

# Trends in total and cause-specific mortality among elderly people in Africa from 2000 to 2015

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## ABSTRACT

**Background:** Due to change in the causes of death, life expectancy in Africa has dramatically increased since 2000. **Objective:** This paper attempts to provide a comparison of the trends of causes of death among elderly people in Africa. **Materials and Methods:** This population-based cross-sectional study, which a dataset was created by compiling from the World Health Organization assessment of deaths by cause for the years 2000–2015. **Results:** Descriptive statistics, this study indicated an increase of death for both men and women. There is an increase in mean age for both men and women from 2000 to 2015. The mortality gap is large between elderly women aged 70 above. From 2000 to 2015, the mortality has increased for most age group, and most clearly for aged 70+. Moreover, the increased has been more pronounced for elderly women than elderly men. African elderly women aged 70+ have (odds ratio = 0.89;  $P < 0.001$ ) higher mortality rate than men. Higher levels association was found for reports of tuberculosis (TB) and ischemic heart disease among elderly men, while lower respiratory disease, diabetic, stroke, and fall were only associated to the elderly men. **Conclusion:** Communicable diseases, particularly TB, are the leading causes of elderly mortality in Africa. There is the need to give care and introduce programs for the elderly to reduce mortality of both communicable and non-communicable disease.


**KEY WORDS:** Elderly People; Cause-specific Mortality; Africa

## INTRODUCTION

Due to the under-registration of vital statistics, little is known about the cause of death, in Africa. Globally in 2015, the number of deaths was estimated around 57 million.<sup>[1]</sup> Majority of deaths are due to non-communicable diseases, in particular, cardiovascular diseases, cancers, diabetes, and chronic lung diseases. Currently, cardiovascular diseases are the number one cause of death in the world, followed by

cancer.<sup>[2]</sup> Communicable diseases are still the main concern in the cause of death, mainly HIV/AIDS, TB, malaria, and lower respiratory infection. In Africa, the majority of deaths in 2015 remained high due to non-communicable diseases. Even though Africa still experiences the high number of deaths, there is a change in the cause of death due to communicable diseases, especially malaria has dropped off the top five cause of death list, allowing ischemic heart disease (IC) to move into the top five list.<sup>[3]</sup>

According to the previous report by the World Health Organization, currently, African continent implemented various measures, which has resulted in Africa to experience a decline in people dying of malaria and HIV/AIDS. The current challenge that now the continent is experiencing is the rise in deaths caused by lifestyle factors.<sup>[4]</sup> In addition, these lifestyle diseases are now the main cause of death in the

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continents of Africa. The number of lives claimed by lifestyle diseases over the last couple of years has been over a million deaths annually. As a result, the average life expectancy for African men is 58 years while for women is 61 years. African life expectancy is the lowest compared to other continents.<sup>[5]</sup> The health profile of Africa is changing very rapidly due to various measures confronts disease of development and disease of poverty in Africa.

Since the year 2000, life expectancy in Africa has dramatically increased, due to change in the causes of death. Toward the start of the 20<sup>th</sup> century, Africa was experiencing the highest death among the young population and that cohort its lifespan was <65 years due to deadly infectious disease.<sup>[6]</sup> Population aging is becoming a serious issue in the African continent. Aging is an irreversible complex event, which gradually increased the probability of death.<sup>[7]</sup> Population aging also leads to important development issues for public health. As the older population continues to increase in size and proportion, aging contributes to new public health challenges for policy-makers. Since chronic diseases are incurable, the prevalence of chronic diseases increases with an aging population.<sup>[8]</sup> Heart disease, stroke, cancer, diabetes, and arthritis are the most common chronic diseases in the African elderly population. This paper attempts to provide a comparison of the trends of causes of death among elderly people in Africa.

## MATERIALS AND METHODS

This population-based cross-sectional study, which a dataset was created by compiling from the World Health Organization assessment of deaths by cause for the years 2000–2015. Definition of elderly differs in African countries as, “any age after 50,” yet some countries mostly used age 60 or 65 years. In order to be consistent with the national definition, this study adopted the United Nations definition of elderly age group by generally using 60+ years to refer to the elderly people.<sup>[9]</sup> This study will use two categories when it comes to age. The active age group that refers to 50–59 years as a reference age. The older people refer to 60 years and above. Descriptive statistics were performed on the main independent variables. The panel data have been used for bivariate and multivariate linear regression analysis. Dependent variable “cause of death” has been used for multivariate linear regression analysis. Explanatory variables were selected based on theoretical considerations. To compare outcomes of the cause of death, multiple variables Poisson regression models adjusting for overdispersion were used to compute rate ratios with 95% confidence intervals. All the variables were transformed into natural logarithms to avoid outliers and normalize the variables. All statistical modelings were carried out using Statistical Analysis System Enterprise Guide, version 6.1. The Committee of Economic Commission for Africa Fellowship programme sanctioned this study.

## RESULTS

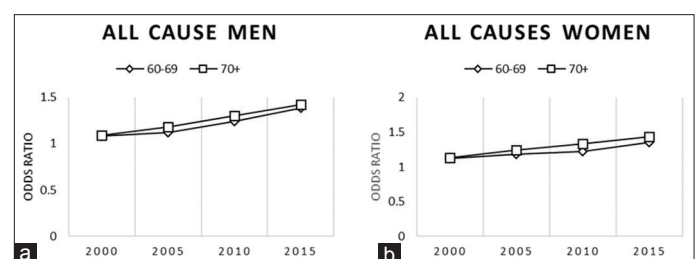
### Descriptive Analysis

Table 1 reports descriptive statistics, for the cause of death from 2000 to 2015 that also shows an increase of death for both elderly men and women. There is an increase in mean age for both men and women from 2000 to 2015. The below table also indicates that during the year 2000 the death caused by communicable diseases for both elderly men and women was high, then a decline in the year 2005–2010 and a rise in the 2015. In addition, as for the deaths caused by non-communicable disease for both elderly men and women, there is an increase from 2000 to 2015. As for death caused by injuries, only the “road injuries” had an increase in both elderly men and women compared to other injuries like “falls” where there is a decline in the deaths rate among both elderly men and women.

### Bivariate Analysis

There are slightly differences in all-cause mortality by age, particularly elderly women [Figure 1b]. The mortality gap is large between elderly women aged 70 above. From 2000 to 2015, the mortality has increased for most age group, and most clearly for aged 70+. Moreover, the increased has been more pronounced for elderly women than elderly men [Figure 1a]. This study revealed that elderly women aged 70 above had almost as high mortality relative to those who were 60–69 years as their elderly male counterparts.

Figure 2 indicated that elderly men have the significantly lower risk of dying relative to elderly women in the study period, from 2000 to 2015. When it comes to TB, age differentials have been stable over time and mortality is high among elderly men [Figure 2a]. There are few significantly age differentials in mortality from lower respiratory infections. Apparently, there is a decline in the mortality for elderly women aged 70+ in the year 2015 [Figure 2d]. However, their odds of deaths are not significantly different from that of elderly men aged 70+ in the year 2015. With respect to death caused by diarrheal disease, elderly men aged 60–69 are at a significantly lower level than those who



**Figure 1:** (a and b) Trends in all-cause mortality by age from the year 2000 to 2015. Odds ratios. African elderly men and women aged 60–69, 70+. Reference category is 50–59. Coefficient significant at  $P < 0.05$

**Table 1:** Distribution of causes of death among African elderly people from the year 2000 to 2015

Parameters	Male				Female			
	2000	2005	2010	2015	2000	2005	2010	2015
Population	5125008	5095260	4838014	4875040	4668003	4722327	4425252	4332208
No deaths	646203	714993	769747	843912	624756	710082	789451	1109528
Crude death rate	0.12	0.14	0.16	0.17	0.13	0.15	0.17	0.26
Mean age in years	69.4	69.9	70.0	75.3	80.2	80.5	81.7	82.0
Cause of death (%)								
Communicable diseases								
TB	37.5	35.2	35.6	36.3	17.1	16.2	16.3	34.2
HIV/AIDS	8.3	9.5	6.4	6.0	10.4	12.7	8.2	7.5
DD	18.3	18.6	18.5	17.2	27.3	26.5	26.6	18.3
Parasitic and vector diseases	4.9	4.3	4.0	3.8	7.5	6.4	6.0	4.3
Lower respiratory infections	31.0	32.4	35.5	36.4	37.7	38.2	42.9	35.7
Non-communicable diseases								
DB	10.3	10.7	11.4	11.7	10.6	11.7	12.7	13.0
IC	37.5	37.2	36.8	37.2	35.9	35.6	35.2	35.4
ST	31.2	31.3	31.4	31.2	38.9	38.8	38.6	32.4
Chronic obstructive pulmonary disease	11.4	11.4	11.2	10.8	7.5	7.3	7.3	9.9
CR	9.6	9.4	9.2	9.1	7.1	6.6	6.2	9.3
Injuries								
RI	35.1	37.0	39.0	39.9	33.7	36.0	36.9	41.9
Falls	28.7	27.9	27.3	27.0	36.0	34.8	34.8	25.5
FH	9.7	9.4	8.9	8.7	13.8	13.2	12.7	9.1
Drowning	7.3	6.8	6.2	5.6	4.8	4.5	4.2	5.3
SH	19.2	18.9	18.6	18.8	11.7	11.5	11.4	18.2

TB: Tuberculosis, LD: Lower respiratory infections, DD: Diarrheal diseases, CR: Cirrhosis of the liver (reference category), DB: Diabetes mellitus, ST: Stroke, IC: Ischemic heart disease, FH: Fire (reference category), RI: Road injury, FL: Falls, SH: Self-harm, CI: Confidence interval, OR: Odds ratio

are aged 70 above [Figure 2e]. The gap is less or more stable over time.

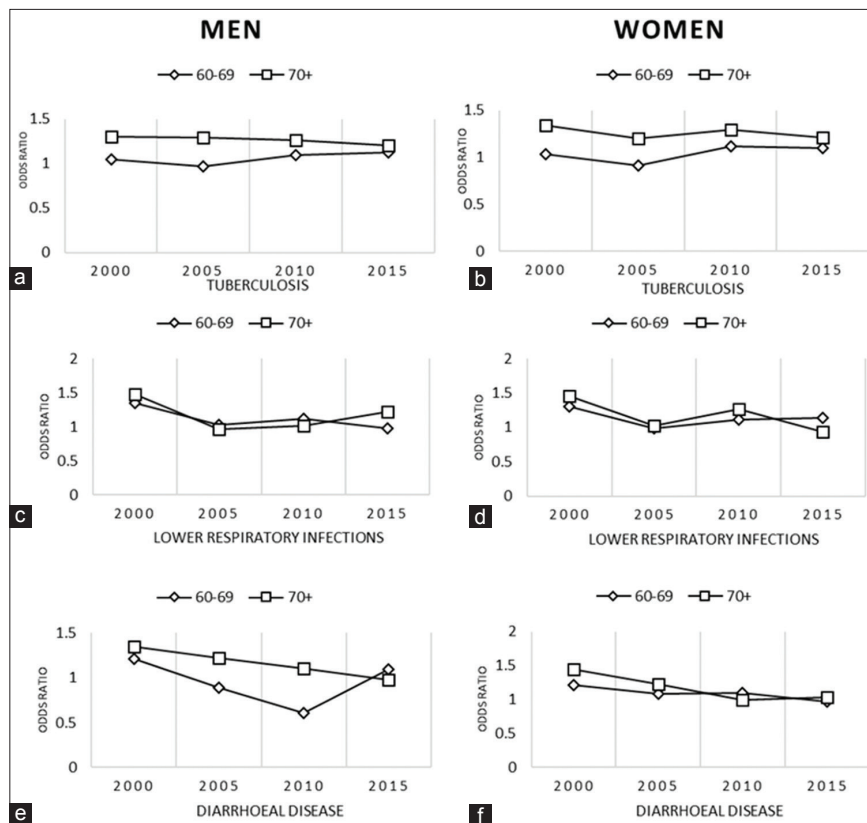
There is an increasing age differential in mortality among elderly women in this study [Figure 3]. The increase is most pronounced for stroke among elderly women [Figure 3d], whereas the increase in the age differentials in IC among elderly men [Figure 3e]. Mortality has been more modest with respect to stroke; elderly men aged 60–69 are at highly significantly higher more than those who are aged 70+. Differences in diabetic among elderly women aged 60–69 years have been increasing over time, while there has been a decrease in mortality among elderly men aged 70+.

In general, age difference in mortality from road injuries is large. However, the trends are different for elderly women and men, and mortality is higher among elderly men aged 70+ [Figure 4a] as compared to elderly woman aged 70+ [Figure 4b]. Concerning mortality in “falls,” elderly women have been a convergence over time due to lower mortality among elderly men aged 70+ [Figure 4c], whereas elderly women have experienced increase among aged 70+ years

[Figure 4d]. When it comes to “self-harm,” there is a decline in mortality among elderly women aged 70+ [Figure 4f]. However, for elderly men aged 60–69 there was an increase from 2000 to 2005, then suddenly a decline until 2015 [Figure 4e].

**Multivariate Analysis**

The different model were run, the first model [Table 2] reported that elderly women aged 70+ have (odds ratio [OR] = 0.89; *P* < 0.001) higher mortality rate than men. However, elderly men who are aged 70 years and above (OR = 2.04; *P* < 0.001) also experienced higher mortality. When adding a cause of death to the model 2, higher levels association was found for the reports of TB and IC among elderly men, while lower respiratory disease, diabetic, stroke, and fall were only associated to the elderly men. The final model 3 indicated that road injury plays a crucial risk factor in the likelihood of elderly women and men. Moreover, men are highly associated with death caused by road injuries (OR = 2.47; *P* < 0.001). Elderly women are highly associated with death caused by fall (OR = 1.33; *P* < 0.01) and no association among elderly men.



**Figure 2:** (a-f) Trends in mortality from tuberculosis, lower respiratory infections, and diarrheal disease by age group (60–69, 70+). African elderly men and women. Reference category is 50–59 years. Odds ratios. Coefficient significant at  $P < 0.05$

**Table 2:** Multivariate linear regression models explaining the cause of death among African elderly men and women from the year 2000 to 2015

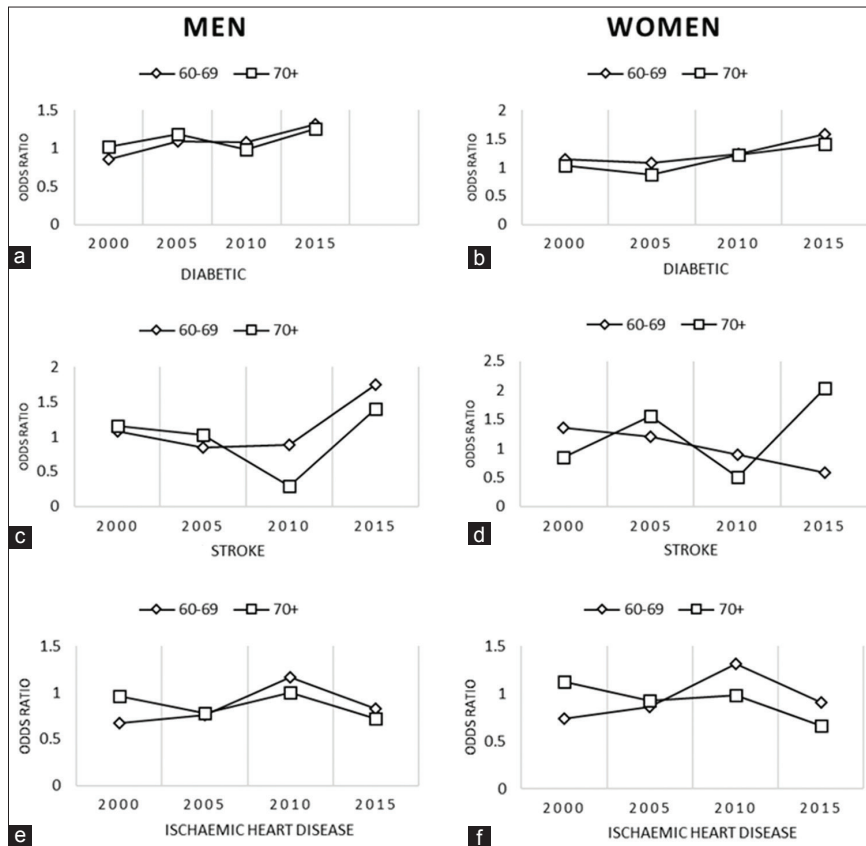
Parameters	Men, OR (95% CI)			Women, OR (95% CI)		
	Model 1	Model 2	Model 3	Model 1	Model 2	Model 3
OL	1.92 (0.97–2.08) <sup>c</sup>	1.66 (1.45–1.86) <sup>c</sup>	1.48 (1.11–1.92) <sup>c</sup>	0.89 (0.65–1.03) <sup>a</sup>	0.94 (0.66–1.33) <sup>c</sup>	1.02 (0.92–1.74) <sup>c</sup>
EL	2.04 (1.88–2.66) <sup>b</sup>	1.62 (1.38–19.9) <sup>b</sup>	1.42 (0.99–2.00) <sup>b</sup>	0.98 (0.91–1.22) <sup>c</sup>	1.02 (0.98–1.71) <sup>c</sup>	1.11 (1.05–1.69) <sup>c</sup>
HV (Ref.)		1.00	1.00		1.00	1.00
TB	-	0.81 (0.53–1.37) <sup>b</sup>	0.93 (0.71–1.22) <sup>b</sup>	-	1.27 (1.09–1.76)	1.41 (1.30–1.80)
LD	-	0.99 (0.79–1.19)	1.31 (1.22–1.50)	-	1.01 (0.95–1.86) <sup>b</sup>	0.92 (0.77–1.41)
DD	-	0.77 (0.52–1.01)	1.65 (1.41–1.90)	-	0.99 (0.67–1.08)	1.06 (0.91–1.79)
CR (Ref.)		1.00	1.00		1.00	1.00
DB	-	1.08 (0.98–1.41)	1.01 (0.91–1.51)	-	0.78 (0.48–1.13) <sup>a</sup>	0.79 (0.51–1.16) <sup>a</sup>
ST	-	0.91 (0.77–1.52)	1.03 (1.90–1.49)	-	0.77 (0.50–1.17) <sup>a</sup>	0.77 (0.56–1.19) <sup>a</sup>
IC	-	1.45 (1.22–1.81) <sup>c</sup>	1.67 (1.33–1.91)	-	1.16 (1.09–1.28)	1.14 (0.95–1.32)
FH (Ref.)		1.00	1.00		1.00	1.00
RI	-	2.16 (1.97–2.61) <sup>a</sup>	2.47 (2.01–2.88) <sup>a</sup>	-	1.18 (0.92–1.86)	1.19 (0.99–1.69) <sup>b</sup>
FL	-	1.55 (1.23–1.93)	1.60 (1.40–2.01)	-	1.34 (1.22–1.90) <sup>b</sup>	1.33 (1.20–1.86) <sup>b</sup>
SH	-	2.04 (1.87–2.44) <sup>c</sup>	1.28 (1.09–1.77) <sup>c</sup>	-	1.09 (0.87–1.39)	1.11 (0.88–1.37)

Significant at  $P < 0.001^a$ ,  $P < 0.01^b$ ,  $P < 0.05^c$ . Refers to OL - people aged 60–69; EL - people aged 70+, HV - HIV/AIDS (reference category), TB: Tuberculosis, LD: Lower respiratory infections, DD: Diarrheal diseases, CR: Cirrhosis of the liver (reference category); DB: Diabetes mellitus, ST: Stroke, IC: Ischemic heart disease, FH: Fire (reference category), RI: Road injury, FL: Falls, SH: Self-harm, CI: Confidence interval, OR: Odds ratio

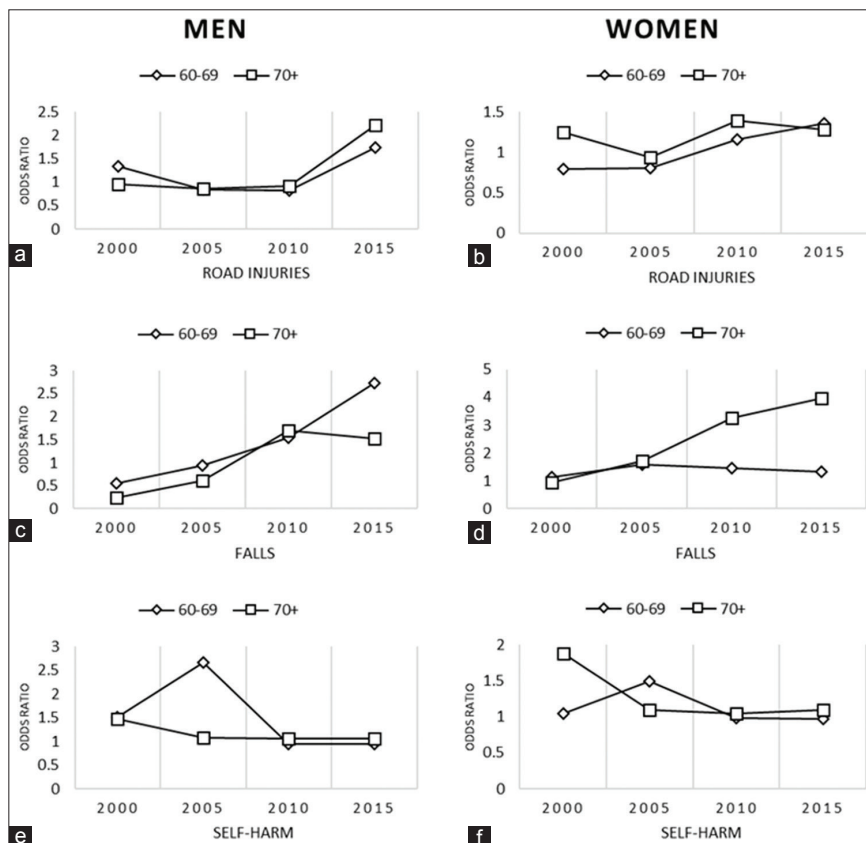
**DISCUSSION**

This study assessed the proportional mortalities due to communicable, non-communicable, and injuries underlying

causes of death in the African region, stratified by sex and age. The study also indicated that tuberculosis (TB) would remain one of the African’s most cause of death, especially among elderly men (OR = 0.93;  $P < 0.01$ ). The previous study reports



**Figure 3:** (a-f) Trends in mortality from diabetic, stroke, and ischemic heart disease by age group (60–69, 70+). African elderly men and women. Reference category is 50–59 years. Odds ratios. Coefficient significant at  $P < 0.05$



**Figure 4:** (a-f) Trends in mortality from road injuries, falls, and self-harm by age group (60–69, 70+). African elderly men and women. Reference category is 50–59 years. Odds ratios. Coefficient significant at  $P < 0.05$

that elderly people are vulnerable to develop TB.<sup>[10]</sup> This study also highlighted that around the year 2010 and 2015, mortality of elderly people caused by TB increased among that period, this is supported by the previous study which demonstrated an epidemic shift from young people to older people.<sup>[11]</sup> Most previous studies associate age as a risk factor for IC, especially the older population. The caused death due to IC among those aged 80 and older expanding most rapidly.<sup>[12]</sup> However, this study shows different results where highest death is recorded among those who are aged 60–69, especially men in Africa. Another previous report stated that proportional mortality due to IC increased with age, and women observed the highest percentages.<sup>[13]</sup> This study indicated that mortality due to road injuries was higher in elderly men, but previous studies specified that mortality rate is similar in both groups.<sup>[14]</sup> In addition, other previous studies showed the highest mortality among men.<sup>[15]</sup> Aging is normally associated with an increased risk of lower respiratory infections,<sup>[16]</sup> this may be because of immunological changes that occur in the respiratory system during aging.<sup>[17]</sup> In this study, age was not significantly associated with the cause of death due to lower respiratory infections. A previous study showed association among elderly men aged 60–69.<sup>[18]</sup> However, in this study, the association was observed among elderly women and gender is linked with the risk factor for lower respiratory infection. A previous study in South Africa reported high mortality among men due to occupational status.<sup>[19]</sup> Previous studies have reported stroke-associated mortality rates among older people,<sup>[20]</sup> but more deaths are recorded among HIV-positive older people.<sup>[21]</sup> This study finds the association among elderly women aged 70 and above, this may be because women have higher rates of depression than men. Several studies also have looked at the stroke as the cause of death, no significant difference between elderly men and women or those elderly women had slightly higher mortality.<sup>[22]</sup> Mortality rates among elderly people with type 2 diabetes are higher in men than in women.<sup>[23]</sup> However, this study indicated association among elderly women. Several factors may explain the high mortality rates among women such as overweight, high blood pressure, depression, and lack of physical activity. The strength of our study was that a comprehensive study was done to cover all countries in Africa. However, this study is limited to only Africa, not other continents. In the future, another study can be done to compare different continents.

## CONCLUSION

Communicable diseases, particularly TB, are the leading causes of elderly mortality in Africa. Road injuries and falls were also commonly encountered causes of death in the African elderly population from the year 2000 to 2015. Nonetheless, this cohort also experienced the highest mortality in stroke and a rise in diabetes mellitus as the leading cause of death. Hence, there is the need to give care to the elderly people and introduce programs that will reduce mortality of both communicable and non-communicable disease among this cohort.

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