BRIDGING DEMOGRAPHIC DATA GAPS THROUGH POPULATION PROJECTIONS

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Abstract: The 2030 Agenda for Sustainable Development launched in 2015 aims to eradicate poverty and hunger, improve health and well-being, quality education, achieve greater gender equality among other goals in order to achieve sustainable development by 2030. Regrettably, the modest progress recorded prior to and since 2015 towards realizing the Sustainable Development Goals (SDGs) is being eroded by the covid-19 pandemic since 2020. Moreover, the adverse economic impact of the pandemic is likely to undermine the supply of funds for timely collection of good quality data required to guide policies and development planning. Using the 2006 Nigeria Census and the 2018 Nigeria Health and Demographic Survey data, this paper provides reliable population estimates and projections for Nigeria for the period 2015-2035. The data are also disaggregated into special population groups to provide requisite denominators to support calculation of appropriate indicators for effective tracking of progress towards achievement of the SDGs.

Keywords: Sustainable development, Data, Disaggregated, Special population groups, Indicators.

Introduction

Achievement of the 2030 Agenda for Sustainable Development launched in 2015 requires reduction in unemployment rate, gender inequality among other things, in other to eradicate poverty and hunger to achieve sustainable development by 2030.

To realize this important agenda requires timely and disaggregated data to guide policies and planning. The modest progress recorded prior to and since 2015 towards realizing the Sustainable Development Goals (SDGs) is being eroded by the covid-19 pandemic since 2020; while the worsening economic impact of the pandemic undermines the capacity of nations to fund timely collection of good quality population data for development planning to support achievement of the SDGs.

This paper therefore provides reliable population estimates and projections for Nigeria for the period 2015-2035. The data are also disaggregated into special population groups to

provide requisite denominators to support calculation of appropriate indicators for effective tracking of progress towards achievement of the SDGs.

Background

Population projection is an important tool that enables production of reliable data on the probable future size, structure and distribution of a population. The process draws from the knowledge of the past trends in the three components of population change, namely fertility, mortality and migration, and plausible assumptions about their future trends, using the most recent population census data as base (Keyfitz and Caswell 2005; United Nations 2018:6).

Thus, population projections complement other sources of demographic data, such as population censuses in providing reliable disaggregated data required for effective planning and optimum allocation of scarce resources (Dunstan and Ball 2016).

By their very nature, population projections are subject to uncertainties. The accuracy of projection results is improved by developing a stochastic forecasting model that attaches explicit statements of probability to population projections outputs (Alho 1990).

Data and Methods

The data used in this study were sourced from the 2006 Nigeria Population Census, and the 2018 Nigeria Demographic and Health Survey (NPC and ICF 2019) conducted by the National Population Commission.

The age-sex distribution of the 2006 Nigeria population census was evaluated using Arriaga smoothing method (Arriaga *et al*. 1994). The smoothed population was then moved from the census date (March 21 2006) to the middle of the launch-year 2005 (i.e., July 1, 2015). This provides a more convenient projection starting point. Results are however presented for the period 2015-2035.

The base population used for projection in this paper is presented in Table 1.

Table 1: Adjusted Age-Specific Distribution of the Base-Year Population: Nigeria, mid-2005

Age Group	Male	Female
0-4	11,601,365	11,039,088
5–9	10,010,263	9,277,967
10–14	8,486,752	7,702,539
15–19	7,301,188	7,055,566
20–24	6,264,003	7,303,710
25–29	5,322,399	6,352,034
30–34	4,347,857	4,753,915
35–39	3,689,708	3,742,945
40–44	3,219,267	2,841,530
45–49	2,643,825	2,168,954
50–54	1,975,517	1,549,113
55–59	1,522,160	1,169,102
60–64	1,117,860	904,410
65–69	842,393	679,890
70–74	621,372	484,853
75–79	454,793	319,296
80+	799,888	652,131
All Ages	70,220,610	67,997,043

Source: Derived from the adjusted 2006 Nigeria Census data.

Methods

Projection Assumptions

Fertility assumptions

The level of fertility measured in terms of TFR remained constant at 5.7 children per woman from 2005 to 2008, but decreased marginally from 5.7 in 2008 to 5.5 in 2013 and further to 5.3 in 2018 (NPC and ICF 2014 and 2019). This implies an annual decline in TFR of 0.04 child assuming a constant rate of decline between 2008 and 2018.

Three variants of fertility assumptions were made (Low, Medium, and High).

Given the rising trend of contraceptive prevalence rate (CPR) among currently married women from 14.6% in 2008 to 16.6% in 2018 and also the increase in school enrolment, especially among girls (NPC and ICF 2009, 2014; 2019), which is likely to delay entry into marriage for most of the girls attending school; the following fertility assumptions were made:

(i) fertility would maintain a gradual but steady declining trend during the projection period. The TFR in present five-year period ($I_{c,t+1}$) is modeled using equation(1)

$$I_{c,t+1} = I_{c,t} - d_{c,t} \quad (1)$$

where

$I_{c,t}$ = the TFR in previous five-year period in Nigeria
$d_{c,t}$ = five-year decline in TFR in Nigeria

Assuming the observed annual rate of decline of 0.04 child in TFR prevails until 2020, and thereafter the annual rate of decline increases slightly to 0.05 child for the rest of the projection period, then TFR would decline to 4.47 by 2035. This represents the medium variant TFR.

Assuming further that the high and low variant levels of TFR are higher or lower by +0.5 or -0.5 child respectively, than the medium variant at any given time, then the TFR trajectory would be as given in Panel A of Table 2.

The age-specific fertility rates (ASFR) corresponding to the projected TFRs were obtained by interpolation using the average UN Model Age Distribution of fertility available in Spectrum Manual (UN 1977 cited in Spectrum Manual, p.57). The interpolation was done using the Waring Lagrange formula for two points which is given as:

$$Y = \left(\frac{X-X_2}{X_1-X_2}\right)Y_1 + \left(\frac{X-X_1}{X_2-X_1}\right)Y_2 \quad (2)$$

where,
Y = interpolated Age-specific percentage share of the projected TFR, X.

X = projected TFR, while

Y_1 and Y_2 are the Age-specific percentage shares of the model TFRs (X_1 and X_2), respectively in the average UN Model Age Distribution of fertility that bracket the projected TFR, X. The interpolated age-specific percentage shares of fertility rates are then converted to age-specific fertility rates. The projected age-specific fertility rates, corresponding to the assumed TFR for the three variants (High, Medium and Low) are also presented in Panel A of Table 2.

Mortality assumptions

Life expectancy at birth for males were estimated at 54.50 years in 2010 and 55.53 years in 2015 from the 2018 NDHS data. The corresponding values for females were 58.30 years in 2010 and 59.40 years in 2015. These figures implied an improvement rate of 1.03 years for males and 1.10 years for females, respectively, for the five-year period between 2010 and 2015. These rates of improvement were adopted as the medium variant mortality assumption throughout the projection period for males and females respectively.

Thus, using the 2015 life expectancy at birth a base, the rest of the medium variant life expectancies were projected using equation (3).

$$e_{c,t+1} = e_{c,t} + g_{c,t} \quad (3)$$

where,

$e_{c,t}$ = the life expectancy of the previous five-year period

$g_{c,t}$ = five-year gain in life expectancy

For the high and low mortality assumptions, respectively, for any given year after the base year, we assumed a moderate increment or decrement of 0.5 year of the medium variant life expectancy as appropriate. The projected life expectancies for the three mortality assumptions are shown in Panel B of Table 2.

Migration assumptions

Data on historical migration are scarce for Nigeria. In this work, we adopted and assumed that the data on net international migrants reported for Nigeria in UN (2015) would prevail during the projection period. The migrations assumptions are presented in Panel C of Table 2.

Table 2: Projection Assumptions

Panel A: Fertility Assumptions about TFR and Age-Specific Fertility Rates (ASFRs) for, High, Medium and Low Fertlity Scenerios, Nigeria:2005-2035

Year	ASFR 15-19	20-24	25-29	30-34	35-39	40-44	45-49	TFR
				High				
2005	0.1183	0.2652	0.2785	0.2318	0.1560	0.0755	0.0148	5.70
2010	0.1389	0.2826	0.2906	0.2426	0.1664	0.0838	0.0191	6.12
2015	0.1206	0.2759	0.2900	0.2415	0.1622	0.0784	0.0154	5.92
2020	0.1185	0.2661	0.2795	0.2326	0.1565	0.0757	0.0149	5.72
2025	0.1158	0.2540	0.2665	0.2217	0.1494	0.0724	0.0142	5.47
2030	0.1129	0.2418	0.2535	0.2107	0.1423	0.0691	0.0136	5.22
2035	0.0876	0.2346	0.2503	0.2068	0.1375	0.0644	0.0128	4.97
				Medium				
2005	0.1183	0.2652	0.2785	0.2318	0.1560	0.0755	0.0148	5.70
2010	0.1175	0.2613	0.2743	0.2282	0.1537	0.0744	0.0146	5.62
2015	0.1153	0.2515	0.2639	0.2195	0.1480	0.0718	0.0141	5.42
2020	0.1129	0.2418	0.2535	0.2107	0.1423	0.0691	0.0136	5.22
2025	0.0876	0.2346	0.2503	0.2068	0.1375	0.0644	0.0128	4.97
2030	0.0863	0.2221	0.2361	0.1955	0.1303	0.0615	0.0122	4.72
2035	0.0848	0.2097	0.2221	0.1842	0.1231	0.0586	0.0116	4.47
				Low				
2005	0.1183	0.2652	0.2785	0.2318	0.1560	0.0755	0.0148	5.70
2010	0.1116	0.2370	0.2484	0.2064	0.1395	0.0678	0.0133	5.12
2015	0.0874	0.2321	0.2474	0.2046	0.1361	0.0638	0.0127	4.92
2020	0.0863	0.2221	0.2361	0.1955	0.1303	0.0615	0.0122	4.72
2025	0.0848	0.2097	0.2221	0.1842	0.1231	0.0586	0.0116	4.47
2030	0.0828	0.1974	0.2082	0.1731	0.1160	0.0556	0.0110	4.22
2035	0.0613	0.2201	0.2320	0.1678	0.0840	0.0261	0.0026	3.97

Panel B: Mortality Assumptions(Life Expectancy at Birth e^0) by Sex and Year, Nigeria: 2005 - Nigeria: 2005 -2035

	High Variant		Medium Variant		Low Variant	
Year	Male	Female	Male	Female	Male	Female
2005	53.59	57.30	53.59	57.30	53.59	57.30
2010	55.09	58.84	54.59	58.37	54.09	57.87
2015	56.09	59.94	55.59	59.44	55.09	58.94
2020	57.09	61.01	56.59	60.51	56.09	60.01
2025	58.09	62.08	57.59	61.58	57.09	61.08
2030	59.09	63.15	58.59	62.65	58.09	62.15
2035	60.09	64.22	59.59	63.72	59.09	63.22

Panel C: Net Migration by Sex and Year, Nigeria: 2005 -2035

	Male	Female
2005	-37167	-24778
2010	-36519	-24346
2015	-36517	-24345
2020	-36487	-24324
2025	-36530	-24353
2030	-36530	-24353
2035	-36530	-24353

Source: 1. TFRs were generated from survey reports after evaluation of relevant extant policies. 2. The ASFRs are interpolated from the Average UN Model Age Distribution of Fertility available in Spectrum .p57. 3. Life Expectancy at Birth were generated from the 2018 NDHS data. 4. Net Migration data were obtained from UN World Population Prospect, 2015.

Projection Method

The cohort component method (CCM) of projection is adopted. It entails updating the population of each age- and sex specific group according to assumptions about fertility, mortality and migration. Each cohort survives forward to the next age group according to the assumed age-specific survival rates. The formula used in the projection model for age groups 0-4, by sex is shown below:

$$P_{0-4}^{m} = (B_{c+5} * MR^{f}) * S_{0-4}^{m(c+5)} * (1 + M_{0-4}^{m(c+5)}) \quad (4)$$

P_{0-4}^{f} = $(B_{c+5} * MR^{m})* S_{0-4}^{f(c+5)}*(1+ M_{0-4}^{f(c+5)})$

(5)

Where P_{0-4}^{m} and P_{0-4}^{f} are the projected male and female populations, 0-4 years old in the five-year projection period.

B_{c+5} is the total births in the five-year time interval, t+5.

MR^{m} and MR^{f} are the ratio of males to total births and ratio of females to total births respectively (i.e. the masculinity ratio for male and female).

$S_{0-4}^{m(c+5)}$ and $S_{0-4}^{f(c+5)}$ are the survival rates for males and females aged 0-4 in the five-year time interval.

$M_{0-4}^{m(c+5)}$ and $M_{0-4}^{f(c+5)}$ are the net migration rates for males and females 0-4 years old in the five-year time interval.

Projecting Population Aged 5-79 Years Old

$${}_5P_{x,t+5,}={}_5P_{x,t} * {}_5S_{x,t} * (1 + {}_5M_{x,t}) \quad (6)$$

where, x = 0,5, 10,… and t = =0,5,10,…

${}_5P_{x,t+5}$ is the projected population of 5-year age interval x (by sex), in the projection year t+5;

${}_5P_{x,t}$ is the population of 5-year age interval x (by sex), in year t;

${}_5S_{x,t}$ is the survival rate for persons in the 5-year age interval x (by sex) for the 5-year time interval t;

${}_5M_{x,t}$ is the net-migration rate for persons in the 5-year age interval x (by sex) for the 5-year time interval t.

Projecting Population Aged 80+ Years Old

$${}_\infty P_{80,t+5} = ({}_5P_{75,t} + {}_\infty P_{80,t})* {}_{80}S_{75,t} * (1 + \infty M_{80,t})$$

(7)

where,

${}_\infty P_{80,t}$ is the projected population in ages 80 and above (by sex) in the projection year t+5;

$_5P_{75,t}$ and $_\infty P_{80,t}$ are the total populations in ages 75-79 and 80 and above (by sex) in year t;

$_{80}S_{75,t}$ is the survival rate for age group 80 plus surviving to 80 and above in the 5-year time interval t (by sex);

$\infty M_{80,t}$ is the total net migration rate for persons in ages 80 and above (by sex) in the 5-year time interval t.

Standard Error of the Mean of the Projected Populations

Consider the three projection results (high, medium and low variants) for each projection year as a random sample of three variables x_1, x_2, and x_3 drawn from a normal population with mean μ and standard deviation σ. Then the mean ($\bar{x}$) of the projected populations is given by:

$$\bar{x} = \frac{x_1 + x_2 + x_3}{3} \quad (8)$$

The standard error of the mean ($SE_{\bar{x}}$) of the projected populations $= \frac{S}{\sqrt{n}}$ (9)

where n =3 and $S = \sqrt{\frac{(x_1 - \bar{x})^2 + (x_2 - \bar{x})^2 + (x_3 - \bar{x})^2}{n-1}}$ (10)

and the margin of error which is the statistic expressing the amount of random sampling error in the results is defined as $MOE = t^* \frac{S}{\sqrt{n}}$ (11)

where t* is the value for the t(n-1) density curve with area C between –t* and t*.

The confidence interval for the population mean μ will then be set as:

$$\bar{x} \pm t^* \frac{S}{\sqrt{n}} \quad (12)$$

Thus, for t(2) and at 95 per cent confidence, t* =4.303, and the confidence interval will be given by : $\bar{x} \pm (4.303)\frac{s}{\sqrt{n}}$.

By plotting the relative error (defined as the margin of error as a percentage of the projected mean value for each projection year), the accuracy of the projection results can be evaluated.

Results

The results presented here represent the mean of the outcomes of three projection variants for each projection year, and covering the period 2015-2035. The associated standard error (SE) of each projected demographic index is also provided.

The results in Table 3 indicate that during the projection period Nigeria's TFR would decline by 18.8 per cent , from 5.42 in 2015 to 4.40 (with a SE of 0.35) in 2035. Infant mortality rate is projected to decline from 75.9 to 59.9 infant deaths per thousand live births between 2015 and 2035, which is equivalent to a 21 per cent reduction during the period.

Life expectancy at birth for males and females respectively, are projected to improve during the projection period. Male life expectancy at birth would increase from 55.53 years from 2015 to 59.5 years (SE = 0.28) by 2035, a 7.1 per cent improvement during the period. Life expectancy at birth for females would similarly increase 7.1 per cent during the same period from 59.40 years in 2015 to 63.63 years (SE =0.32) by 2035.

The projected changes in fertility and mortality among others are likely to translate to a modest 14.1 per cent reduction in the annual population growth rate from 2.81 per cent to 2.41 per cent during the twenty year period 2015-2035. Notwithstanding the reduction in the annual growth rate, the net reproduction rate (NRR) of 1.83 estimated for 2035 implies that the population of Nigeria has potential to over-replace itself beyond 2035.

Consequently, Nigeria's population is projected to increase by 66 per cent from 186 million in 2015 to 309 million by 2035(Table 4). The population under age 15 as a percentage of the total would decrease from 43.9 per cent in 2015 to 39.7 per cent by 2035.

With respect to young persons in ages 15-24, the corresponding percentage share would increase from 18.3 per cent in 2015 to 19.8 per cent by 2035. In absolute terms, the population of persons under age 15 would increase by 50 per cent, from 81.83 million in 2015 to 122.71 million by 2035. Correspondingly, the population of young persons in ages 15-24 would increase from 34.13 million in 2015 to about 61.4 million by 2035.

The school-going age population (6-24 years) would likely increase by 66.8 per cent from 77.31 million to 128.97 million between 2015 and 2035. This would require enormous investment in education to achieve the educational goal of the SDG Agenda.

The working-age population (15-59 years) is likely to increase from 96.54 million to 168.94 million, this would imply a 75.0 per cent increase between 2015 and 2035. These projected tremendous increases in Nigeria's population would present enormous developmental opportunities and challenges.

Table 3: Projected TFR, Population Growth Rate(GR), Net Reproduction Rate(NRR), Expectation of Life at Birth(e^0),Infant Mortality Rate (IMR), Standard Error(SE) , and 95% Confidence Intervals by Year, Nigeria: 2015-2035

A		Standard	95% Confidence Interval	
Year	TFR	Error(SE)	Lower Limit	Upper Limit
2015	5.42	0.29	4.18	6.66
2020	5.22	0.29	3.98	6.46
2025	4.97	0.29	3.73	6.21
2030	4.72	0.29	3.48	5.96
2035	4.40	0.35	2.91	5.90
B		**Standard**	**95% Confidence Interval**	
Year	**GR**	**Error(SE)**	**Lower Limit**	**Upper Limit**
2015	2.81	0.16	2.13	3.49
2020	2.61	0.14	2.03	3.19
2025	2.50	0.14	1.91	3.10
2030	2.49	0.16	1.79	3.20
2035	2.41	0.20	1.57	3.26
C		**Standard**	**95% Confidence Interval**	
Year	**NRR**	**Error(SE)**	**Lower Limit**	**Upper Limit**
2015	2.13	0.12	1.60	2.67
2020	2.08	0.12	1.55	2.62
2025	2.01	0.12	1.49	2.53
2030	1.93	0.12	1.40	2.47
2035	1.83	0.15	1.19	2.46
D#		**Standard**	**95% Confidence Interval**	
Year	**e^0**	**Error(SE)**	**Lower Limit**	**Upper Limit**
2015	55.53 (59.40)	0.31 (0.29)	54.16 (58.16)	56.90 (60.64)
2020	56.56 (60.47)	0.26 (0.26)	55.44 (59.35)	57.68 (61.59)
2025	57.50 (61.50)	0.28 (0.29)	56.25 (60.26)	58.74 (62.74)
2030	58.50 (62.69)	0.28 (0.29)	57.25 (61.36)	59.74 (63.84)
2035	59.50 (63.63)	0.28 (0.32)	58.25 (62.27)	60.74 (65.00)
E		**Standard**	**95% Confidence Interval**	
Year	**IMR**	**Error(SE)**	**Lower Limit**	**Upper Limit**
2015	75.90	1.21	70.68	81.12
2020	71.70	1.10	66.98	76.42
2025	67.80	1.10	63.08	72.52
2030	63.80	1.10	59.08	68.52
2035	59.90	1.10	55.18	64.62

Derived from Projection outputs.

#: Figures in brackets in Panel D relate to expectation of at birth for females, those not in bracket are for males

Table 4 : Special and School-Going Populations (Thousands) by Age and Sex, Nigeria, 2015- 2035

	2015		2016		2017		2018		2019		2020		2021	
Age	Male	Female	Male	Female	Male	Female	Male	Female	Male	Female	Male	Female	Male	Female
Special Age Groups														
0	3,280	3,074	3,363	3,140	3,463	3,222	3,584	3,324	3,728	3,451	3,879	3,585	3,937	3,642
1–4	13,487	12,587	13,629	12,726	13,756	12,845	13,876	12,952	13,983	13,066	14,081	13,164	14,293	13,355
0–14	42,086	39,747	43,221	40,780	44,399	41,838	45,628	42,928	46,880	44,099	48,191	45,300	48,971	46,029
15-24	17,644	16,487	18,163	17,068	18,645	17,610	19,088	18,104	19,432	18,603	19,742	19,037	20,616	19,917
15-49	42,480	44,370	43,660	45,616	44,835	46,793	46,005	47,901	47,027	49,095	48,063	50,230	49,714	51,821
15-59	47,612	48,923	48,936	50,402	50,245	51,819	51,541	53,174	52,684	54,626	53,841	56,025	55,615	57,883
15-64	49,227	50,250	50,628	51,809	52,021	53,316	53,407	54,766	54,636	56,316	55,875	57,810	57,725	59,761
60+	4,323	3,617	4,464	3,759	4,621	3,918	4,792	4,094	4,971	4,284	5,159	4,486	5,354	4,699
65+	2,708	2,289	2,773	2,351	2,845	2,422	2,926	2,502	3,019	2,594	3,125	2,700	3,244	2,821
6	3,157	2,953	3,183	2,987	3,198	3,006	3,199	3,011	3,183	3,004	3,162	2,990	3,215	3,035
6–24	39,475	37,350	40,934	38,764	42,431	40,203	43,957	41,653	45,432	43,182	46,954	44,709	48,255	46,005
17+	47,896	48,724	49,247	50,204	50,635	51,677	52,058	53,141	53,374	54,744	54,731	56,334	56,384	58,158
All Ages	94,022	92,287	96,621	94,941	99,265	97,575	101,961	100,196	104,535	103,009	107,192	105,811	109,940	108,611
School Going Ages														
6	3,213	3,045	3,183	2,987	3,198	3,006	3,199	3,011	3,183	3,004	3,162	2,990	3,215	3,035
7	2,918	2,790	2,949	2,787	3,021	2,851	3,093	2,914	3,163	2,978	3,237	3,045	3,272	3,079
8	2,675	2,575	2,751	2,615	2,863	2,711	2,985	2,815	3,114	2,929	3,253	3,053	3,279	3,082
9	2,478	2,397	2,585	2,469	2,722	2,585	2,874	2,715	3,039	2,860	3,218	3,018	3,243	3,048
10	2,183	2,133	2,356	2,258	2,569	2,430	2,818	2,640	3,101	2,885	3,414	3,161	3,382	3,157
11	2,170	2,108	2,313	2,220	2,478	2,361	2,665	2,521	2,869	2,703	3,092	2,900	3,118	2,934
12	2,147	2,073	2,265	2,175	2,392	2,289	2,528	2,411	2,670	2,542	2,822	2,678	2,892	2,742
6–12	17,784	17,121	18,401	17,511	19,243	18,233	20,162	19,027	21,139	19,901	22,198	20,846	22,403	21,077
13	2,115	2,029	2,213	2,122	2,310	2,217	2,407	2,308	2,501	2,400	2,598	2,491	2,699	2,576
14	2,075	1,979	2,157	2,063	2,232	2,143	2,300	2,213	2,359	2,277	2,416	2,335	2,537	2,435
15	2,055	1,954	2,113	2,018	2,148	2,066	2,163	2,093	2,158	2,105	2,143	2,100	2,317	2,230
16	1,983	1,871	2,041	1,939	2,083	1,994	2,112	2,034	2,123	2,062	2,126	2,076	2,268	2,193
17	1,914	1,795	1,971	1,862	2,019	1,923	2,057	1,971	2,082	2,013	2,099	2,043	2,216	2,148
13-17	10,142	9,629	10,494	10,004	10,792	10,342	11,039	10,619	11,223	10,857	11,383	11,045	12,036	11,583
18	1,848	1,725	1,904	1,789	1,955	1,852	2,001	1,907	2,035	1,958	2,064	2,000	2,160	2,096
19	1,784	1,661	1,839	1,720	1,892	1,783	1,943	1,841	1,984	1,900	2,021	1,951	2,101	2,038
20	1,723	1,669	1,778	1,727	1,837	1,782	1,898	1,829	1,950	1,878	1,998	1,927	2,053	1,994
21	1,665	1,567	1,716	1,613	1,770	1,669	1,826	1,724	1,876	1,785	1,925	1,844	1,979	1,915
22	1,609	1,491	1,657	1,525	1,707	1,578	1,759	1,636	1,806	1,703	1,854	1,767	1,909	1,839
23	1,555	1,437	1,600	1,460	1,646	1,507	1,695	1,564	1,740	1,631	1,787	1,697	1,840	1,766
24	1,503	1,402	1,545	1,414	1,589	1,455	1,635	1,506	1,677	1,569	1,723	1,632	1,775	1,698
18-24	11,686	10,952	12,039	11,249	12,395	11,627	12,755	12,006	13,069	12,424	13,373	12,818	13,816	13,345
6–24	39,612	37,702	40,934	38,764	42,431	40,203	43,957	41,653	45,432	43,182	46,954	44,709	48,255	46,005

Table 4 : Special and School-Going Populations (Thousands) by Age and Sex, Nigeria, 2021- 2035 (Continued)

	2022		2023		2024		2025		2026		2027		2028	
Age	Male	Female	Male	Female	Male	Female	Male	Female	Male	Female	Male	Female	Male	Female
Special Age Groups														
0	4,004	3,706	4,071	3,768	4,133	3,829	4,204	3,898	4,295	3,983	4,386	4,066	4,481	4,154
1–4	14,535	13,569	17,073	15,908	15,087	14,067	15,386	14,345	15,689	14,624	16,016	14,924	16,365	15,242
0–14	49,775	46,760	50,602	47,490	51,412	48,251	52,252	49,028	53,138	49,837	54,088	50,698	55,105	51,615
15-24	21,512	20,785	22,427	21,638	23,281	22,505	24,166	23,370	25,042	24,168	25,978	25,002	26,965	25,870
15-49	51,436	53,405	53,226	54,971	54,869	56,576	56,579	58,164	58,344	59,730	60,162	61,275	62,028	62,801
15-59	57,463	59,738	59,386	61,587	61,171	63,501	63,040	65,430	64,987	67,365	67,004	69,303	69,087	71,242
15-64	59,645	61,708	61,634	63,650	63,480	65,663	65,406	67,699	67,404	69,752	69,469	71,816	71,598	73,888
60+	5,555	4,925	5,761	5,164	5,968	5,420	6,173	5,694	6,379	5,986	6,584	6,297	6,791	6,624
65+	3,374	2,955	3,513	3,102	3,658	3,259	3,808	3,425	3,962	3,599	4,119	3,783	4,279	3,978
6	3,274	3,085	3,342	3,141	3,417	3,209	3,493	3,277	3,549	3,329	3,614	3,388	3,684	3,451
6–24	49,547	47,246	60,482	57,355	52,010	49,614	53,216	50,777	54,527	51,965	55,927	53,214	57,418	54,530
17+	58,057	59,931	59,751	61,655	61,269	63,406	62,821	65,143	64,977	67,341	67,243	69,607	69,617	71,936
All Ages	112,794	111,422	115,749	114,241	118,550	117,173	121,466	120,151	124,503	123,188	127,676	126,297	130,982	129,481
School Going Ages														
6	3,274	3,085	3,342	3,141	3,417	3,209	3,493	3,277	3,549	3,329	3,614	3,388	3,684	3,451
7	3,305	3,110	3,337	3,138	3,368	3,168	3,397	3,194	3,451	3,243	3,513	3,298	3,581	3,359
8	3,298	3,102	3,311	3,115	3,317	3,124	3,319	3,127	3,371	3,172	3,429	3,224	3,495	3,282
9	3,259	3,067	3,266	3,076	3,264	3,076	3,256	3,072	3,305	3,115	3,360	3,162	3,421	3,217
10	3,318	3,119	3,223	3,047	3,097	2,945	2,953	2,822	3,034	2,886	3,131	2,966	3,248	3,066
11	3,132	2,954	3,133	2,959	3,119	2,951	3,099	2,937	3,152	2,982	3,210	3,032	3,276	3,090
12	2,963	2,805	3,035	2,868	3,104	2,930	3,177	2,996	3,212	3,030	3,246	3,061	3,278	3,090
6–12	22,551	21,241	22,647	21,344	22,686	21,403	22,695	21,426	23,076	21,757	23,503	22,131	23,983	22,556
13	2,811	2,671	2,932	2,774	3,058	2,885	3,195	3,007	3,222	3,036	3,242	3,057	3,257	3,071
14	2,673	2,549	2,825	2,678	2,985	2,820	3,161	2,975	3,186	3,004	3,204	3,024	3,214	3,034
15	2,529	2,400	2,777	2,607	3,052	2,848	3,358	3,119	3,328	3,115	3,268	3,078	3,179	3,009
16	2,433	2,331	2,619	2,489	2,817	2,667	3,035	2,861	3,061	2,894	3,077	2,914	3,081	2,921
17	2,342	2,261	2,478	2,379	2,615	2,507	2,763	2,641	2,832	2,703	2,904	2,766	2,977	2,829
13-17	12,788	12,212	13,632	12,927	14,528	13,726	15,511	14,603	15,629	14,753	15,695	14,839	15,708	14,864
18	2,256	2,188	2,353	2,277	2,444	2,366	2,538	2,455	2,637	2,538	2,748	2,632	2,869	2,735
19	2,174	2,115	2,243	2,182	2,299	2,244	2,354	2,299	2,472	2,398	2,607	2,511	2,758	2,638
20	2,087	2,039	2,103	2,064	2,097	2,073	2,081	2,067	2,251	2,195	2,459	2,363	2,704	2,568
21	2,021	1,968	2,049	2,004	2,059	2,029	2,061	2,042	2,200	2,157	2,362	2,293	2,545	2,450
22	1,955	1,897	1,993	1,943	2,015	1,980	2,032	2,007	2,146	2,110	2,270	2,221	2,404	2,340
23	1,890	1,827	1,935	1,879	1,967	1,925	1,995	1,964	2,088	2,057	2,183	2,148	2,278	2,238
24	1,826	1,758	1,876	1,814	1,915	1,867	1,951	1,914	2,028	1,999	2,100	2,075	2,168	2,143
18-24	14,209	13,793	14,553	14,162	14,796	14,484	15,010	14,749	15,821	15,455	16,728	16,244	17,727	17,111
6–24	49,547	47,246	50,832	48,434	52,010	49,614	53,216	50,777	54,527	51,965	55,927	53,214	57,418	54,530

Table 4 : Special and School-Going Populations (Thousands) by Age and Sex, Nigeria, 2021- 2035 (Continued)

	2029		2030		2031		2032		2033		2034		2035	
Age	Male	Female	Male	Female	Male	Female	Male	Female	Male	Female	Male	Female	Male	Female
Special Age Groups														
0	4,573	4,241	4,666	4,327	4,763	4,417	4,863	4,509	4,963	4,601	5,062	4,690	5,151	4,772
1–4	16,708	15,565	17,073	15,908	17,453	16,262	17,841	16,622	18,241	16,988	18,635	17,349	19,014	17,699
0–14	56,137	52,576	57,215	53,578	58,354	54,632	59,560	55,742	60,828	56,903	62,119	58,086	63,425	59,287
15-24	27,916	26,755	28,942	27,699	29,448	28,174	29,952	28,628	30,461	29,070	30,963	29,506	31,462	29,938
15-49	63,739	64,297	65,527	65,832	67,369	67,365	69,262	68,902	71,212	70,466	73,185	72,081	75,181	73,765
15-59	71,018	73,164	73,034	75,134	75,111	77,111	77,246	79,094	79,444	81,081	81,665	83,063	83,909	85,036
15-64	73,578	75,943	75,648	78,043	77,785	80,144	79,984	82,248	82,254	84,363	84,555	86,494	86,890	88,645
60+	6,997	6,964	7,208	7,315	7,421	7,675	7,639	8,047	7,864	8,438	8,099	8,859	8,347	9,317
65+	4,437	4,185	4,593	4,406	4,748	4,642	4,901	4,893	5,054	5,156	5,209	5,428	5,365	5,708
6	3,753	3,516	3,829	3,588	3,914	3,666	4,000	3,746	4,092	3,831	4,184	3,915	4,279	4,002
6–24	58,905	55,907	60,482	57,355	61,559	58,355	62,691	59,386	63,873	60,444	65,079	61,526	66,322	62,643
17+	71,895	74,306	74,282	76,760	76,916	79,433	78,636	81,213	80,873	83,435	83,111	85,649	85,379	87,883
All Age	134,152	132,704	137,457	136,027	140,887	139,418	144,445	142,883	148,137	146,422	151,883	150,008	155,681	153,640
School Going Ages														
6	3,753	3,516	3,829	3,588	3,914	3,666	4,000	3,746	4,092	3,831	4,184	3,915	4,279	4,002
7	3,655	3,427	3,732	3,499	3,810	3,571	3,893	3,648	3,981	3,729	4,070	3,812	4,164	3,898
8	3,567	3,348	3,643	3,418	3,715	3,484	3,794	3,557	3,878	3,635	3,964	3,715	4,056	3,800
9	3,491	3,279	3,562	3,344	3,628	3,406	3,703	3,474	3,782	3,548	3,864	3,624	3,953	3,706
10	3,389	3,189	3,537	3,320	3,595	3,376	3,661	3,438	3,726	3,501	3,790	3,562	3,862	3,630
11	3,352	3,157	3,429	3,225	3,485	3,278	3,549	3,337	3,617	3,400	3,688	3,466	3,766	3,537
12	3,310	3,120	3,339	3,148	3,393	3,197	3,455	3,252	3,523	3,313	3,598	3,381	3,676	3,453
6–12	24,517	23,037	25,072	23,541	25,541	23,977	26,055	24,454	26,600	24,957	27,159	25,474	27,755	26,026
13	3,263	3,080	3,265	3,084	3,317	3,130	3,376	3,182	3,442	3,240	3,516	3,306	3,592	3,375
14	3,210	3,035	3,204	3,032	3,253	3,075	3,308	3,123	3,371	3,177	3,442	3,240	3,513	3,304
15	3,054	2,909	2,912	2,789	2,993	2,853	3,091	2,932	3,208	3,032	3,349	3,154	3,495	3,282
16	3,066	2,913	3,047	2,900	3,100	2,945	3,159	2,995	3,227	3,053	3,304	3,120	3,382	3,188
17	3,044	2,891	3,116	2,957	3,152	2,991	3,186	3,022	3,221	3,052	3,256	3,082	3,288	3,110
13-17	15,637	14,828	15,544	14,762	15,815	14,993	16,119	15,253	16,468	15,553	16,866	15,901	17,269	16,258
18	2,992	2,844	3,126	2,965	3,154	2,994	3,175	3,016	3,192	3,031	3,203	3,040	3,210	3,045
19	2,915	2,778	3,087	2,932	3,113	2,961	3,132	2,981	3,144	2,992	3,146	2,994	3,144	2,991
20	2,974	2,805	3,274	3,072	3,245	3,069	3,189	3,034	3,104	2,967	2,989	2,869	2,856	2,752
21	2,740	2,624	2,954	2,816	2,981	2,850	2,998	2,870	3,003	2,877	2,996	2,871	2,982	2,858
22	2,539	2,464	2,685	2,597	2,754	2,660	2,825	2,722	2,898	2,785	2,969	2,846	3,045	2,911
23	2,368	2,325	2,461	2,412	2,560	2,496	2,669	2,588	2,788	2,690	2,915	2,799	3,051	2,917
24	2,224	2,203	2,279	2,258	2,396	2,355	2,528	2,467	2,676	2,593	2,836	2,731	3,009	2,883
18-24	18,752	18,043	19,866	19,053	20,203	19,385	20,516	19,679	20,805	19,934	21,054	20,151	21,297	20,359
6–24	58,905	55,907	60,482	57,355	61,559	58,355	62,691	59,386	63,873	60,444	65,079	61,526	66,322	62,643

Derived from Projection Outputs

Accuracy of the Projection Results

The accuracy of projection results is fundamental to their reliability and usefulness. Therefore, the standard errors associated with the projected demographic indices are provided.

Figure 1, provides an evaluation of the associated margin of error as a percentage of the projected population for each year. It shows that relative error increases the further into the future projection goes. The associated error for each projection year is higher for females than for males. It ranged from 4.9 per cent in 2015 to 17.9 per cent in 2035 for the male population estimates, and from 5.1 per cent in 2015 to 19.1 per cent in 2035 for the female population estimates.

Evidence indicates that short-range (less than 10 years) to middle-range (10-25 years) projection results are accurate enough for economic analysis, as well as planning for educational and medical facilities and services. Long-range projections tend to be associated with large margin of error. Often, projections are revised to improve their accuracy as additional data for more recent periods and perhaps also more refined data for earlier years become available.

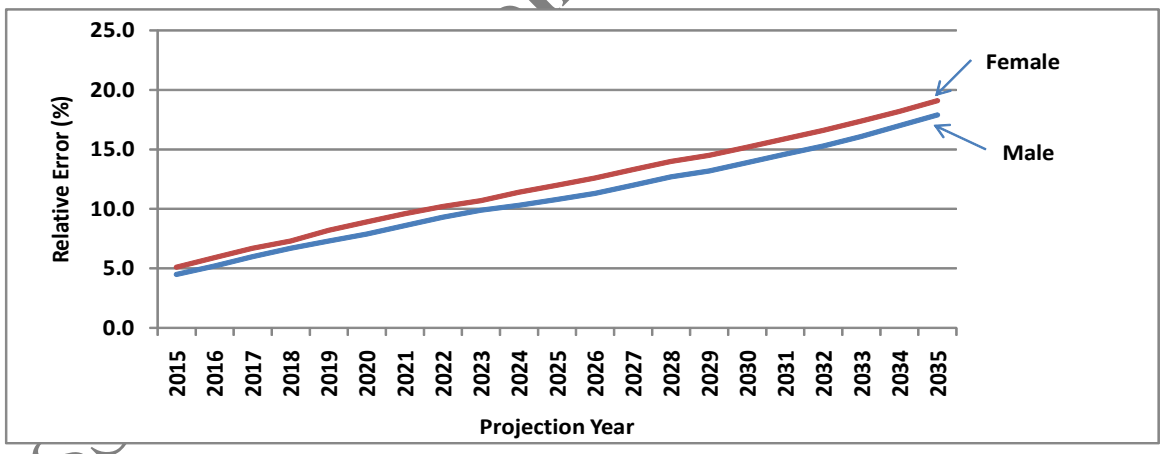

Figure 1: Margin of Error as a Percentage of the Projected Mean Population by Sex, Nigeria: 2015-2035

DISCUSSION AND CONCLUSION

The changing size and structure of Nigeria's population, as well as the trends in the drivers of the population change have been analyzed. Evidence suggests potential improvements in the dynamics of population change. The projected modest decline in fertility rate and improvements in mortality indicators (IMR and e^0) during the projection period (2015 – 2035), reflected in reduction of the annual growth rate of the population. Consequently, by 2035 the doubling time of Nigeria's population would likely increase to 28.8 years from 24.7 years as at 2015.

Notwithstanding the observed decline in the annual growth rate, evidence (NRR=1.8) indicates that Nigeria's population would still be over-replacing itself well beyond 2035. Consequently, the population would increase by 66 per cent, in just 20 years, between 2015) and 2035.

Apart from the large and growing size of the population, the age structure reveals a rapidly increasing number of young persons (15-24) and the working-age population (15-64). This portends a serious challenge to Nigeria's developmental efforts, more so with the rising unemployment rate, especially among the youth (15-24) reported by Nigeria National Bureau of Statistics (NBS 2020). High rate of youth unemployment breeds restiveness, violence, and criminality, which have continued to breach the peace and security of the country. The government of Nigeria can curb the rising youth unemployment and the associated negative consequences by deliberate investments in education, health, entrepreneurship development, establishment of effective skill acquisition centres, agriculture, and reviving weak industries (Onah and Okwuosa 2016). Such investments would produce a healthy workforce that is skilled, with opportunities to productively engage in economic activities to drive economic growth and deliver the *potential demographic dividend* the youth bulge represents.

The disaggregation of projected population into special population groups provides requisite denominators to support calculation of appropriate indicators for effective tracking of progress towards achievement of the SDGs.

Of relevance also is the provision of the standard error associated with each demographic indices generated in this paper to guide users of the data. By quantifying the errors associated with the projection results; the usefulness of the projection outputs is enhanced.

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