distribution of differences is symmetric about zero. The standardized statistic Z is approximately normally distributed for large samples, making this approach suitable for cross-national data that may depart from normality. Convergent significance across both tests provides robust evidence of the gender differential (Tabachnick & Fidell, 2019).

RESULTS AND DISCUSSION

Descriptive Overview of Life Expectancy Across Africa

Table 1 presents regional averages life expectancy data for all African countries, disaggregated by sex and ranked in descending order of combined life expectancy. Table 2 presents summary statistics for the full continental dataset.

Table 1. Regional Averages of Life Expectancy by Gender in Africa

Region	Both Sexes (years)	Male (years)	Female (years)
North Africa	73.2	71.3	76.0
West Africa	63.3	61.3	65.3
Central Africa	61.9	59.7	64.0
East Africa	64.1	61.9	66.3
Southern Africa	65.9	62.9	69.0

Source: Computed from WHO (2023) and Statista (2024).

Table 2. Descriptive Statistics of Life Expectancy at Birth Across 54 African Countries

Statistic	Both Sexes	Male	Female
Count (n)	54	54	54
Mean (years)	64.9	62.8	67.2
Standard Deviation	5.52	5.41	5.99
Minimum	54.1	52.3	54.5
25th Percentile (Q1)	61.7	59.7	63.4
Median	64.1	61.8	66.4
75th Percentile (Q3)	67.3	65.1	69.9
Maximum	77.1	76.3	81.1

Source: Computed from WHO (2023) and Statista (2024).

Across the 54 countries analyzed, the continental mean life expectancy is 64.9 years (SD = 5.52). Male life expectancy averages 62.8 years (SD = 5.41), while female life expectancy averages 67.2 years (SD = 5.99), yielding a mean difference of 4.4 years in favor of females. The minimum male life expectancy of 52.3 years is recorded in Lesotho; the maximum female life expectancy of 81.1 years is observed in Cabo Verde. Regional averages (Table 2) confirm that North Africa consistently leads on all three indicators (combined: 73.2 years), followed by Southern Africa (65.9 years), East Africa (64.1 years), West Africa (63.3 years), and Central Africa (61.9 years). Figures 1 through 4 provide graphical illustration of these patterns at regional and country levels.

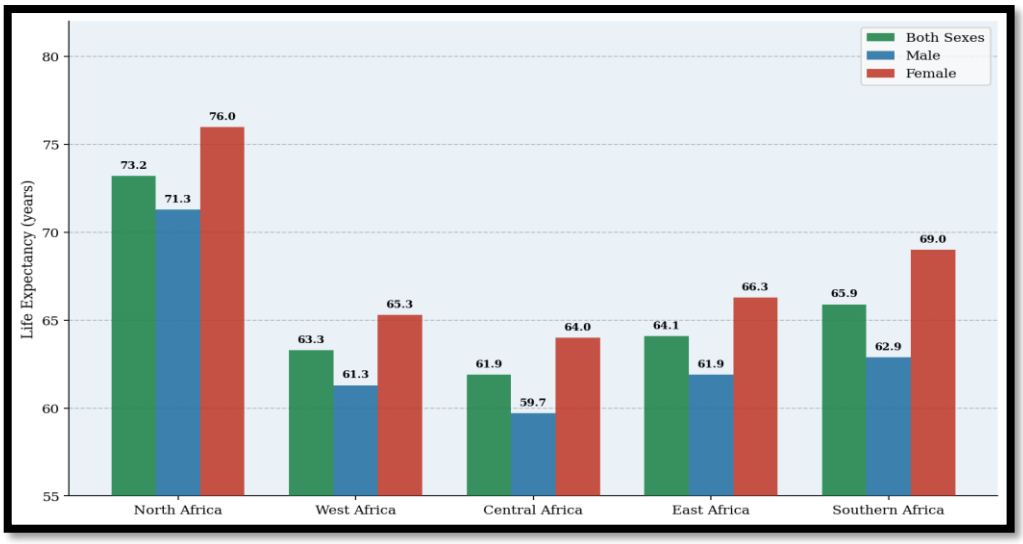

Figure 1. Regional Average Life Expectancy by Gender in Africa

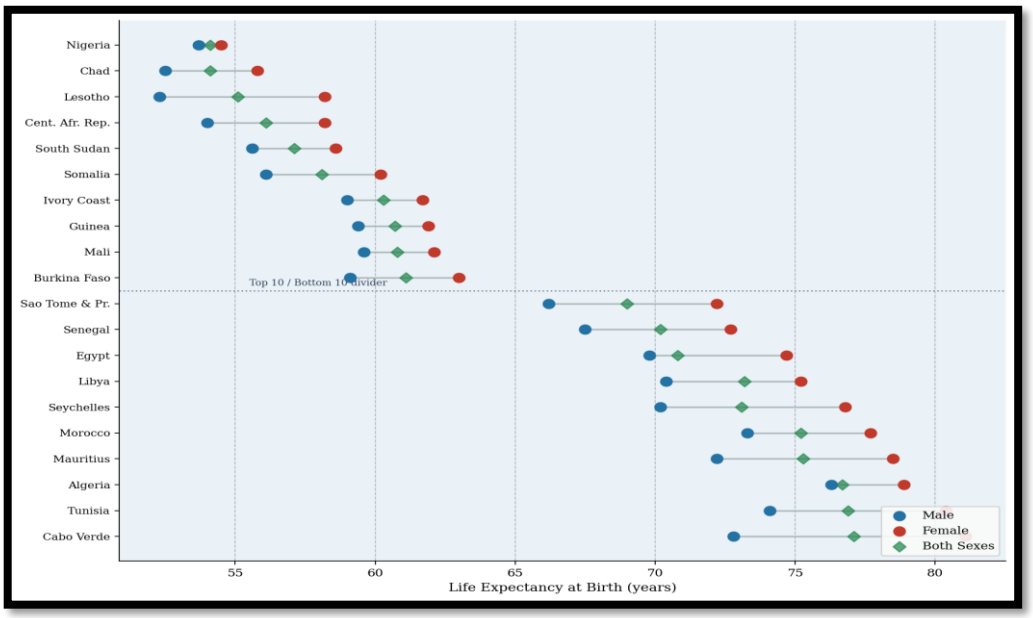

Figure 2. Life Expectancy at Birth for Selected African Countries (Top 10 and Bottom 10)

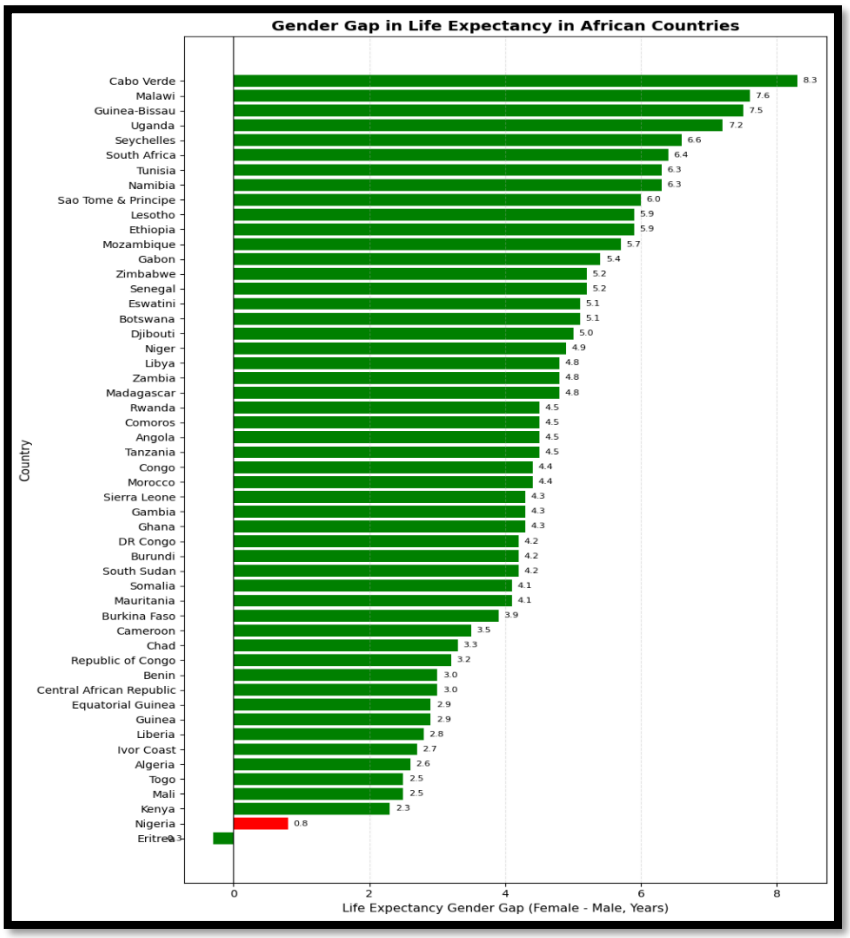

Figure 3. Gender Gap in Life Expectancy Across All 54 African Countries

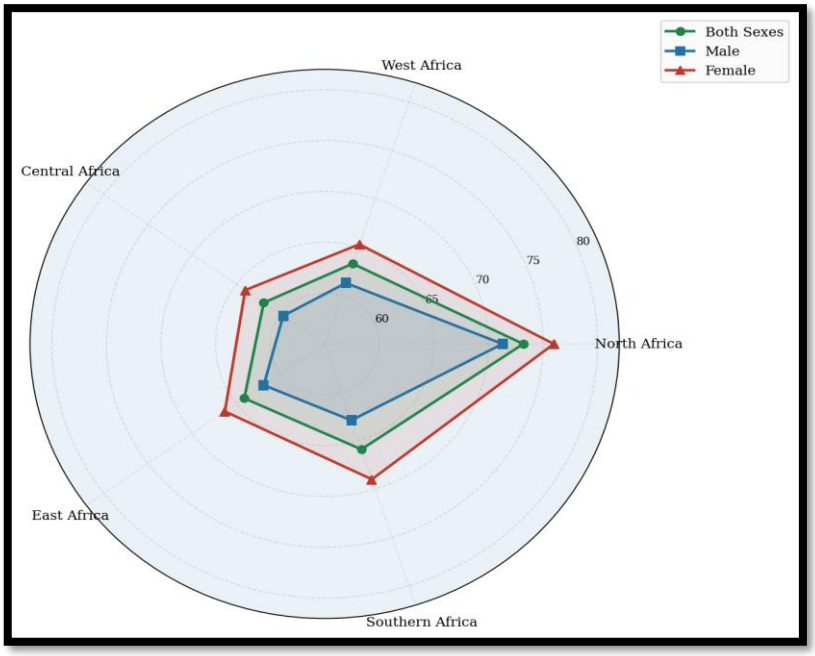

Figure 4. Radar Chart of Regional Life Expectancy by Gender in Africa

Normality Test for Male and Female Life Expectancy

Normality was assessed to confirm the suitability of the data for paired-samples t-test analysis, with emphasis on the paired difference between female and male life expectancy. At the 5% significance level, p-values greater than 0.05 indicate that the null hypothesis of normality is not rejected, implying that the data are approximately normally distributed and suitable for the paired-samples t-test.

Table 3. Kolmogorov-Smirnov normality test with Lilliefors correction

Variables	N	Mean	Std. Deviation	K-S Statistic	p-value	Skewness	Kurtosis	Decision
Male life expectancy	54	62.80	5.41	0.121	0.051	0.491	0.197	Normally distributed
Female life expectancy	54	67.20	5.99	0.093	0.312	0.409	0.120	Normally distributed
Paired difference	54	4.40	1.69	0.096	0.266	-0.169	0.511	Normally distributed

The Kolmogorov-Smirnov results showed that male life expectancy, female life expectancy, and the paired differences were approximately normally distributed, with K-S values of 0.121, 0.093, and 0.096, and p-values of 0.051, 0.312, and 0.266, respectively. Since all p-values exceeded 0.05, the normality assumption was satisfied, supporting the use of the paired-samples t-test.

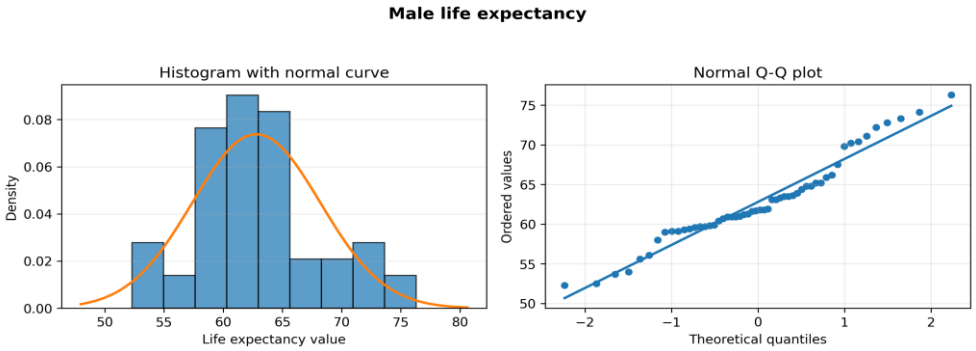

Figure 5. Histogram and normal Q-Q plot for male life expectancy

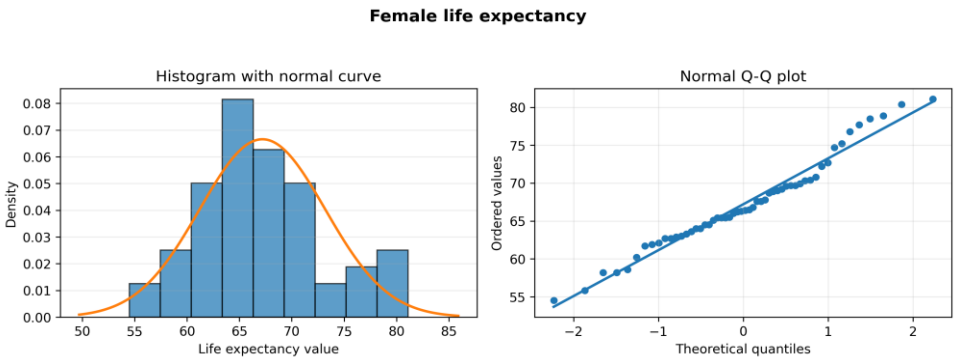

Figure 6. Histogram and normal Q-Q plot for female life expectancy

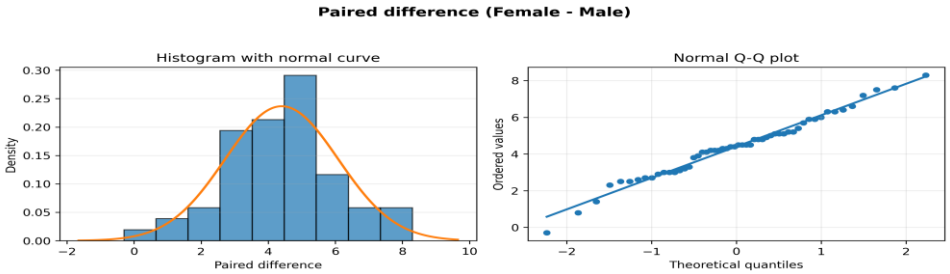

Figure 7. Histogram and normal Q-Q plot for paired differences between female and male life expectancy

Gender Differential in Life Expectancy

Table 4. Results of Paired-Samples t-Test and Wilcoxon Signed-Rank Test for Gender Differences in Life Expectancy

Parameter	Paired-Samples t-Test	Wilcoxon Signed-Rank Test
Male Mean (years)	62.80	-

Female Mean (years)	67.20	-
Mean Difference (Female - Male)	4.40 years	-
95% Confidence Interval	3.94 to 4.86	-
Test Statistic	t = 19.18	W = 1; Z = 6.1
Degrees of Freedom / n	df = 53	n = 54
p-value	< 0.001	< 0.001
Effect Size	Cohen's dz = 2.61	r = 0.87
Significance Level (α)	0.05	0.05
Decision	Reject H_0	Reject H_0

Note. The Wilcoxon statistic W is reported as the smaller signed-rank sum; the positive signed-rank sum was W+ = 1484. Cohen's dz is the standardized mean paired difference. The p-values for both tests are less than 0.001.

Hypotheses Tested

$H_0: \mu_D = 0$ (there is no significant difference between male and female life expectancy)

$H_1: \mu_D \neq 0$ (a significant difference exists between male and female life expectancy)

The paired-samples t-test revealed a statistically significant gender difference in life expectancy, ($t(53) = 19.18$, $p < 0.001$), leading to the rejection of the null hypothesis at the 5% significance level. The estimated mean female advantage was 4.40 years, with a 95% confidence interval of 3.94 to 4.86 years, indicating that the difference was consistently above zero. This finding was further supported by the Wilcoxon signed-rank test, ($W = 1$, $Z = 6.1$, $p < 0.001$), confirming the robustness of the result under a non-parametric framework. The magnitude of the effect was very large, ($dz = 2.61$), suggesting that the female life expectancy advantage is not only statistically significant but also substantively meaningful across the 54 African countries examined.

Country-Level Gender Gap Analysis

Table 5. Countries with the Largest Female Advantage in Life Expectancy (Female minus Male, Years)

Country	Gender Gap (years)
Cabo Verde	8.3
Malawi	7.6
Eswatini	7.5
Namibia	7.2
Seychelles	6.6

Table 6. Countries with the Smallest (or Reversed) Gender Gap in Life Expectancy

Country	Gender Gap (years)
Eritrea	−0.3 (male advantage) *
Togo	1.4
Niger	2.3
Mali	2.5
Guinea	2.5

** A negative value indicates that male life expectancy exceeds female life expectancy.*

Among countries with the widest gender gaps, Cabo Verde (8.3 years) stands out, reflecting a combination of high female life expectancy (81.1 years) and elevated male exposure to occupational and behavioral health risks. Malawi (7.6 years) and Eswatini (7.5 years) exhibit pronounced gaps attributable primarily to high HIV/AIDS-related male mortality, a pattern consistent with epidemiological data from Southern Africa (Talifu *et al.*, 2024). Eritrea is the only country where males outlive females (gap of 0.3 years), a pattern that may reflect unique societal contexts or known data limitations in the country's vital registration system (WHO, 2023).

The present analysis confirms pronounced regional heterogeneity in life expectancy across Africa, with an 11.3-year gap between the highest regional average (North Africa: 73.2 years) and the lowest

(Central Africa: 61.9 years). This gradient is consistent with findings from Mouteyica and Ngepah (2025), whose multilevel analysis of African Regional Economic Communities documented structural health outcome disparities attributable to differences in governance capacity, infrastructure, and health expenditure. North Africa's advantage reflects higher average income levels, greater investment in primary healthcare, and lower burdens from HIV/AIDS compared to sub-Saharan subregions (Apeagyei *et al.,* 2024).

Southern Africa's second-place position (65.9 years) conceals considerable within-region heterogeneity: Mauritius (75.3 years) and Seychelles (73.1 years) perform comparably to North African countries, whereas Lesotho (55.1 years) and Eswatini (61.6 years) record among the continent's lowest figures. This pattern aligns with Osei-Kusi *et al.,* (2024), who documented strong associations between energy access, income, and life expectancy within African subregions, and with Zeng and Niu (2023), who identified health financing as a key driver of healthy life expectancy differentials in West Africa. Central Africa's persistently low performance (61.9 years combined; 59.7 years for males) reflects the compounding effects of conflict, weak health system infrastructure, and high communicable disease burden, particularly in the Democratic Republic of Congo and the Central African Republic (WHO, 2023).

East Africa shows moderate performance (64.1 years) with notable internal variability: Eritrea (68.7 years) and Tanzania (68.1 years) outperform Somalia (58.1 years) and South Sudan (57.1 years), where prolonged conflict and humanitarian crises have severely constrained population health outcomes. These findings align with Kyriacou *et al.* (2025), who demonstrated that subnational disparities in life expectancy are driven by inequality in education and income across low- and middle-income country settings.

The 4.56-year female longevity advantage documented here is consistent with global patterns and prior African-focused analyses. Pinho-Gomes, Peters, and Woodward (2023) demonstrated in a 156-country cross-national study that gender equality is positively associated with life expectancy for both sexes, yet a biological female survival advantage persists even after controlling for gender equality indices. Chang et al. (2025) further showed that sex inequalities in life expectancy are driven by structural factors including differential access to healthcare, occupational hazard exposure, and risk behaviors, all of which operate at differential intensity across African contexts.

The particularly wide gender gap in Southern Africa (approximately 6.2 years) is consistent with HIV/AIDS epidemiology: male HIV-related mortality rates in South Africa, Botswana, and Eswatini substantially exceed female rates, widening the longevity differential (Talifu *et al.,* 2024). Conversely, the narrower gap in East Africa and the anomalous male advantage in Eritrea align with evidence that in contexts of high maternal mortality and limited reproductive health services, the female survival advantage can be substantially eroded (WHO, 2023; Chang et al., 2025). The findings are further contextualized by Asongu and Odhiambo (2023), whose quantile regression analysis of 43 sub-Saharan African countries confirmed that female life expectancy provides a significant boost to economic growth, underscoring the broader socioeconomic importance of addressing gender-based mortality differentials.

These findings carry several concrete policy implications. First, the magnitude and consistency of the female longevity advantage calls for gender-disaggregated health planning across all African subregions, with targeted attention to male-specific mortality drivers including HIV/AIDS prevention, occupational safety, and health-seeking behavior promotion. Second, the severity of disparities in Central Africa warrants prioritized investment in primary healthcare infrastructure, disease surveillance, and health financing reform, consistent with recommendations by Apeagyei *et al.* (2024) and Li *et al.* (2025). Third, island and coastal nations such as Cabo Verde, Mauritius, and Seychelles offer instructive models of policy achievement worth examining, given their life expectancy figures approaching those of middle-income countries elsewhere.

CONCLUSION

This study presents a comprehensive statistical assessment of life expectancy across the 54 African countries, highlighting pronounced regional heterogeneity and a persistent continent-wide female survival advantage. The findings indicate substantial disparities in longevity outcomes, with North Africa exhibiting the highest regional average life expectancy (73.2 years) and Central Africa recording the lowest (61.9 years), underscoring the cumulative influence of epidemiological burdens, healthcare system constraints, and socioeconomic inequalities. Inferential analyses reveal a statistically significant female life expectancy advantage of 4.4 years, consistently supported by both parametric and

non-parametric approaches, thereby confirming the robustness of the observed gender differential. Regional variation in this advantage is also evident, with the widest gender gaps occurring in Southern Africa and the narrowest in East Africa, while Eritrea emerges as a notable demographic outlier requiring further investigation. These findings contribute to the growing body of evidence on health inequalities across Africa and underscore the need for future research employing multilevel analytical frameworks capable of disentangling individual, national, and regional-level determinants of longevity.

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