

# Population Dynamics and Population Projections for Lesotho 2016-2036

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## Introduction

- Population dynamics are population processes resulting in population change.
  - Population processes are the ingredients in population projections.
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## Population Projections

- The multilingual demographic dictionary defines population projections as calculations which show the future development of a population when certain assumptions are made about the future course of population change, usually with respect to fertility, mortality and migration.
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## Need for Population Projections

Because censuses are undertaken every 5 or 10 years depending on the country, population projections are undertaken before the next census:

- To aid planning in different sectors of the economy;
- To provide denominators for computing different rates;

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- To provide population universe in different geographical hierarchies for sampling and weighting (Udjo 2019).



## Drivers of Population Change

- Drivers of population change, or population dynamics better understood by reference to the basic demographic equation:

$$P_{(t+n)} = P_t + B_{(t+n)} - D_{(t+n)} + I_{(t+n)} - E_{(t+n)} \quad \dots\dots\dots(1)$$

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## Drivers of Population Change

$P_{(t+n)}$  is the population at a specified future date

$P_{(t)}$  is the population at a base period.

$B_{(t+n)}$  is the no of births occurring between the base period & specified future date

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$D_{(t+n)}$  is the no of deaths occurring between the base period & specified future date

$I_{(t+n)}$  is the no of immigrants into the population between the base period & specified future date.

$E_{(t+n)}$  is the no emigrants from the population between the base period & specified future date.



## Drivers of Population Change

Equation 1 may be re-written as

$$P_{(t+n)} - P_t = B_{(t+n)} - D_{(t+n)} + I_{(t+n)} - E_{(t+n)} \dots\dots\dots(2)$$

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The term in the left side of equation (2) is population change.



## Drivers of Population Change

- We see from equation 2 that the drivers of population change are fertility, mortality and migration. Equation 2 can be further re-written as

$$P_{(t+n)} - P_t = NI_{(t+n)} - NM_{(t+n)} \dots\dots\dots(3)$$

- The first term on the right side of the equation is natural increase (the difference between births and deaths while the second term is net migration (the difference between immigration and emigration).
- The relative importance of each these two terms in driving population change differs from one country to the other and especially comparing the more and less developed countries.



## Data Requirements in Population Projections

- Fertility, mortality and migration data
- The data come from different sources which include censuses, vital registration and sample surveys.
- There would usually be errors in the data sources, thus, need to be evaluated and corrected before they are used as inputs in population projections.



## Sources and Quality of Data in Analysing Population Change

### Censuses

- Typical errors are coverage and content errors.
- Coverage errors can be estimated using a Post Enumeration Survey. It would appear Lesotho has not had a PES in its censuses, thus the extent of coverage in its censuses is undetermined.
- Content errors relate to the characteristics of persons enumerated in the census. For example, when asked about biological children ever born, a woman may report adopted children as biological children. An enumerated biological father may be reported dead when in fact he is alive.



## Sources and Quality of Data in Analysing Population Change

### Vital Registration

- Typical errors relate to completeness of registration in general, late registration in the case of births, mis-classification of immediate and underlying causes of death in the case of deaths.

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### Sample Surveys.

- Typical errors are sampling and content errors. The former can be handled using appropriate statistical methods, but content errors are a bigger challenge in sample surveys.
- Non-conventional sources of data include for example, hospital records. Major problem with such sources is generalisability.



## Approach in the Lesotho Population Projections

- The cohort component method for the national population projections
  - The ratio method for the district population projections (results not provided in this presentation).
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## Incorporating HIV/AIDS in the projections

- The INDEPTH life table.
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## Historical Trends in Drivers of Population Change in Lesotho

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## Drivers of Population Change in Lesotho

### Fertility Trend in Lesotho





## Historical Trends in Drivers of Population Change in Lesotho

### Fertility Trend in Lesotho

- According to census figures as seen from the above graph, total fertility rate (TFR) declined from 5.4 in 1976 to 3.2 in 2016. It appears from the figures that Lesotho experienced the largest decline in TFR during the period 1986 and 1996. Currently, women in Lesotho expect to have on average about 3 children by the age of 50 years.
- The next graph puts TFR in Lesotho in a global context.



## Drivers of Population Change in Lesotho in a Global Context

### Total Fertility Rates in Selected Regions 2010-2015 (Lesotho\* 2016)





## **Drivers of Population Change in Lesotho in a Global Context**

### **Fertility Trend in Selected Regions**

- The graph indicates that TFR in Lesotho in 2016 was lower than the average TFR for Africa during the period 2010-15 and less than half the TFR for Niger in 2010-2015. (Figures from the selected regions are from the UN World Population Prospects, 2015 revision).
- Furthermore from the graph, TFR in Lesotho in 2016 was more than twice the level of TFR in Mauritius as well as almost twice the level in the more developed countries in 2010-2015.



## Drivers of Population Change in Lesotho in a Global Context

**Mortality Trend in Lesotho:** Life expectancy at birth,  $e_0$  and infant mortality rate,  ${}_1q_0$ .





## Drivers of Population Change in Lesotho in a Global Context

**Mortality Trend in Lesotho:** Life expectancy at birth,  $e_0$  and infant mortality rate,  ${}_1q_0$ .

- The graph suggests that life expectancy at birth declined from about 52 years (both sexes combined) in 1976 to about 40 years (both sexes) in 2006. Official figures suggest that in 2016, life expectancy at birth (both sexes) was about 56 years (both) sexes.
- The estimates of life expectancy at birth and infant mortality rates for 2006 are inconsistent: either infant mortality rate was under estimated or life expectancy at birth was underestimated i.e. exaggeration of the impact of AIDS related death on life expectancy at birth.



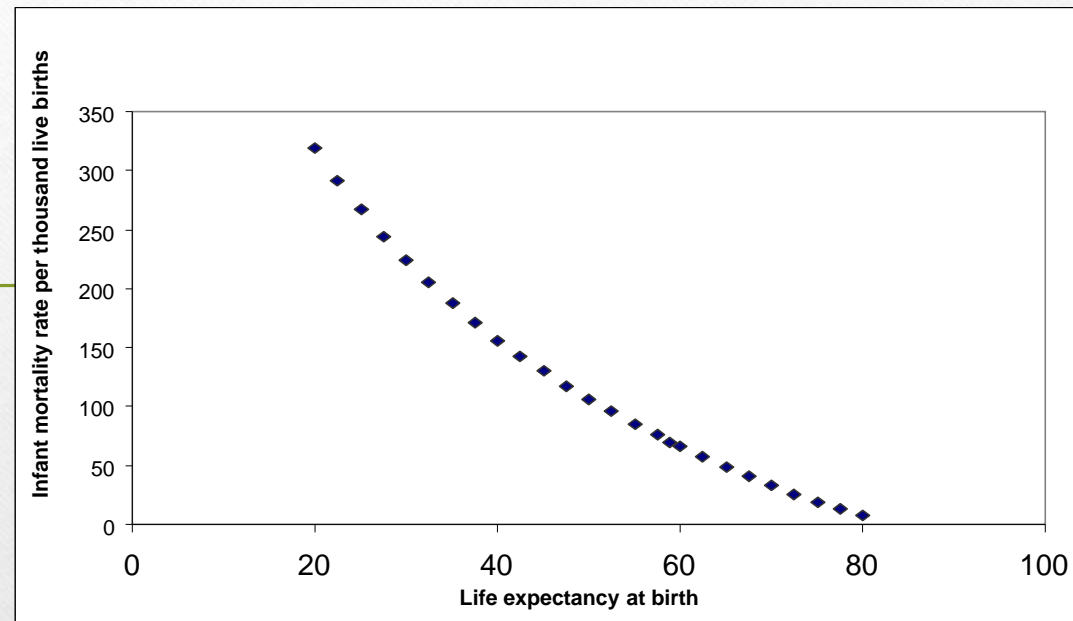
## Drivers of Population Change in Lesotho in a Global Context

**Mortality Trend in Lesotho:** Life expectancy at birth,  $e_0$  and infant mortality rate,  ${}_1q_0$ .

- That the 2006 estimates of life expectancy at birth & infant mortality rate are inconsistent stems from the fact that there is a relationship between infant mortality rate and life expectancy as illustrated from the following model life table graph. (Source: Udjo 2008: Current HIV Research 6, 143-151).

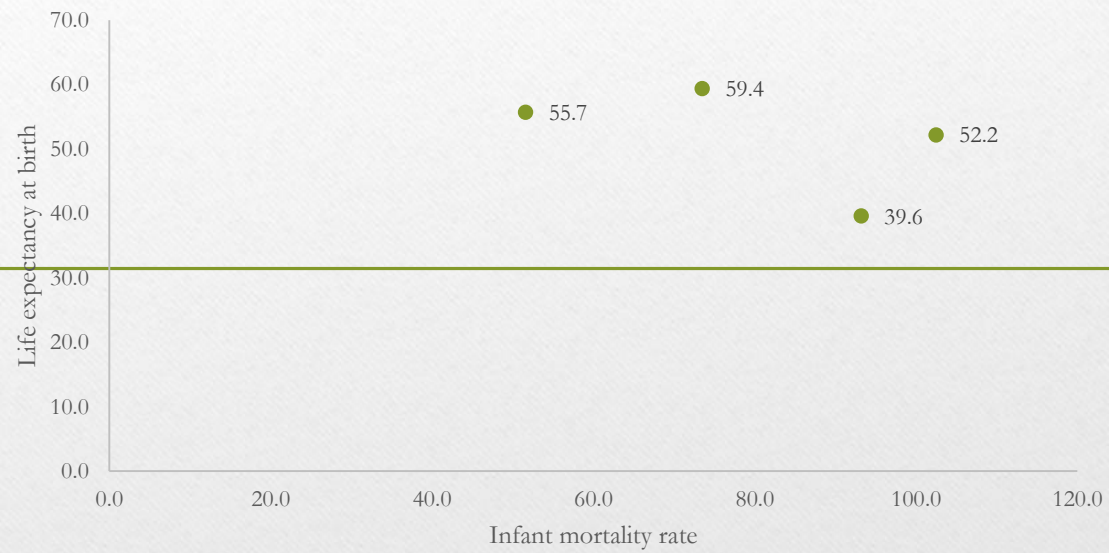


## Relationship of Infant mortality & Life expectancy at birth





## Relationship of Infant mortality & Life expectancy at birth in Lesotho





## Drivers of Population Change in Lesotho

### Migration:

- Net migration usually the most problematic to estimate in population projections due to lack of data.
- In the Lesotho projections, net migration was indirectly estimated by projecting natural increase and comparing with 2016 census population size, the difference is then attributable to net migration.
- By this approach, annual volume of net migration between 2006 and 2016: was estimated as -5,697 males, -6,329 females.



### **The Medium Variant Assumptions in the Projections.**

- **Fertility:** Total fertility rate was projected to decline from **3.2** in **2016** to **2.7** in **2026** and remain at **2.7** till **2036**.
- **Mortality:** Life expectancy at birth was projected to increase from **51.8** years for males and **59.6** years for females in **2016**, to **59** years for males and **66.1** years for females in **2036**.
- **Net migration:** Annual net migration was projected to be -5,697 males and -6,329 females for each of the projection years.



### **The Medium Variant Assumptions in the Projections.**

- The assumptions were developed by fitting and extrapolating historical and current levels of the drivers of population change outlined above using appropriate mathematical curve fitting procedures.
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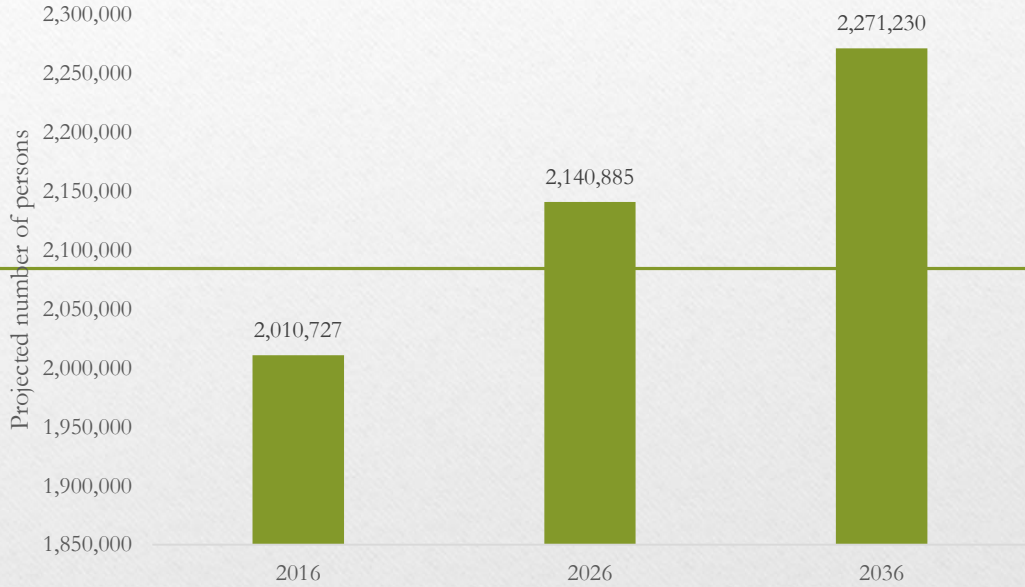


## Projection Results – Medium Variant

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# Projected National Population





## Projected National Population

- If the assumptions about population processes in the medium variant hold, the population of Lesotho could increase from about 2.0 million in 2016 to about 2.3 million in 2036.
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- Projected population for Lesotho at mid-2019 was 2,050,424.



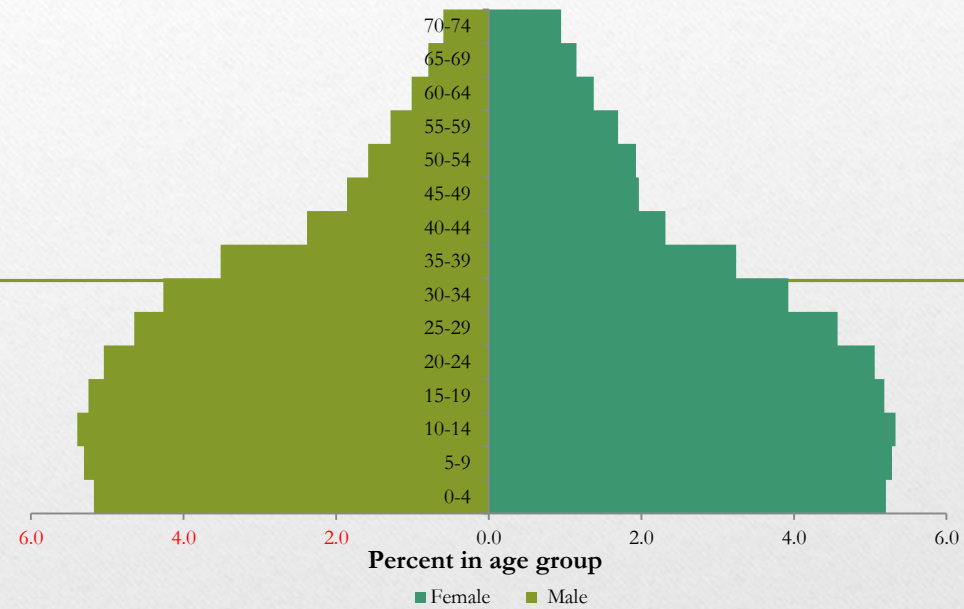
## Projected Changing Age Structure

The effect of declining fertility and improvement in mortality on the age structure is summarized in the following graphs and indicate the following:

- The base of the population pyramid is projected to get gradually narrower decreasing from about 10.4% of the total population in 2016 to about 9.4% of the projected population in 2036.
- A gradual transition from a bell-shaped population pyramid in 2016 to an increasing bee-hive shaped population pyramid by 2036.
- The structural change in the shape of the population pyramid is characteristic of populations undergoing demographic transition i.e. the transition from high to low fertility and mortality.

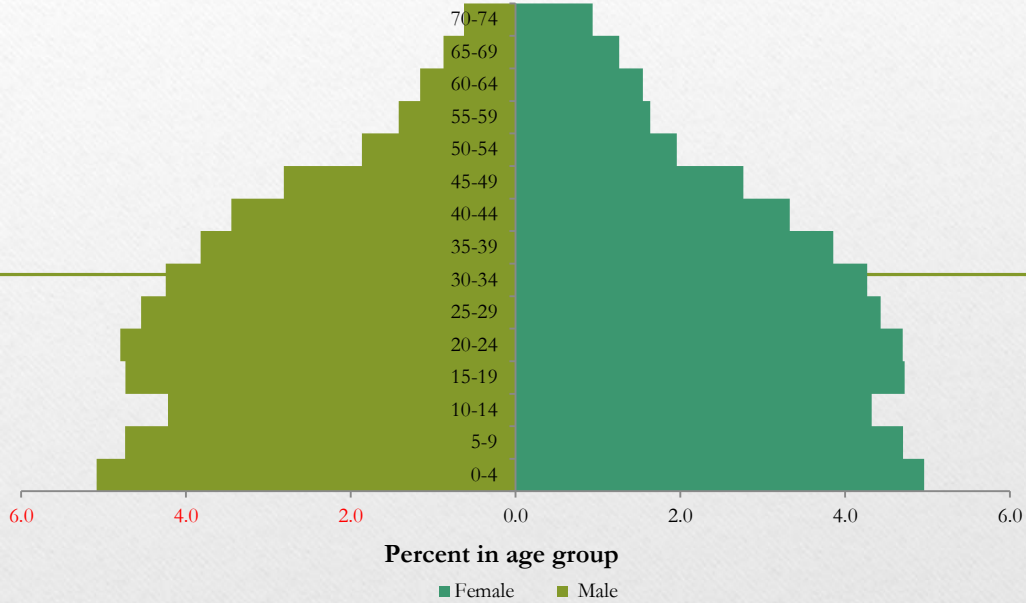


## Base Year Population Pyramid



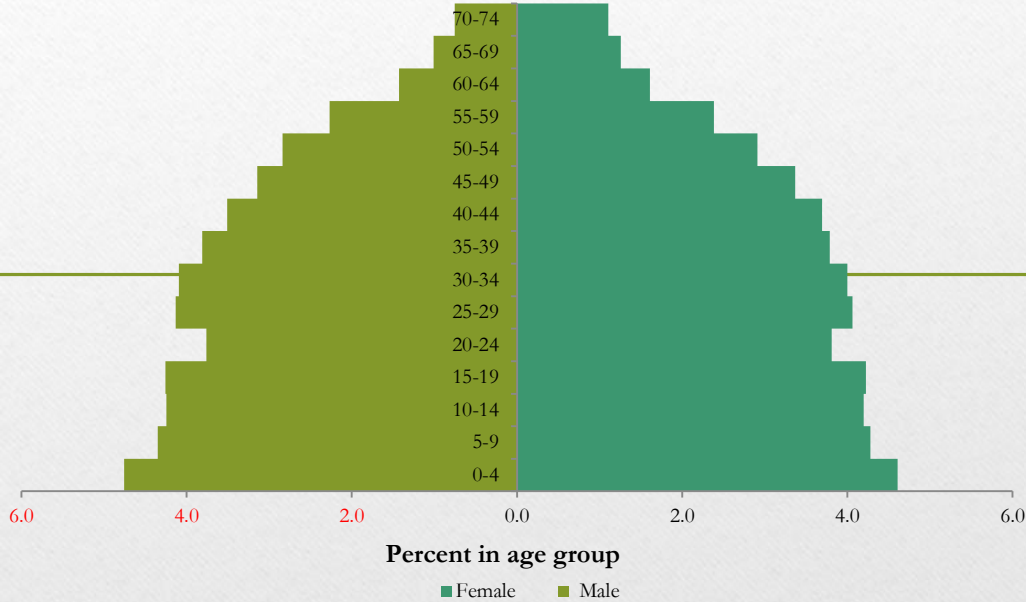


# Projected Population Pyramid 2026





# Projected Population Pyramid 2036





## Projected Sex Ratio





## Projected Sex Ratio

- The projected overall sex ratios indicate that the number of males per 100 females could increase from about 96 in 2016 to about 97 in 2036.
  - Thus, the projections indicate that overall, there would continue to be excess females over males in Lesotho at the national level.
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- Overall sex ratio changes very slowly in a population and is a reflection differential sex ratio at birth (biologically, there is excess males over females at birth), differential mortality by sex (force of mortality is higher for males than females at any change, though cultural practices arising from male preference might change this), differential net migration by sex.



## Projected Median Age of the Population

- Another effect of demographic transition is the median age of the population. The graph suggests that the median age of the population would increase from about 24 years in 2016 to about 30 years in 2036.
- Using Shryock, Siegal and Associates' classification of median age, the projections suggest that Lesotho would transit from an intermediate stage of ageing in 2026 to an 'old' population by 2036.
- According to their classification Median age

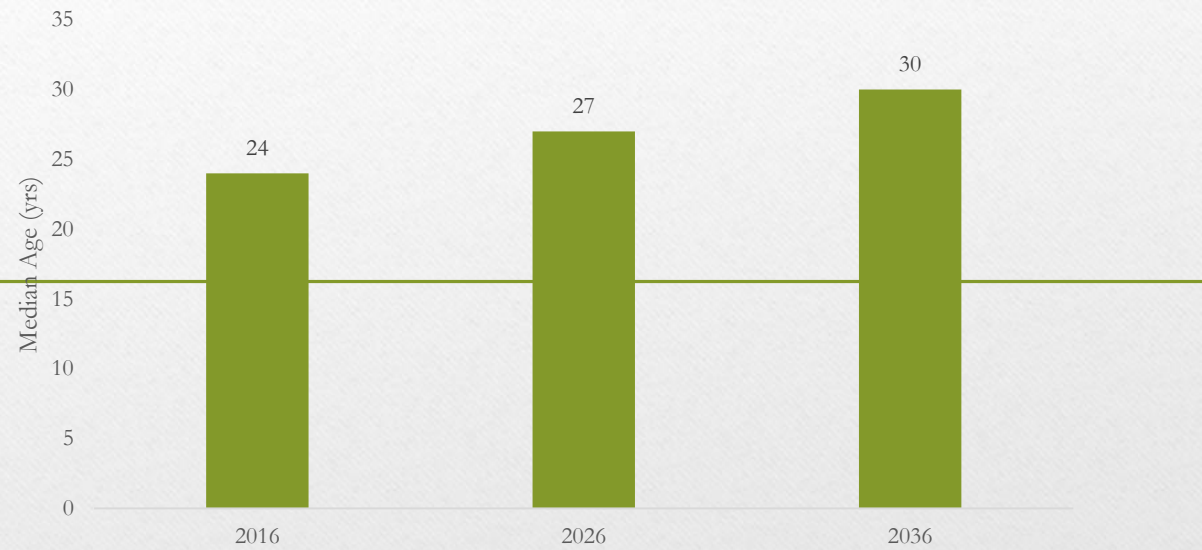
<20 = Young population

20 – 29 = Intermediate stage of ageing

30+ = Old population



## Projected Median Age of the Population



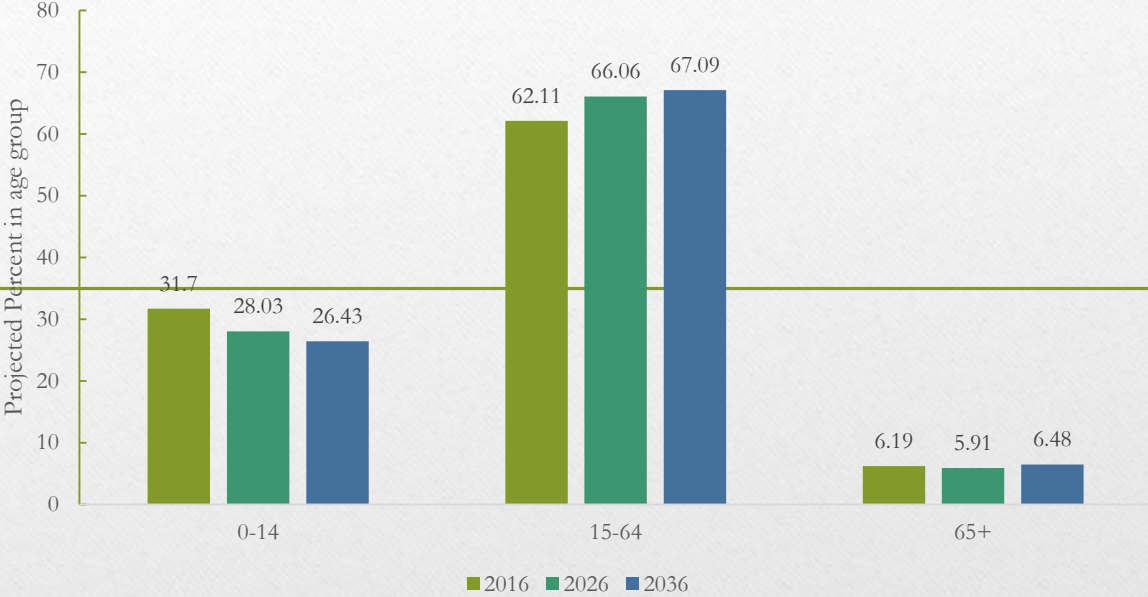


## Projected Annual Growth Rate

- The annual growth rate of the population is projected to be low decreasing from **0.68%** per annum in **2016** to about **0.62%** per annum by **2036**.
- The projected low growth rate is due to the estimated negative net migration and assumed to hold throughout the projection period.
- The rate of natural increase (i.e. population growth rate without taking account of net migration) was projected to decrease from **1.28%** per annum in **2016** to about **1.15%** per annum due to declining fertility.



# Projected Percentage in Broad Age Group



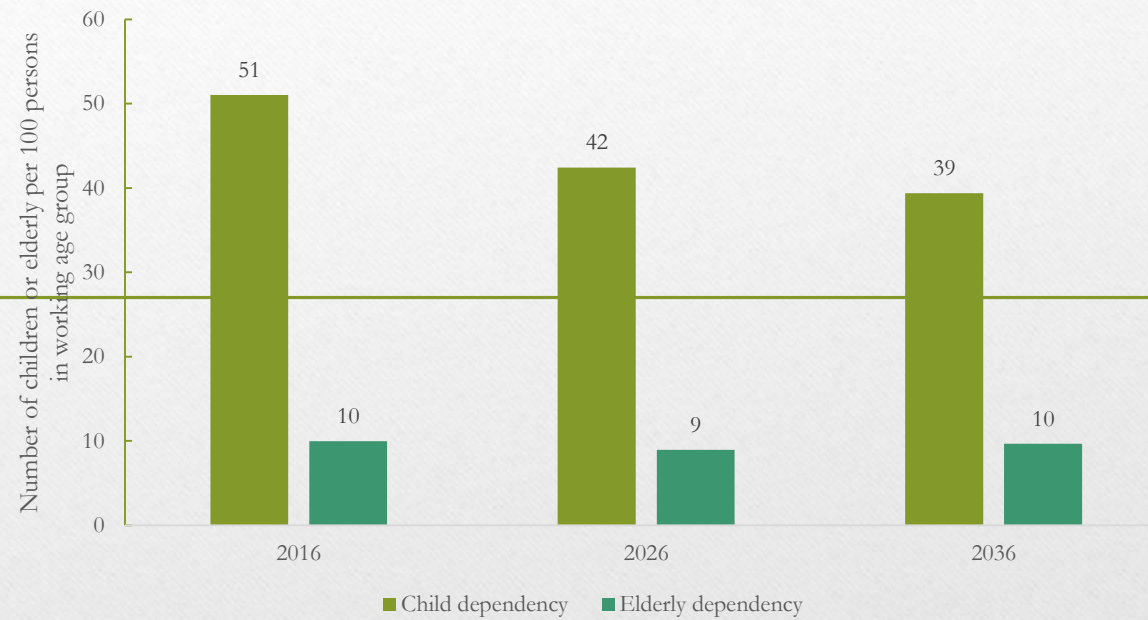


## Projected Percentage in Broad Age Group

- It is projected that the percentage of persons age 0-14 would decline from about 32% in 2016 to about 26% by 2036.
  - The projected percentage of persons aged 15-64 (i.e. the working age group) would increase from about 62% in 2016 to about 67% by 2036.
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## Projected Child and Elderly Dependency



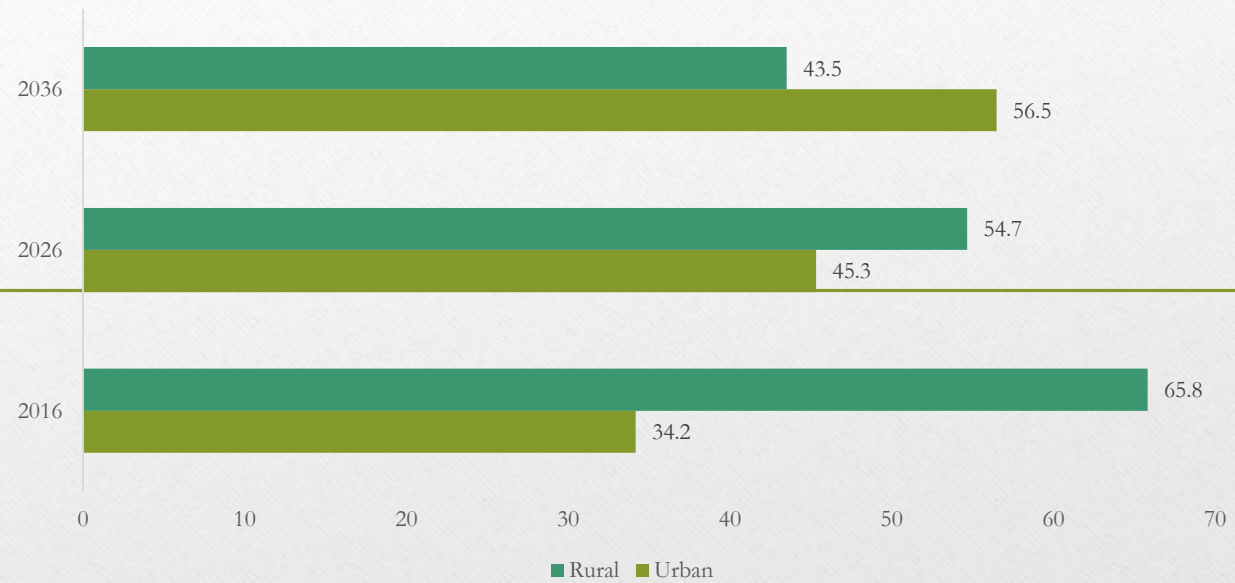


## Projected Child and Elderly Dependency

- Due to declining fertility and projected improvement in mortality, child dependency (persons aged 0-14) is projected to decline from about 51 children for 100 persons in the working age group in 2016 to 39 children for 100 persons in the working age group.
- ~~Elderly dependency is projected to remain stable at 10 elderly persons~~ (persons aged 65 years and over) for every 100 persons in the working age group during the projection period.



## Projected Urban/Rural Population



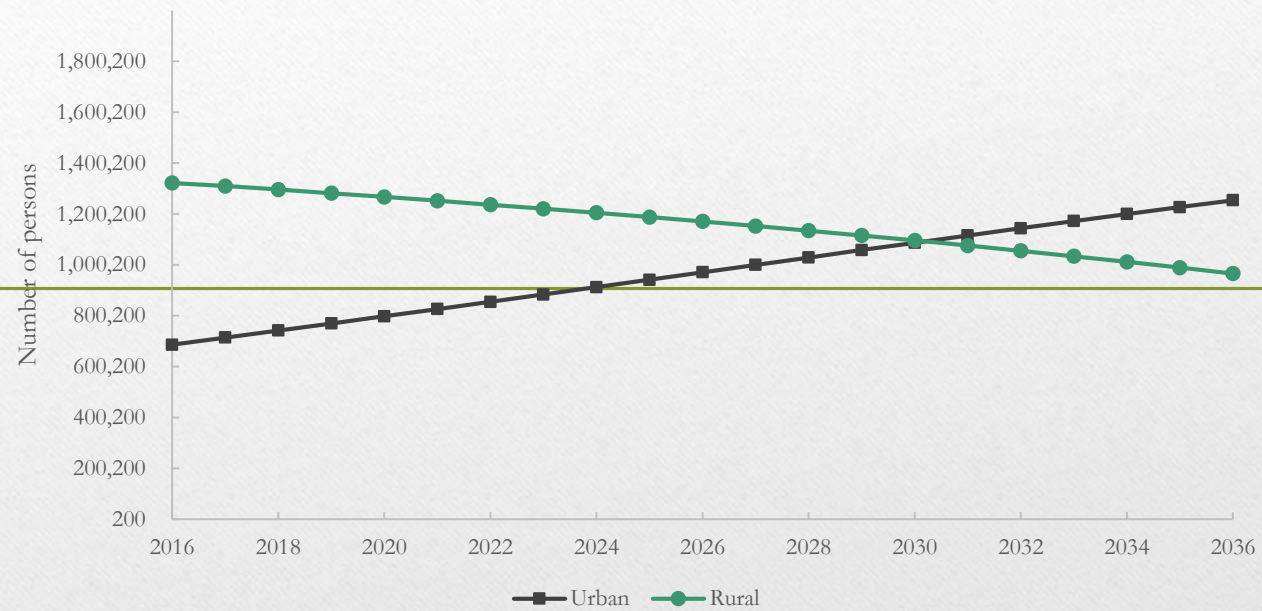


## Projected Urban/Rural Population

- In 2016, the number of persons living in rural areas was about 66% of the total population of Lesotho. This is projected to decline to about 44% by 2036.
- Correspondingly, the number of persons living in urban areas about 34% of the total population of Lesotho in 2016. This is projected to increase to about 56% by 2036.
- The transitional period in which the number of persons living in urban areas is projected to exceed the number of persons living in rural areas in Lesotho is projected to be around the year 2030.



## Transitional Period of Urban vs Rural Population





## Conclusion

- Censuses are the conventional source of information about the size and structure of the population.
- Because of cost and logistical issues, censuses cannot be undertaken yearly yet population information is required for planning & efficient allocation of resources in years when census information is not available.
- Population projections are a cost-effective tools for providing such information.
- The projections figures provided in this study hopefully will aid planning in Lesotho until the next census in 2026.



## Projected Urban/Rural Population

- It is projected that the percentage of the number of persons living in urban areas would increase from about 34% in 2016 to about 57% in 2036.
- Correspondingly the percentage of the number of persons living in rural areas is projected to decrease from about 66% in 2016 to about 44% in 2036.



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