

REVIEW ARTICLE

COVID-19 in African Countries versus other World Regions: A Review

DOI: 10.29063/ajrh2020/v24i2s.17

Amadu J. Kaba¹* and Andzi Nkweti Kaba²

Seton Hall University, South Orange, New Jersey¹; Independent Scholar, New Jersey²

*For Correspondence: Email: Amadu.Kaba@shu.edu

Abstract

This review examines the spread of COVID-19 (coronavirus) in Africa. By May 15, 2020, while the COVID-19 infections were 1,741,129 in Europe, 1,632,167 in North America, 757,924 in Asia, 401,072 in South America, there were only 79,780 infections in Africa, a continent with 1.34 billion people. During this same date, of the total COVID-19 deaths of 308,154 worldwide, Europe accounted for 160,482 (52.1%) deaths; North America accounted for 99,633 (32.3%) deaths; Asia accounted for 23,963 (7.8%) deaths; South America accounted for 21,303 (6.9%) deaths; and Africa accounted for only 2,639 (0.9%) deaths. Among the factors cited for this phenomenon (Africa's low figures) are: low volumes of international tourism to most African nations; a relatively young African population, with 533.5 (39.8%) million under the age of 15; low obesity rates in Africa; low rates of urbanization in most African nations; hot or high temperatures and high humidity in most African nations; low levels of testing, which continues to be the case in countries all across the world and proactive measures by African governments and people to slow the spread of the coronavirus. It is recommended that African countries continue to pursue proactive measures such as use of facemasks, hand sanitizers, regular hand washing and immediate partial or full lockdown when necessary. (*Afr J Reprod Health 2020 (Special Edition); 24[2]: 125-141*).

Keywords: Age, Africa, Coronavirus, COVID-19, Obesity, Tourism, Urbanization

Résumé

Cette revue examine la propagation du COVID-19 (coronavirus) en Afrique. Au 15 mai 2020, alors que les infections au COVID-19 étaient de 1 741 129 en Europe, 1 632 167 en Amérique du Nord, 757 924 en Asie, 401 072 en Amérique du Sud, il n'y avait que 79 780 infections en Afrique, un continent de 1,34 milliard d'habitants. Au cours de cette même date, sur un total de 308 154 décès dus au COVID-19 dans le monde, l'Europe représentait 160 482 (52,1%) décès; L'Amérique du Nord a été responsable de 99 633 (32,3%) décès; L'Asie représentait 23 963 décès (7,8%); L'Amérique du Sud représentait 21 303 décès (6,9%); et l'Afrique ne représentait que 2 639 (0,9%) décès. Parmi les facteurs cités pour ce phénomène (les faibles chiffres de l'Afrique) figurent: les faibles volumes de tourisme international dans la plupart des pays africains; une population africaine relativement jeune, avec 533,5 (39,8%) millions de moins de 15 ans; les faibles taux d'obésité en Afrique; les faibles taux d'urbanisation dans la plupart des pays africains; températures chaudes ou élevées et humidité élevée dans la plupart des pays africains; de faibles niveaux de tests, ce qui continue d'être le cas dans les pays du monde entier et des mesures proactives des gouvernements et des peuples africains pour ralentir la propagation du coronavirus. Il est recommandé aux pays africains de continuer à prendre des mesures proactives telles que l'utilisation de masques faciaux, de désinfectants pour les mains, le lavage régulier des mains et le verrouillage immédiat partiel ou complet si nécessaire. (*Afr J Reprod Health 2020 (Special Edition); 24[2]: 125-141*).

Mots-clés: Âge, Afrique, Coronavirus, COVID-19, Obésité, Tourisme, Urbanisation

Introduction

In the past eleven decades, there are two types of events that could be argued to have directly impacted people all across the world, including the loss of millions of lives, and economic devastations worth hundreds of billions of dollars or more. One such event is war, especially World

War I and World War II. World War I (1914-1918) caused the death of 65 million soldiers combined, representing almost all parts of the world¹, costing hundreds of billions of dollars or more². World War II (1939-1945) caused 15 million battle deaths and 45 million civilian deaths, representing people from all over the world³. It also caused hundreds of billions of

dollars in economic devastation to the point where the United States had to financially rescue European nations through the Marshall Plan⁴. The second event that impacted the entire world in the past eleven decades is the Influenza pandemic of 1918. The flu, as it is commonly known, resulted in worldwide deaths estimated at 20-100 million⁵, and other scholars put the figure at as high as or no less than 50 million^{6,7}.

The continent of Africa was directly impacted by these three events. For example, Lunn points out that 2.35 million “Africans were mobilized” by European powers to fight in World War I and that “250,000 soldiers and carriers, as well as approximately 750,000 civilians perished” in the war^{8,9}. During World War II, Morrow Jr. points out that 30,000 to 31,000 West African soldiers lost their lives fighting for the French government¹⁰. Both World Wars I and II negatively impacted the economies of African nations⁹⁻¹¹. The flu pandemic of 1918, which originated outside of Africa⁷, killed 2.3 million people in Africa⁶. The 1918 flu left serious economic effects in the world, including in Africa⁶.

In the year 2020, there has been the emergence of the COVID-19 (coronavirus) pandemic, which originated in China in December 2019, and became known to the world in January 2020. By May 15, 2020, the disease had infected 4,621,414 people in the world, including in Africa. It had also resulted in the deaths of 308,154 (e Table 1A). However, although Africa has been negatively impacted by COVID-19, the spread of the disease and the death rates have not been as high in African nations as they are in Asia, Europe, Latin America and North America. For example, by May 15, 2020, while there were 1,484,285 people infected in the United States, resulting in 88,507 deaths, there were only 79,780 people infected and 2,639 deaths in Africa, a continent with 1.34 billion people in 2020 (Compiled and computed from Tables 1A and 2A-2F). This is a very interesting observation because there appeared to be an initial expectation that Africans would be negatively impacted the most^{12,13}. For example, Heaton and Falolanote that during the influenza pandemic of 1918, while both Africa and Europe had 2.3 million deaths, on a per

capita basis it was 14.2-17.2 deaths per 100,000 of the population in Africa, but only 4.8 deaths per 100,000 people in Europe⁶.

According to Napoli and Nioi: “Although we cannot exclude an underestimation of the real cases of SARS-CoV-2 epidemic in poorest countries of Africa due to the lack of appropriate diagnostic techniques, no official report has documented an increase in the death rate for pneumonia of unknown causes. Accordingly, alternative hypotheses can be derived from epidemiological data to explain the disproportional spread of the disease”¹⁴. By May 15, 2020, however, the small European nation of Luxemburg, with 628,381 people, according to the CIA World Factbook, had more COVID-19 infections (3,923, according to Worldometer) than the following 16 African nations combined: Ethiopia, Democratic Republic of Congo, Tanzania, Kenya, Uganda, Angola, Madagascar, Mozambique, Malawi, Zimbabwe, Burundi, Togo, Botswana, The Gambia, Lesotho, and Western Sahara (3,920 infections, with a combined population of over half a billion people, 518.114 million) (Compiled and computed from Tables 2A-2F).

This review examines the spread of COVID-19 (coronavirus) in Africa in the first five months of 2020, specifically as of May 15, 2020. The study begins by presenting a methodology section. Next, the study presents the overall infection and death rates in the world, and then the infection and death rates in each African nation, and each of the five regions of the continent to examine any similarities and differences among the nations and regions. Finally, the study identified the factors that may be responsible for the similarities and differences among the nations and regions of Africa. It is useful to note that it is still too early to get a full understanding of the COVID-19 pandemic. However, it is important to start to build a body of knowledge on the spread of the disease and the deaths resulting from it.

The coronavirus statistics presented in this study were compiled and computed from the Worldometer website. We carefully observed for two weeks the COVID-19 statistics presented by Johns Hopkins University

(<https://coronavirus.jhu.edu/map.html>), which is widely cited around the world and Worldometer statistics which are widely cited by major organizations or entities and the same as those from Johns Hopkins University. However, Johns Hopkins University does not provide recovered and active cases statistics for all countries listed. Also, while Worldometer provides statistics categorized as “Yesterday” and “2 Days Ago”, Johns Hopkins does not provide such categories (they only provide live statistics, which can change every few hours or minutes or seconds). Therefore, we decided to use the statistics from Worldometer, which are really the same as those provided by Johns Hopkins University. Coronavirus statistics in this study for infections, deaths, recovered and active cases were compiled on May 16, 2020. Coronavirus statistics for total tests and tests per 1 million of population were compiled on June 13, 2020.

The population statistics in this study were compiled from the CIA World Factbook and Worldmeter. The international tourists or visitors data were compiled from the World Bank. The data for the under 15 population, obesity rates and urbanization rates were compiled from the CIA World Factbook. Data for international tourists or visitors were not available for three African countries. Data for total tests and tests per 1 million population were not available for 13 African countries. The non-African countries listed in Tables 1B and 3B were selected for this study because they were ranked among the top 20 of COVID-19 cases as of May 15, 2020. Most of these non-African countries are among the most populous in the world, with many of them ranked in the top 15. Most of these countries also have the highest Gross Domestic Product (GDP) in the world, with many of them in the top 10.

The breakdown of the five regions of Africa is based on the United Nations' classifications of world regions and regions of Africa: “Composition of macro geographical (continental) regions, geographical sub-regions, and selected economic and other groupings” (<https://unstats.un.org/unsd/methodology/m49/>). Finally, the academic journal articles cited in this study to explain or make sense of the statistics or

claims made were carefully retrieved from academic search engines such as Proquest and JSTOR.

COVID-19 infection and death rates in the world: a focus on Africa

Tables 1A and 1B present statistics on the number of COVID-19, deaths, recoveries and active cases worldwide and disaggregated by regions, continents, and selected number of countries around the world as of May 15, 2020. As shown, there were 4,621,414 COVID-19 infections in the world, with 308,154 (6.7%) deaths; 1,756,649 (38%) people had recovered; and 2,556,611 (55.3%) cases were still active. Africa's 79,780 total infections accounted for 1.7% of the total world infections. Europe and North America had the highest proportions of world infections: 1,741,129 (37.7%) and 1,632,167 (35.3%) respectively. Of the total number of infections in Africa, there were 2,639 deaths resulting in a case-fatality rate of 3.3% in Africa. Africa accounted for 0.1% of world infections; and 0.9% of the 308,154 world deaths. Europe and North America had the highest numbers of deaths: 160,482 (52.1% of total world deaths, 9.2% of those infected in Europe, and 3.5% of world infections) and 99,633 (32.3% of total world deaths, 6.1% of those infected in North America, and 2.2% of world infections) respectively. Of the 79,780 Africans infected, 30,210 (37.9%) recovered. By contrast the proportionate number of cases, deaths and recoveries in other regions of the world were as follows: Europe, 42.5%, 16%, 42.1% respectively; North America, 24.9%, 8.8% and 23.1% respectively; Asia, 14%, 2.3%, and 6% respectively; South America, 34.8%, 3%, and 7.9% respectively; and Oceania, 91.1%, 0.2%, and 0.4% respectively. Finally, of the 79,780 infections in Africa, 46,931 (58.8%, 1% of total world infections, and 1.8% of 2,556,611 world active cases) are still active as of May 15, 2020; compared to 48.8%, 18.2%, and 32.9% respectively in Europe; 69%, 24.4%, and 44% respectively in North America; 4.8%, 0.8% and 1.4% respectively in Asia; 59.9%, 5.2% and 9.4% respectively in South America; and 7.5%, 0% and 0.03% respectively in Oceania (Table 1A).

Tables 1A and 1B: World and Regional populations 2020, COVID-19 Infections, Deaths, Recovered, and Active Cases Statistics for the World, World Regions, and Selected Countries, as of Friday, May 15, 2020

	Population	Total	Total	% of	% of	% of	Total	% of	% of	% of	Active	% of	% of	% of
Table 1A	Total	Infections	Deaths	Region	World	World Deaths	Recovered	Region	World	World Total Recovered	Cases	Region	World	World Active Cases
World	7,784,849,118	4,621,414	308,154		6.7		1,756,649		38.0		2,556,611		55.3	
Africa	1,340,598,147	79,780	2,639	3.3	0.1	0.9	30,210	37.9	0.7	1.7	46,931	58.8	1.0	1.8
Asia	4,641,054,775	757,924	23,963	3.2	0.5	7.8	106,133	14.0	2.3	6.0	36,269	4.8	0.8	1.4
Europe	747,636,026	1,741,129	160,482	9.2	3.5	52.1	739,801	42.5	16.0	42.1	840,846	48.3	18.2	32.9
North America	368,869,647	1,632,167	99,633	6.1	2.2	32.3	406,544	24.9	8.8	23.1	1,125,990	69.0	24.4	44.0
Oceania	42,677,813	8,621	119	1.4	0.0	0.0	7,858	91.1	0.2	0.4	644	7.5	0.0	0.03
South America	430,759,766	401,072	21,303	5.3	0.5	6.9	139,641	34.8		7.9	240,128	59.9	5.2	9.4
Table 1B				% of	% of	% of		% of	% of	% of		% of	% of	% of
Selected Countries				Country	World	World Deaths		Country	World	World Total Recovered		Country	World	World Active Cases
United States	332,639,102	1,484,285	88,507	6.0	1.9	28.7	327,751	22.1	7.1	18.7	1,068,027	72.0	23.1	41.8
Spain	50,015,792	274,367	27,459	10.0	0.6	8.9	188,967	68.9	4.1	10.8	57,941	21.1	1.3	2.3
Italy	62,402,659	223,885	31,610	14.1	0.7	10.3	120,205	53.7	2.6	6.8	72,070	32.2	1.6	2.8
United Kingdom	65,761,117	236,711	33,998	14.4	0.7	11.0	..	..	..	..	..	..	..	..
France	67,848,156	179,506	27,529	15.3	0.6	8.9	60,448	33.7	1.3	3.4	91,529	51.0	2.0	3.6
Germany	80,159,662	175,699	8,001	4.6	0.2	2.6	151,700	86.3	3.3	8.6	15,998	9.1	0.3	0.6
China	1,394,015,977	82,933	4,633	5.6	0.1	1.5	78,209	94.3	1.7	4.5	91	0.1	0.0	0.0
Canada	37,694,085	74,613	5,562	7.5	0.1	1.8	36,895	49.4	0.8	2.1	32,156	43.1	0.7	1.3
Belgium	11,720,716	54,644	8,959	16.4	0.2	2.9	14,301	26.2	0.3	0.8	31,384	57.4	0.7	1.2
India	1,326,093,247	85,784	2,753	3.2	0.1	0.9	30,258	35.3	0.7	1.7	52,773	61.5	1.1	2.1
Russia	141,722,205	262,843	2,418	0.9	0.1	0.8	58,226	22.2	1.3	3.3	202,199	76.9	4.4	7.9

Source: Population statistics in Table 1A compiled from Worldometer on Saturday, May 16, 2020 from: <https://www.worldometers.info/population/>; The Population statistics in Table 1B compiled from the 2020 CIA World Factbook on Saturday, May 16, 2020 from: <https://www.cia.gov/library/publications/the-world-factbook/geos/ml.html>; All COVID-19 statistics compiled and computed by authors from Worldometer on Saturday, May 16, 2020 from: https://www.worldometers.info/coronavirus/?utm_campaign=homeAdvegas1?

Note: Data for recovered and active cases not available for the United Kingdom

According to Table 1 B, there were five countries with 100,000 or more cases of COVID-19 infections in the world as of May 15, 2020. These include the United States, 1,484,285 (32.1% of total world infections); Spain, 274,367 (5.94%); Russia, 262,843 (5.7%); United Kingdom, 236,711 (5.1%); Italy, 223,885 (4.8%); France, 179,506 (3.9%); and Germany, 175,699 (3.8%). These five countries have the highest number of COVID-19 deaths: United States, 88,507 deaths (6% of those infected in the United States, 1.9% of 4,621,414 infected in the world, and 28.7% of 308,154 world deaths); United Kingdom, 33,998 deaths (14.4%, 0.7%, and 11%) respectively; Italy, 31,610 deaths (14.1%, 0.7%, and 10.3%) respectively; France, 27,529 deaths (15.3%, 0.6%, and 8.9%) respectively; and Italy, 27,459 deaths (10%, 0.6% and 8.9%) respectively. Of the five countries with the highest number of deaths, Germany had the highest proportion of those who recovered (86.3% or 151,700 people) followed by Spain (68.9% or 188,967 people); Italy (53.7% or 120,205 people); France (33.7% or 60,448 people); and the United States (22.1% or 327,751 people). The following countries had at least 40% of active cases: Russia had the highest proportion of active cases: 76.9%; United States, 72%; India, 61.5%; Belgium, 57.4%; France, 51%; and Canada, 43.1% (Table 1B).

Tables 2A to 2F (in appendix) present COVID-19 infections and death figures for Africa and its five regions as of May 15, 2020. Tables 2A to 2F also present data on those who had recovered from COVID-19, and active cases for Africa and its five regions. As shown, the following countries had 1,000 or more infections: South Africa, 13,524 (17% of total 79,780, but 98.3% of Southern Africa's total); Egypt, 11,228 (14.1% of Africa's total, but 40.7% of Northern Africa's total); Morocco, 6,652 (8.3% of Africa's total, but 24.1% of Northern Africa's total); Algeria, 6,629 (8.3% of Africa's total, but 24% of Northern Africa's total); Ghana, 5,628 (7.1% of Africa's total, but 24.6% of Western Africa's total); Nigeria, 5,450 (6.8% of Africa's total, but 23.8% of Western Africa's total); Cameroon, 2,954 (3.7% of Africa's total, but 39.6% of Middle Africa's total); Guinea, 2,473 (3.1% of Africa's

total, but 10.8% of Western Africa's total); Senegal, 2,310 (2.9% of Africa's total, but 10.1% of Western Africa's total); Cote d'Ivoire, 2,017 (2.5% of Africa's total, but 8.8% of Western Africa's total); Sudan, 1,964 (2.5% of Africa's total, but 7.1% of Northern Africa's total); Djibouti, 1,309 (1.6% of Africa's total, but 16.2% of Eastern Africa's total); Democratic Republic of Congo, 1,298 (1.6% of Africa's total, but 17.4% of Middle Africa's total); Somalia, 1,284 (1.6% of Africa's total, but 15.9% of Eastern Africa's total); Mayotte, 1,210 (1.5% of Africa's total, but 15% of Eastern Africa's total); Gabon, 1,209 (1.5% of Africa's total, but 16.2% of Middle Africa's total); and Tunisia, 1,035 (1.3% of Africa's total, but 3.8% of Northern Africa's total).

Of the five regions in Africa, Northern Africa had the highest number or proportion of COVID-19 as of May 15, 2020: (27,578 or 34.6% of Africa's total), but has 18.5% (247.5 million people) of Africa's total population of 1.34 billion; Western Africa, 22,918 (28.73% of Africa's total) infections, but 30.2% (404.14 million people) of Africa's total population; Southern Africa, 13,755 (17.24% of Africa's total) infections, but 4.9% (64.5 million people) of Africa's total population; Eastern Africa, 8,071 (10.12% of Africa's total) infections, but 32.2% (431 million people) of Africa's total population; and Middle Africa, 7,458 (9.35% of Africa's total) infections, but 14.5% (193.5 million people) of Africa's total population (Tables 2A to 2F in appendix).

The countries in Africa with at least 50 COVID-19 deaths as of May 15, 2020, were: Egypt, 592 (22.4% of 2,639 Africa's total) deaths, Algeria, 536 (20.3%) deaths; South Africa, 247 (9.4%) deaths; Morocco, 190 (7.2%) deaths; Nigeria, 171 (6.5%) deaths; Cameroon, 139 (5.3%) deaths; Sudan, 91 (3.5%) deaths; Somalia, 53 (2%) deaths; Burkina Faso and Niger each, 51 (1.9%) deaths; and the Democratic Republic of Congo, 50 (1.9%) deaths. Of the 2,639 deaths in Africa, 1,457 (55.2%) were in Northern Africa; 480 (18.2%) were in Western Africa; 278 (10.5%) were in Middle Africa; 250 (9.5%) were in Southern Africa; and 174 (6.6%) were in Eastern Africa. The 2,639 COVID-19 deaths in Africa account for 3.3% of the 79,780 total number of

Tables 2A to 2F: Africa and Regional African and Country populations 2020, COVID-19 Infections, Deaths, Recovered, and Active Cases Statistics for Africa, African Regions, and African Countries, as of Friday, May 15, 2020

	Population	Total	Total	% of	% of	% of	% of
Table 2A	Total	Infections	Deaths	Infections	Recovered	Infections	Active
Burundi	11,865,821	15	1	0.001	7	0.009	7
Comoros	846,281	11	1	0.001	3	0.004	7
Djibouti	921,804	1,309	4	0.005	935	1.172	370
Eritrea	6,081,196	39	0	0.000	39	0.049	0
Ethiopia	108,113,150	287	5	0.006	112	0.140	170
Kenya	53,527,936	781	45	0.056	284	0.356	452
Madagascar	26,955,737	238	0	0.000	112	0.140	126
Malawi	21,196,629	63	3	0.004	24	0.030	36
Mauritius	1,379,365	332	10	0.013	322	0.404	0
Mayotte (2010)	231,139	1,210	16	0.020	627	0.786	567
Mozambique	30,098,197	119	0	0.000	42	0.053	77
Reunion (2006)	787,584	441	0	0.000	354	0.444	87
Rwanda	12,712,431	287	0	0.000	177	0.222	110
Seychelles	95,981	11	0	0.000	10	0.013	1
Somalia	11,757,124	1,284	53	0.066	135	0.169	1,096
South Sudan	10,561,244	236	4	0.005	4	0.005	228
Tanzania	58,552,845	509	21	0.026	183	0.229	305
Uganda	43,252,966	203	0	0.000	63	0.079	140
Zambia	17,426,623	654	7	0.009	124	0.155	523
Zimbabwe	14,546,314	42	4	0.005	13	0.016	25
Angola	32,522,339	48	2	0.003	17	0.021	29
Cameroon	27,744,989	2,954	139	0.174	1,553	1.947	1,262
Central African Rep.	5,990,855	301	0	0.000	13	0.016	288
Chad	16,877,357	428	48	0.060	88	0.110	292
Congo, Rep.	5,293,070	391	15	0.019	87	0.109	289
Congo (D.R.)	101,780,263	1,298	50	0.063	212	0.266	1,036
Equatorial Guinea	836,178	594	7	0.009	22	0.028	565
Gabon	2,230,908	1,209	10	0.013	219	0.275	980
Sao Tome & Principe	211,122	235	7	0.009	4	0.005	224
Algeria	42,972,878	6,629	536	0.672	3,271	4.100	2,822
Egypt	104,124,440	11,228	592	0.742	2,799	3.508	7,837
Libya	6,890,535	64	3	0.004	28	0.035	33
Morocco	35,561,654	6,652	190	0.238	3,400	4.262	3,062
Sudan	45,561,556	1,964	91	0.114	205	0.257	1,668
Tunisia	11,721,177	1,035	45	0.056	802	1.005	188
Western Sahara	652,271	6	0	0.000	6	0.008	0
Botswana	2,317,233	24	1	0.001	17	0.021	6
Lesotho	1,969,334	1	0	0.000	0	0.000	1
Namibia	2,630,073	16	0	0.000	13	0.016	3
South Africa	56,463,617	13,524	247	0.310	6,083	7.625	7,194
eSwatini	1,104,479	190	2	0.003	66	0.083	122
Benin	12,864,634	339	2	0.003	83	0.104	254
Burkina Faso	20,835,401	780	51	0.064	595	0.746	134
Cabo Verde	583,255	326	2	0.003	67	0.084	257
Cote d'Ivoire	27,481,086	2,017	24	0.030	942	1.181	1,051
Gambia	2,173,999	23	1	0.001	10	0.013	12
Ghana	29,340,248	5,638	28	0.035	1,460	1.830	4,150
Guinea	12,527,440	2,473	15	0.019	895	1.122	1,563
Guinea-Bissau	1,927,104	913	3	0.004	26	0.033	884
Liberia	5,073,296	219	20	0.025	108	0.135	91

Mali	19,553,397	806	46	0.058	455	0.570	305	0.382
Mauritania	4,005,475	29	3	0.004	7	0.009	19	0.024
Niger	22,772,361	885	51	0.064	684	0.857	150	0.188
Nigeria	214,028,302	5,450	171	0.214	1,320	1.655	3,959	4.962
Saint Helena	7,862	..	..	..	..	..	..	..
Senegal	15,736,368	2,310	25	0.031	890	1.116	1,395	1.749
Sierra Leone	6,624,933	447	27	0.034	97	0.122	323	0.405
Togo	8,608,444	263	11	0.014	96	0.120	156	0.196
Total	1,340,510,300	79780	2639	3.31	30210	37.87	46931	58.83
Table 2B	Regional	Total	Total	total	Total	total	Active	total
Eastern Africa	Population	Infections	Deaths	Infections	Recovered	Infections	Cases	Infections
Burundi	11,865,821	15	1	0.012	7	0.087	7	0.087
Comoros	846,281	11	1	0.012	3	0.037	7	0.087
Djibouti	921,804	1,309	4	0.050	935	11.585	370	4.584
Eritrea	6,081,196	39	0	0.000	39	0.483	0	0.000
Ethiopia	108,113,150	287	5	0.062	112	1.388	170	2.106
Kenya	53,527,936	781	45	0.558	284	3.519	452	5.600
Madagascar	26,955,737	238	0	0.000	112	1.388	126	1.561
Malawi	21,196,629	63	3	0.037	24	0.297	36	0.446
Mauritius	1,379,365	332	10	0.124	322	3.990	0	0.000
Mayotte (2010)	231,139	1,210	16	0.198	627	7.769	567	7.025
Mozambique	30,098,197	119	0	0.000	42	0.520	77	0.954
Reunion (2006)	787,584	441	0	0.000	354	4.386	87	1.078
Rwanda	12,712,431	287	0	0.000	177	2.193	110	1.363
Seychelles	95,981	11	0	0.000	10	0.124	1	0.012
Somalia	11,757,124	1,284	53	0.657	135	1.673	1,096	13.579
South Sudan	10,561,244	236	4	0.050	4	0.050	228	2.825
Tanzania	58,552,845	509	21	0.260	183	2.267	305	3.779
Uganda	43,252,966	203	0	0.000	63	0.781	140	1.735
Zambia	17,426,623	654	7	0.087	124	1.536	523	6.480
Zimbabwe	14,546,314	42	4	0.050	13	0.161	25	0.310
Total	430,910,367	8071	174	2.16	3570	44.23	4327	53.61
% of Africa	32.2	10.12	0.22		4.47		5.42	
% of World	5.5	0.17	0.00		0.08		0.09	
Table 2 C	Regional	Total	Total	total	Total	total	Active	total
Middle Africa	Population	Infections	Deaths	Infections	Recovered	Infections	Cases	Infections
Angola	32,522,339	48	2	0.027	17	0.23	29	0.389
Cameroon	27,744,989	2,954	139	1.864	1,553	20.82	1,262	16.921
Central African Rep.	5,990,855	301	0	0.000	13	0.17	288	3.862
Chad	16,877,357	428	48	0.644	88	1.18	292	3.915
Congo, Rep.	5,293,070	391	15	0.201	87	1.17	289	3.875
Congo (D.R.)	101,780,263	1,298	50	0.670	212	2.84	1,036	13.891
Equatorial Guinea	836,178	594	7	0.094	22	0.29	565	7.576
Gabon	2,230,908	1,209	10	0.134	219	2.94	980	13.140
Sao Tome & Principe	211,122	235	7	0.094	4	0.05	224	3.003
Total	193,487,081	7458	278	3.73	2215	29.70	4965	66.57
% of Africa	14.5	9.35	0.35		2.78		6.22	
% of World	2.5	0.16	0.01		0.05		0.11	
Table 2D	Regional	Total	Total	total	Total	total	Active	total
Northern Africa	Population	Infections	Deaths	Infections	Recovered	Infections	Cases	Infections
Algeria	42,972,878	6,629	536	1.944	3,271	11.861	2,822	10.233
Egypt	104,124,440	11,228	592	2.147	2,799	10.149	7,837	28.418
Libya	6,890,535	64	3	0.011	28	0.102	33	0.120

Morocco	35,561,654	6,652	190	0.689	3,400	12.329	3,062	11.103
Sudan	45,561,556	1,964	91	0.330	205	0.743	1,668	6.048
Tunisia	11,721,177	1,035	45	0.163	802	2.908	188	0.682
Western Sahara	652,271	6	0	0.000	6	0.022	0	0.000
Total	247,484,511	27,578	1457	5.28	10,511	38.11	15,610	56.60
% of Africa	18.5	34.57	1.83		13.17		19.57	
% of World	3.2	0.60	0.03		0.23		0.34	
Table 2 E	Regional	Total	Total	% of total	Total	% of total	Active	% of total
Southern Africa	Population	Infections	Deaths	Infections	Recovered	Infections	Cases	Infections
Botswana	2,317,233	24	1	0.007	17	0.124	6	0.044
Lesotho	1,969,334	1	0	0.000	0	0.000	1	0.007
Namibia	2,630,073	16	0	0.000	13	0.095	3	0.022
South Africa	56,463,617	13,524	247	1.796	6,083	44.224	7,194	52.301
eSwatini	1,104,479	190	2	0.015	66	0.480	122	0.887
Total	64,484,736	13755	250	1.82	6179	44.92	7326	53.26
% of Africa	4.9	17.24	0.31		7.75		9.18	
% of World	0.83	0.30	0.01		0.13		0.16	
Table 2F	Regional	Total	Total	% of total	Total	% of total	Active	% of total
Western Africa	Population	Infections	Deaths	Infections	Recovered	Infections	Cases	Infections
Benin	12,864,634	339	2	0.009	83	0.362	254	1.108
Burkina Faso	20,835,401	780	51	0.223	595	2.596	134	0.585
Cabo Verde	583,255	326	2	0.009	67	0.292	257	1.121
Cote d'Ivoire	27,481,086	2,017	24	0.105	942	4.110	1,051	4.586
Gambia	2,173,999	23	1	0.004	10	0.044	12	0.052
Ghana	29,340,248	5,638	28	0.122	1,460	6.371	4,150	18.108
Guinea	12,527,440	2,473	15	0.065	895	3.905	1,563	6.820
Guinea-Bissau	1,927,104	913	3	0.013	26	0.113	884	3.857
Liberia	5,073,296	219	20	0.087	108	0.471	91	0.397
Mali	19,553,397	806	46	0.201	455	1.985	305	1.331
Mauritania	4,005,475	29	3	0.013	7	0.031	19	0.083
Niger	22,772,361	885	51	0.223	684	2.985	150	0.655
Nigeria	214,028,302	5,450	171	0.746	1,320	5.760	3,959	17.275
Saint Helena	7,862	..	..	..	..	..	..	..
Senegal	15,736,368	2,310	25	0.109	890	3.883	1,395	6.087
Sierra Leone	6,624,933	447	27	0.118	97	0.423	323	1.409
Togo	8,608,444	263	11	0.048	96	0.419	156	0.681
Total	404,143,605	22918	480	2.09	7735	33.75	14703	64.15
% of Africa	30.2	28.73	0.60		9.70		18.43	
% of World	5.2	0.50	0.01		0.17		0.32	

Source: Population statistics in Tables 2A to 2F from the 2020 CIA World Factbook: <https://www.cia.gov/library/publications/the-world-factbook/geos/ml.html>; All COVID-19 statistics compiled and computed by authors from Worldometer on Saturday, May 16, 2020 from: https://www.worldometers.info/coronavirus/?utm_campaign=homeAdvegas1?

people infected. (Tables 2A to 2F in appendix). Of the 79,780 total infections in Africa in May 2020, 30,210 (37.8%) had recovered: 6,179 (44.92%) out of 13,755 infected in Southern Africa; 3,570 (44.23%) out of 8,071 infected in Eastern Africa; 10,511 (38.1%) out of 27,578 infected in Northern Africa; 7,735 (33.75%) out of 22,918 in Western Africa; and 2,215 (29.7%) out of 7,458 infected in Middle Africa.

Finally, of the 79,780 total infections in Africa, 46,931 (58.83%) cases were still active as of May 15, 2020: 4,965 (66.6%) out of 7,458 infected in Middle Africa; 14,703 (64.2%) out of 22,918 infected in Western Africa; 15,610 (56.6%) out of 27,578 infected in Northern Africa; 4,327 (53.61%) out of 8,071 infected in Eastern Africa; and 7,326 (53.3%) out of 13,755 infected in Southern Africa (Table 2A to 2F in appendix;^{12,15}).

Factors responsible for the similarities and differences in infection and death rates of COVID-19 in Africa; and the relative low rates in Africa compared with countries in Europe, North America and Asia

Some of the factors that may be responsible for fewer cases of COVID-19 and deaths in African countries closer to the equator, than countries in Northern Africa and South Africa in particular, could be similar to the same factors that separate these same African nations and countries in Europe, North America, and Asia. The remaining factors will tend to apply to all African nations versus countries in Europe, North America, and Asia. These factors including the following: low volumes of international tourism to most African nations; high proportion of individuals under the age of 15; low urbanization rates in Africa; relatively low obesity rates in Africa; Africa's relatively hot and humid climate; low levels of testing; adequate preparations for COVID-19 by African governments and its people.

Low volumes of international tourists to African nations

The COVID-19 pandemic originated from the city of Wuhan, the capital of Hubei Province, central China in late December 2019, and spread to Europe and North America by early January 2020. A careful observation of the countries with the highest infection and death rates shows that they have very large volumes of international tourists that they host annually. For example, the following countries located in Europe, North America and Asia are ranked among the top 20 with infections or deaths of COVID-19 as of Friday, May 15, 2020: United States (1,484,285 infections), Spain (274,367 infections), Italy (223,885 infections), United Kingdom (236,711 infections), France (179,506 infections), Germany (175,699 infections), Russia (262,843 infections), Turkey (146,457 infections), China (82,933 infections), Canada (74,613 infections), India (85,784 infections), Belgium (54,644 infections), The Netherlands (43,681 infections), Saudi Arabia (49,176 infections), Switzerland (30,514 infections), and Portugal (28,583 infections).

Compared with most African nations, these nations listed have very large volumes of International tourists.

According to the World Bank, as of 2018, there were 79.75 million tourists that visited the United States; Spain, 82.8 million visitors; Italy, 61.6 million visitors; United Kingdom, 36.3 million visitors; France, 89.3 million visitors; Germany, 38.9 million visitors; Russia, 25.6 million visitors; Turkey, 45.8 million visitors; China, 63 million visitors; Canada, 21.1 million visitors; India, 17.4 million visitors; Belgium, 9.1 million visitors; Saudi Arabia, 15.3 million visitors; the Netherlands, 18.8 million visitors; Switzerland, 10.4 million visitors; and Portugal, 16.2 million visitors¹⁶.

For African nations with a population of one million or more, the international tourism arrival numbers are higher for South Africa and most Northern African countries, but relatively low for most sub-Saharan African nations. For example, in 2018, there were 10.5 million visitors to South Africa; Morocco, 12.3 million visitors; Egypt, 11.2 million visitors; Tunisia, 8.3 million visitors; Algeria, 2.7 million visitors; and Libya, 142,000 visitors (2003 figures). For sub-Saharan African nations, there were 5.3 million visitors to Nigeria; Ethiopia, 849,000 visitors; Democratic Republic of Congo, 351,000 visitors (2016 figures); Tanzania, 1.4 million visitors; Kenya, 1.364 million visitors (2017 figures); Uganda, 1.4 million visitors; Sudan, 836,000 visitors; Angola, 218,000 visitors; Mozambique, 2.743 million visitors; Ghana, 897,000 (2015 figures); Cameroon, 1.1 million visitors; Cote d'Ivoire, 1.97 million visitors; Madagascar, 291,000 visitors; Niger, 157,000 visitors; Malawi, 871,000 visitors; Zambia, 1.072 million visitors; Mali, 14,000 visitors; Chad, 87,000 visitors (2017 figures); Senegal, 1.37 million visitors (2017 figures); Zimbabwe, 2.6 million visitors; Benin, 295,000 visitors; Rwanda, 932,000 visitors (2016 figures); Guinea, 99,000 (2017 figures); Burundi, 299,000 visitors (2017 figures); Togo, 573,000 visitors; Sierra Leone, 57,000 visitors; Eritrea, 142,000 visitors (2016 figures); Central African Republic, 107,000 visitors (2017 figures); Republic of Congo, 156,000 visitors; Namibia, 1.5 million visitors (2017 figures); Botswana, 1.623 million

visitors (2017 figures); The Gambia, 552,000 visitors; Gabon, 269,000 (2005 figures); Lesotho, 1.2 million visitors; Guinea Bissau, 45,200 visitors (2016 figures); Mauritius, 1.4 million visitors; and eSwatini, 782,000 visitors. For sub-Saharan Africa as a whole, there was a total of 47.63 million visitors in 2017¹⁶.

It is useful to point out that there is no data provided for Liberia, Somalia, South Sudan. The primary reason is civil war. Libya has been experiencing a civil war since 2011, which is one of the reasons why 2003 tourism figures are presented, and also why its COVID-19 infection numbers are very low. Liberia experienced a very serious civil war that lasted from the 1990s to 2005. Somalia has been experiencing a bloody civil war since the 1990s. South Sudan gained its independence from Sudan in July 2011, after many years of rebellion. Countries that experience civil wars tend to have low numbers of international tourists, because visitors are not certain whether the society has political, economic, and social stability. This economic liability, however, may have contributed to the slow spread of the coronavirus in these African nations, because it is a disease brought into the continent from other continents.

High proportion of individuals under the age of 15

Age appears to be playing a significant role in the infection and death rates of the COVID-19 pandemic. It has been widely reported in the media across the world and in scholarly journal publications that regardless of geographic location or racial or ethnic backgrounds, the COVID-19 tends to impact the elderly more than young people¹⁷⁻¹⁹. According to a study by Wang *et al.* of coronavirus patients, “High proportion of severe to critical cases and high fatality rate were observed in the elderly patients with COVID-19” (p.639)¹⁹. Niu *et al.* found in their study of COVID-19 patients that: “The older confirmed patients with COVID-19 infection has a high proportion of severe cases, and the COVID-19 infection was generally susceptible with a relatively high fatality rate in older populations”¹⁸.

This observation could help to explain the relatively low rates of COVID-19 infections and

deaths in Africa, compared with the nations among the top 20 most impacted by this COVID-19 pandemic mentioned above. For example, of the 50 million people in Spain in July 2020, 15.02% are under the age of 15, 9.9% are aged 15-24, and 18.49% are aged 65 and over; for Italy’s 62.4 million people as of July 2020, the figures are 13.45%, 9.61, and 22.08% respectively; for the United States’ 332.6 million people, the figures are 18.6%, 12.91% and 16.85% respectively; For the United Kingdom’s 65.8 million people, the figures are 17.63%, 11.49%, and 18.48% respectively; for France’s 67.85 million people, the figures are 18.36%, 11.88%, and 20.46% respectively; for Germany’s 80.2 million people, the figures are 12.89%, 9.81%, and 22.99% respectively; for Canada’s 37.7 million people, the figures are 15.99%, 11.14% and 18.98% respectively; for China’s 1.394 billion people, the figures are 17.29%, 11.48%, and 12.34% respectively; and for Belgium’s 11.72 million people, the figures are 17.22%, 11.2%, and 19.21% respectively²⁰.

In Africa, as of July 2020, of the 1.34 billion people, 533.5 million (39.8%) are under the age of 15, 18.1% are aged 15-24, and 3.3% are aged 65 and over. The youngest people in the world are in Niger, with 50.58% of its 22.8 million population under the age of 15. Other African nations with 45% or higher are: Uganda, 48.21% out of 43.3 million people; Malawi, 45.87% out of 21.2 million people; Angola, 47.83% out of 32.5 million people; Mali, 47.69% out of 19.6 million people; Chad, 47.43% out of 16.9 million people; the Democratic Republic of Congo, 46.38% out of 101.8 million people; Zambia, 45.74% out of 17.4 million people; Mozambique, 45.57% out of 30.1 million people; and Benin, 45.56% out of 12.9 million people²⁰.

It is useful to note that the proportion of people under the age of 15 is relatively lower, and also the proportion of those aged 65 and over is relatively higher in Northern African nations compared with countries in sub-Saharan Africa: Algeria, 29.58% and 6.17% respectively; Egypt, 33.62% and 4.44% respectively; Libya, 33.65% and 4.04% respectively; Morocco, 27.04% and 7.11% respectively; and Tunisia, 25.28% and 8.86% respectively. These visible differences

could be a potential factor for more COVID-19 cases in North African countries compared with their counterparts in sub-Saharan Africa²⁰.

Africa's youth, which has sometimes been viewed as a liability, because with such a massive number of young people under the age of 15, societies in the continent must educate them, feed them, provide them with healthcare, etc., in this current COVID-19 pandemic appears to be a strength because the data so far illustrates that young people in this age group are not infected as much or even if they are infected, they tend to recover from the disease. Scholars have noted that while rates of infection with coronavirus are lower among the young population in Africa, this does not eliminate the need for vigilance in mitigating infection in this population. For example, Napoli and Nioi point out: "Interestingly, although the low median age of Africans is expected to be associated with a reduced case fatality rate, the high presence of young adults in Africa does not eliminate the risk of contagion within the population or the possibility of detecting a certain number of cases"¹⁴.

Low obesity rates in Africa

It has been widely reported that obese individuals are at a disadvantage to fight the COVID-19 disease, primarily due to a number of underlying conditions resulting from being obese^{21,22}. Muscogiuri *et al.* point out that: "Until now, there are no data in the literature reporting that subjects with obesity have a higher risk of getting COVID-19; however, since obesity is known to increase the risk of developing severe forms of respiratory failure, it could be hypothesized that subjects with obesity could be at risk of serious illness if infected. ... it was observed that 72.1% of 775 patients with confirmed COVID-19 were overweight or obese and that among patients with BMI > 30 who had undergone intensive care, 60.9% of them died"²¹. According to Zheng *et al.*: "The presence of obesity in MAFLD [metabolic associated fatty liver disease] patients was associated with a ~6-fold increased risk of severe COVID-19 illness.... Notably, this association with obesity and COVID-19 severity remained significant... even after adjusting for age, sex,

smoking, diabetes, hypertension, and dyslipidaemia"²².

In 2016, the adult obesity prevalence rate in the United States was 36.2%; Canada, 29.4%; United Kingdom, 27.8%; Spain, 23.8%; Russia, 23.1%; Germany, 22.3%; Belgium, 22.1%; France, 21.6%; and Italy, 19.9 percent. In Africa, the obesity adult prevalence rates are very low for most of the countries, especially in sub-Saharan Africa. However, the figures are relatively higher in countries in Northern Africa and Southern Africa, especially South Africa, which could be a potential factor for their relatively high COVID-19 cases. For example, as of 2016, the adult obesity prevalence rate in Ethiopia was 4.5%; Eritrea, 5%; Madagascar and Uganda each, 5.3%; Burundi, 5.4%; Niger, 5.5%; Burkina Faso, 5.6%; Malawi and Rwanda each, 5.8%; Chad, 6.1%; South Sudan, 6.6% (2014 figures); Democratic Republic of Congo, 6.7%; Kenya, 7.1%; Mozambique, 7.2%; Central African Republic, 7.5%; Guinea, 7.7%; Comoros, 7.8%; Equatorial Guinea, 8%; Zambia, 8.1%; Angola, 8.2%; Somalia, 8.3%; Tanzania and Togo each, 8.4%; Mali, 8.6%; Sierra Leone, 8.7%; Senegal, 8.8%; Nigeria, 8.9%; Guinea-Bissau, 9.5%; Benin and the Republic of Congo each, 9.6%; Liberia, 9.9%; Cote d'Ivoire and The Gambia each, 10.3%; Mauritius, 10.8%; Ghana, 10.9%; Cameroon, 11.4%; Cabo Verde, 11.8%; Sao Tome & Principe, 12.4%; Mauritania, 12.7%; Djibouti, 13.5%; Seychelles, 14%; Gabon, 15%; and Zimbabwe, 15.5 percent. For Northern African countries, the obesity figures are slightly higher: Libya, 32.5%; Egypt, 32%; Algeria, 27.4%; Tunisia, 26.9%; Morocco, 26.1%; and Sudan, 6.6% (2014 figures). For Southern African countries, the obesity figures are also slightly higher: South Africa, 28.3%; Botswana, 18.9%; Namibia, 17.2%; Lesotho, 16.6%; and eSwatini, 16.5 percent²⁰.

These obesity figures may help to explain why the COVID-19 pandemic is more prevalent in the European and Northern American countries discussed above, and also why the pandemic is more prevalent in Northern African countries, and South Africa because they tend to have relatively higher rates than most sub-Saharan African nations. These obesity statistics are presented to show that there are countries that are doing so well

economically that this leads to excess caloric consumption which in turn leads to obesity and obesity-related conditions. The low obesity rates prevalent in most countries, including those in Africa, indicate that these populations consume fewer total calories on a daily basis. However, this has turned out to be a good development with COVID-19. It is useful to note that there are wealthy nations that still manage to carefully monitor caloric consumption so as not to become overweight. In Japan, the obesity rate in 2016 was 4.3% and 4.7% in South Korea²⁰. This sends a message to these African nations with relatively low rates to try to maintain them even as they become wealthy or developed societies.

Low rates of urbanization in African countries

What has been regularly considered a liability for Africans in Africa might now turn to be a strength in the continent's attempt to avoid the worst effect of the spread of COVID-19 – slow urbanization in Africa. High rate of urbanization for a country is seen as a good indicator for modernization and economic development^{23,24}. This has now turned out to be a big liability for the countries mentioned above that are the most negatively impacted by the coronavirus pandemic mentioned above. Their relatively high rates of urbanization have resulted in the rapid spread of the coronavirus, partly because such countries have many large cities where residents use public transportation such as buses, rails/trains in underground subways, and massive high-rise public and private housing buildings, with hundreds and thousands of residents.

For example, the urban population as a proportion of the total population in the United States, as of 2020, is 82.7%, with a rate of urbanization (annual rate of change) from 2015-2020 of 0.95%; United Kingdom, 83.9% and 0.9% respectively; Canada, 81.6% and 0.97% respectively; France, 81% and 0.72% respectively; China, 61.4% and 2.42% respectively; Italy, 71% and 0.29% respectively; Spain, 80.8% and 0.33% respectively; Germany, 77.5% and 0.27% respectively; Russia, 74.8% and 0.18% respectively; Turkey, 76.1% and 2.04% respectively; Saudi Arabia, 84.3% and 2.17%

respectively; Belgium, 98.1% and 0.62% respectively; the Netherlands, 92.2% and 0.74% respectively; and Switzerland, 73.9% and 0.88% respectively²⁰.

In contrast, African nations have continued to experience slow urbanization, and some studies even tend to show declines in urbanization rates for some countries²⁴⁻²⁶. At 11.635 million square miles, Africa is such a massive continent that its 1.34 billion people inhabiting it seem to be a small number for its size. According to Cohen, in 1950, Africa's urban population was 33 million (14.9% of Africa's total population and 4.5% of world urban population); Asia, 232 million (16.6% of Asia's total population and 31.7% of world urban population); Europe, 280 million (51.2% of Europe's total population and 38.2% of world urban population); and Northern America, 110 million (63.9% of total population of Northern America and 15% of world urban population). In 2000, for Africa, the figures were 295 million, and 37.1% and 10.3% respectively; Asia, 1.367 billion, and 37.1% and 47.8% respectively; Europe, 529 million, and 72.7% and 18.5% respectively; and Northern America, 250 million, and 79.1% and 8.8% respectively²⁴.

Among African countries, the Northern African and Southern African countries tend to have higher percentages of urbanization. In Northern Africa, although the countries' percentage of urbanization rates are generally higher, Egypt and Sudan had <50% (42.8%, with an urbanization rate of 1.86% in Egypt and 35.3% and 3.17% respectively in Sudan); 80.7%, with an urbanization rate of 1.68% in Libya; 73.7% and 2.46% respectively in Algeria; 69.6% and 1.53% respectively in Tunisia; 63.5% and 2.14% in Morocco respectively. In Southern Africa, Lesotho has 29% and 2.83% respectively; 52% and 4.2% respectively in Namibia; 67.4% and 1.97% respectively in South Africa; and 70.9% and 2.87% respectively in Botswana²⁰.

For sub-Saharan African countries with $\geq 50\%$ percentages of urbanization are: 51.7% and 3.38% respectively in Cote d'Ivoire; 52% and 4.23% respectively in Nigeria; 52% and 4.2% respectively in Namibia;

52.1% and 3.41% respectively in Liberia; 55.3% and 4.28% respectively in Mauritania; 57.3% and 3.34% respectively in Ghana; 57.6% and 3.63% respectively in Cameroon; 62.6% and 4.07% respectively in Gambia; 66.8% and 4.32% respectively in Angola; and 67.8% and 3.28% respectively in Republic of Congo²⁰.

For sub-Saharan African countries with <50% percentages of urbanization, the figures are as follows: 13.7% and 5.68% respectively in Burundi; 16.6% and 4.27% respectively in Niger; 17.4% and 4.19% respectively in Malawi; 17.4% and 2.86% respectively in Rwanda; 20.2% and 4.1% respectively in South Sudan; 21.7% and 4.63% respectively in Ethiopia; 23.5% and 3.88% respectively in Chad; 24.2% and 2.46% respectively in eSwatini; 25% and 5.7% respectively in Uganda; 28% and 4.23% respectively in Kenya; 30.6% and 4.99% respectively in Burkina Faso; 32.2% and 2.19% respectively in Zimbabwe; 35.2% and 5.22% respectively in Tanzania²⁰.

These low urbanization percentages in most African countries, in addition to the continent being very vast may have helped to slow the spread of the coronavirus. The countries impacted the most right now tend to also be highly urbanized, which results in very congested cities and towns. It is in such environments that the coronavirus tends to be very effective in spreading among people in public transportation, such as buses and trains²⁷.

Hot temperatures and high humidity in most African countries

Scholars have pointed out that viruses, including those within the coronavirus family tend to have less success infecting people in regions that have high temperatures and high humidity. Some of these scholars have used Africa, especially countries closer to the equator as an example. The viruses, however, are more successful in spreading in cooler regions of the world. Most of the countries hardest hit by the current COVID-19 tend to have cold and long winters or temperate climate.

Even in Italy and Spain, two southern European nations, the coronavirus is more prevalent in the northern and cooler regions of those countries^{14,28-33}.

According to Napoli and Nioi: “Surprisingly, the historical data relating to SARS-CoVs and MERS-CoV epidemics reveal a limited or no dissemination of these disorders in African countries, despite the limitations of the health system and the geographical continuity of the two outbreaks... Similarly, very recent data concerning the spread of COVID-19 in Africa describe a much smaller than expected number of cases, particularly when considering the vulnerability of this population”¹⁴. Araújo and Naimi point out that: “Our models fitted on the existing pattern of spread between January and March 2020, support the view that incidence of the virus could follow a seasonal climate pattern with outbreaks generally being favored by cool and dry weather, while being slowed down by extreme conditions of both cold and heat as well as moist”³³. Xu *et al.* point out that: “Combining one of the most comprehensive datasets of COVID-19 transmission to date with weather data across the world, this paper provides evidence for the association of various meteorological variables with the spread of COVID-19.... We find a stronger effect... for temperatures above 25 °, the relatively mild slope of temperature effect below 25 degrees suggests many temperate zones with high population density may face larger risks, while some warmer areas of the world may experience slower transmission rates. For example, the estimated associations may partially explain the smaller sizes of outbreaks in southern Asia and Africa to date”³².

The examples presented in this section show that the hot temperatures and high humidity in most countries in Africa, could be contributing to slow down the spread of the coronavirus. South Africa and Northern African nations that tend to have the highest infection rates of the coronavirus could be due to the fact that they tend to be a little farther away from the equator. South Africa, for example, has a winter season, with snow when it is summer in North America. North African countries are reported to be cooler from September to January in the coastal regions.

Low levels of testing

Low levels of testing have been an issue in most countries worldwide. Even in wealthier countries such as the United States, Germany and the United Kingdom testing only accounts for a fraction of those countries total populations and as such does not accurately reflect the number of existing cases of COVID-19. It is also important to note that although Africa as a whole has lower rates of testing than wealthier countries of the world, there are at least two notable exceptions, Mauritius (108,353 tests per 1 million) and Djibouti (40,878 tests per 1 million), that have higher rates of testing than many wealthier countries (see Table 3A in appendix).

Tables 3A and 3B present population figures, total coronavirus tests, and tests per 1 million of the population for African countries and selected countries as of June 12, 2020. Of the 58 African countries and entities in Table 3A, total coronavirus tests and tests per 1 million of population were available for 45 of them. In Table 3B, total tests and tests per 1 million of population were not available for China. Although the United States had the highest number of total tests (23.79 million), its tests per 1 million of its population (71,900) was lower than figures for Russia: 97,434 (14.22 million total tests); Spain, 95,507 and 4.47 million respectively; United Kingdom, 94,811 and 6.43 million respectively; and Belgium, 86,025 and 996,785 respectively. Although France is a wealthy nation of 65.2 million people, it only had 1.38 million total tests and 21,215 tests per 1 million people (Tables 3A and 3B).

African countries and entities have lower overall total tests and tests per 1 million people, with the 45 countries and entities with available data accounting for 3.088 million total tests. This is the case even with South Africa, which had the highest number of total tests: 1.06 million and 17,892 tests per 1 million of its population respectively. It is useful to point out that Mauritius had a higher rate of tests per 1 million of its population, 108,353 (137,789 total tests) than all of the selected nations listed in Table 3B, including Russia, Spain, United Kingdom, Belgium, United States, Italy (74,661), Germany (56,035), and Canada (54,926). Djibouti's tests per

1 million of its population of 40,878 is higher than the rate for France. Apart from South Africa and Mauritius, the following countries have 100,000 or more total tests: Morocco, 389,142 (10,549 tests per 1 million people); 242,218 and 7,804 respectively for Ghana; 170,860 and 1,488 respectively for Ethiopia; 135,000 and 1,321 respectively for Egypt; 111,436 and 2,441 respectively for Uganda; and 108,666 and 2,023 respectively for Kenya. Nigeria had 88,432 total tests, with 430 tests per 1 million people (Tables 3A and 3B).

Proactive policies and preparation by African governments and people

African nations were able to observe in real time the devastation of the coronavirus in China in January and February, and in Europe and the United States starting in March. As a result, the government and people of almost all African nations took proactive measures immediately to reduce the spread of the coronavirus. Some of the measures taken included closing all educational institutions, locking down entire regions of a country or the entire country, with almost all non-essential businesses closed⁴⁰. The borders of countries across the continent are also shut down, including ports of entry, especially airports (including international flights). Depending on the African country, some of the lockdown measures were for a few days at a time or for a week at a time or every two weeks, subject to extensions. Even before the lockdowns and after partial re-openings of countries, there were water stations all across large and small cities and towns for people to wash their hands regularly, and almost all businesses had people stationed outside of their premises to give hand sanitizers to customers and guests. Social distancing measures were also mostly observed whereby people stayed at least six feet from others. A very substantial number of leaders and the masses all across the continent were seen with face masks on. Without any doubt whatsoever these measures substantially reduced the rapid spread of COVID-19, albeit at a great financial cost to the continent after working hard in the past decade to substantially improve the economic status of people on the continent^{12,15,34-40}.

Tables 3A and 3B: Populations of African Countries, Selected Countries, Total Coronavirus tests, and Tests per 1 Million of Population, as of Friday, June 12, 2020

Table 3A	Population	Tests per 1 million	
	Total	Total Tests	of population
Burundi	11,868,767	382	32
Comoros	868,536	..	..
Djibouti	987,227	40,356	40,878
Eritrea	3,543,797	..	..
Ethiopia	114,794,517	170,860	1,488
Kenya	53,702,760	108,666	2,023
Madagascar	27,648,383	15,148	548
Malawi	19,100,310	6,690	350
Mauritius	1,271,669	137,789	108,353
Mayotte (2010)	272,427	8,800	32,302
Mozambique	31,201,863	16,919	542
Reunion (2006)	894,993	17,200	19,218
Rwanda	12,933,152	85,613	6,620
Seychelles	98,317	..	..
Somalia	15,866,124	..	..
South Sudan	11,186,857	3,356	300
Tanzania	59,629,682	..	..
Uganda	45,649,727	111,436	2,441
Zambia	18,352,460	28,236	1,539
Zimbabwe	14,851,276	52,905	3,562
Angola	32,801,945	10,000	305
Cameroon	26,506,586	..	..
Central African Rep.	4,825,119	18,921	3,921
Chad	16,396,849	..	..
Congo, Rep.	5,510,035	..	..
Congo (D.R.)	89,391,169	..	..
Equatorial Guinea	1,400,039	8,268	5,906
Gabon	2,222,650	19,517	8,781
Sao Tome & Principe	218,931	1,354	6,185
Algeria	43,806,931	..	..
Egypt	102,226,041	135,000	1,321
Libya	6,866,309	11,765	1,713
Morocco	36,887,633	389,142	10,549
Sudan	43,789,277	401	9
Tunisia	11,812,229	57,273	4,849
Western Sahara	596,469	..	..
Botswana	2,348,927	26,800	11,409
Lesotho	2,141,394	1,515	707
Namibia	2,538,340	5,514	2,172
South Africa	59,269,206	1,060,425	17,892
eSwatini	1,159,544	6,551	5,650
Benin	12,104,097	45,637	3,770
Burkina Faso	20,868,398	..	..
Cabo Verde	555,674	1,307	2,352
Cote d'Ivoire	26,339,495	35,179	1,336
Gambia	2,412,511	1,970	817
Ghana	31,035,817	242,218	7,804
Guinea	13,111,180	14,407	1,099
Guinea-Bissau	1,965,269	1,500	763

Liberia	5,050,706	..	..
Mali	20,214,891	3,483	172
Mauritania	4,642,299	7,654	1,649
Niger	24,148,953	6,252	259
Nigeria	205,836,204	88,432	430
Saint Helena	..	..	..
Senegal	16,717,343	58,003	3,470
Sierra Leone	7,967,746	..	..
Togo	8,267,347	24,802	3,000
Total	1,338,676,397	3087646	
Table 3B			
Selected Countries	Population	Total Tests	Tests per 1 million of population
United States	330,906,997	23,792,191	71,900
Spain	46,753,936	4,465,338	95,507
Italy	60,465,875	4,514,441	74,661
United Kingdom	67,868,549	6,434,713	94,811
France	65,266,664	1,384,633	21,215
Germany	83,771,107	4,694,147	56,035
China	1,439,323,776	..	..
Canada	37,725,348	2,072,096	54,926
Belgium	11,587,177	996,785	86,025
India	1,379,307,780	5,363,445	3,889
Russia	145,931,552	14,218,674	97,434

Source: Compiled and computed by authors from Worldometer on Saturday, June 13, 2020 from: https://www.worldometers.info/coronavirus/?utm_campaign=homeAdvegas1?

As Okonofua *et al.* observe: “The attempts to restrain the COVID-19 have had most interesting moments in the African continent. For many countries where politicians have often paid lip services to public health, it has been refreshing to see heads of governments and key officials lead the campaign against the virus in many countries. Health funding that had hitherto been restricted to a few privileged cases are being made available, and donations are coming from philanthropists from within the continent rather than from outside”³⁷.

Conclusion

This review has presented data substantiating various observations that Africa has been less currently negatively impacted by the spread of COVID-19 as most people in the world had expected. A combination of natural phenomena and proactive measures by African governments and people may have resulted in slowing the spread of COVID-19 in African countries. At this moment in history, African countries host

relatively smaller numbers of international tourists when compared with countries in Europe and North America. Even within Africa, Northern African nations and South Africa host a lot more tourists than most other sub-Saharan African nations. However, for this particular COVID-19 pandemic, this 'liability' has turned out to be very helpful, in reducing the spread of the disease. Africa's youth and lower obesity rate may have also contributed to the lower incidence of COVID-19 since older persons and obese individuals are more susceptible to severe illness from COVID-19. Low urbanization rates in Africa, as well as the vast land may also have helped to slow down the spread of COVID-19.

Finally, African governments and people had time to observe how devastating COVID-19 had been in countries such as China, Italy, Spain and the United States. This resulted in African governments and people taking proactive measures or actions to slow the spread of the coronavirus. Without these measures or actions the total number of infections by May 15, 2020 could have been in the hundreds of thousands or more, instead of 79,780.

Contribution of Authors

Amadu J. Kaba conceived the initial idea and discussed with Andzi Nkweti Kaba. They both selected the factors used in the paper. Both authors compiled and computed all the data in the study. Both authors wrote the entire paper.

References

- World War One: Casualty and Death Tables. *PBS: The Great War*. 2020. Retrieved on May 7, 2020 from: https://www.uwosh.edu/faculty_staff/henson/188/WWI_Casualties%20and%20Deaths%20%20PBS.html
- Fregert K. The Costs and Finances of World War I According to Eli F. Heckscher. *Economia* 2016; 6 (4): 515-524.
- Research Starters: Worldwide Deaths in World War II. The National World War II Museum. New Orleans. 2020. Retrieved on May 7, 2020 from: <https://www.nationalww2museum.org/students-teachers/student-resources/research-starters/research-starters-worldwide-deaths-world-war>
- Weissman AD. Pivotal Politics – The Marshall Plan: A Turning Point in Foreign Aid and the Struggle for Democracy. *The History Teacher* 2013; 47 (1): 111-129.
- Johnson NA. The 1918 Flu Pandemic and its Aftermath. *Evolution: Education and Outreach* 2018; 11 (5): 2.
- Heaton M and Falola T. Global Explanations versus Local Interpretations: The Historiography of the Influenza Pandemic of 1918-1919 in Africa. *History in Africa* 2006; 33: 208, 214, 223, 214.
- Humphris MO. Paths of Infection: The First World War and the Origins of the 1918 Influenza Pandemic. *War in History* 2014; 21 (1): 55.
- Lunn JH. War Losses (Africa). International Encyclopedia of the First World War. 2017, January 8. Retrieved on May 15, 2020 from: https://encyclopedia.1914-1918-online.net/article/war_losses_africa.
- Rathbone R. World War I and Africa: Introduction. *The Journal of African History* 1978; 19 (1): 1.
- Morrow Jr. J. H. Black Africans in World War II: The Soldiers' Stories. *The Annals of the American Academy of Political and Social Science* 2010; 632: 13.
- Pallaver K. Organization of War Economies (Africa). International Encyclopedia of the First World War. 2015, September 17. Retrieved on May 15, 2020 from: https://encyclopedia.1914-1918-online.net/article/organization_of_war_economies_africa
- Adekunle IA, Onanuga AT, Akinola OO and Ogunbanjo OW. Modelling spatial variations of coronavirus disease (COVID-19) in Africa. *Science of the Total Environment* 2020; 729: 1-4.
- Berhan Y. Will Africa be Devastated by Covid-19 as Many Predicted? Perspective and Prospective. *Ethiopian Journal of Health Sciences* 2020; 30 (3): 459-467.
- Napoli PE and Nioi M. Global Spread of Coronavirus Disease 2019 and Malaria: An Epidemiological Paradox in the Early Stage of a Pandemic. *Journal of Clinical Medicine* 2020; 9 (4): 4, 2.
- Gilbert M, Pullano G, Pinotti F, Valdano E, Poletto C, Boëlle P Y, D'Ortenzio E, Yazdanpanah Y, Eholie SP, Altmann M, Gutierrez B, Kraemer, MUG and Colizza V. Preparedness and vulnerability of African countries against importations of COVID-19: a modelling study. *Lancet* 2020; 395 (10227): 871-877.
- International tourism, number of arrivals. World Bank. 2020. Retrieved on May 13, 2020 from: <https://data.worldbank.org/indicator/ST.INT.ARVL?view=map>.
- Mustafa F and Green R J. The implications of COVID-19 for the children of Africa. *SAMU: South African Medical Journal* 2020; 110 (6):
- Niu S, Tian S, Lou J, Kang X, Zhang L, Lian H and Zhang J. Clinical characteristics of older patients infected with COVID-19: A descriptive study. *Archives of Gerontology and Geriatrics* 2020; 89: 4.
- Wang L, He W, Yu X, Hu D, Bao M, Liu H, Zhou J and Jiang H. Coronavirus Disease 2019 in Elderly Patients: Characteristics and Prognostic Factors

- Based on 4-week Follow-up. *Journal of Infection* 2020; 80 (6):639; also see Liu K, Chen Y, Lin R and Han K. Clinical features of COVID-19 in elderly patients: A comparison with young and middle-aged patients. *Journal of Infection* 2020; 80(6): e14-e18.
20. Compiled and computed from the 2020 CIA World Factbook. Available at: <https://www.cia.gov/library/publications/the-world-factbook/>.
 21. Muscogiuri G, Pugliese G, Barrea L, Savastano S and Colao A. Obesity: The “Achilles Heel” for COVID-19? *Metabolism* 2020; 108: 2.
 22. Zheng KI, Gao F, Wang XB, Sun QF, Pan KH, Wang TY, Ma HL, Chen YP, Liu WY, George J and Zheng MH. Obesity as a Risk Factor for Greater Severity of COVID-19 in Patients with Metabolic Associated Fatty Liver Disease. *Metabolism Clinical and Experimental* 2020; 108: 1.
 23. Arku G. Rapidly Growing African Cities Need to Adopt Smart Growth Policies to Solve Urban Development Concerns. *Urban Forum* 2009; 20 (3): 253–270.
 24. Cohen B. Urbanization in Developing Countries: Current Trends, Future Projections, and Key Challenges for Sustainability. *Technology in Society* 2006; 28 (1-2): 70.
 25. Potts D. Whatever Happened to Africa’s Rapid Urbanisation? Africa Research Institute. London, England. 2012, February 15. Retrieved on May 10, 2020 from: <https://www.africaresearchinstitute.org/newsite/podcast/whatever-happened-to-africas-rapid-urbanisation-2/>.
 26. Potts D. The Slowing of sub-Saharan Africa’s Urbanization: Evidence and Implications for Urban Livelihoods *Environment & Urbanization* 2009; 21 (1): 253-259.
 27. Zhao S, Zhuang Z, Ran J, Lin J, Yang G, Yang L and He D. The association between domestic train transportation and novel coronavirus (2019-nCoV) outbreak in China from 2019 to 2020: A data-driven correlational report. *Travel Med Infect Dis.* 2020 Jan-Feb; 33: 1-3.
 28. Becchetti L, Conzo G, Conzo P and Salustri F. Understanding the heterogeneity of adverse COVID-19 outcomes: the role of poor quality of air and lockdown decisions,” 2020, April 15; Available at SSRN 3572548. https://papers.ssrn.com/sol3/papers.cfm?abstract_id=3572548.
 29. Briz-Redón Álvaro and Serrano-Aroca Á. A spatio-temporal analysis for exploring the effect of temperature on COVID-19 early evolution in Spain. *Science of the Total Environment* 2020; 728: 1-7.
 30. Hunter P. The Spread of the COVID-19 Coronavirus: Health Agencies Worldwide Prepare for the Seemingly Inevitability of the COVID-19 Coronavirus Becoming Endemic. *EMBD Reports* 2020; 21 (4) e50334: 1-3.
 31. Memarzadeh F. Literature Review of the Effect of Temperature and Humidity on Viruses. *ASHRAE Transactions* 2012; 118 (1):1049-1060.
 32. Xu R, Rahmandad H, Gupta M, Ghaffarzagdegan N, DiGennaro C, Amini H and Jalali MS. Weather Conditions and COVID-19 Transmission: Estimates and Projections. medRxiv 2020, May 12; Page 10. Available at: https://projects.iq.harvard.edu/files/covid19/files/weather_and_covid-19_preprint.pdf
 33. Araújo MH and Naimi B. Spread of SARS-COV-2 Coronavirus Likely Constrained by Climate. medRxiv 2020;7-8. Available at: <https://www.medrxiv.org/content/10.1101/2020.03.12.20034728v3.full.pdf>
 34. Balogun JA. Lessons from the USA Delayed Response to the COVID-19 Pandemic. *African Journal of Reproductive Health* 2020; 24 (1): 14-21.
 35. Iken O, Abakporo U, Ayobami O and Attoye T. COVID-19: Travel health and the implications for sub-Saharan Africa. *Travel Medicine and Infectious Disease* 2020; 1-4. Doi: [10.1016/j.tmaid.2020.101645](https://doi.org/10.1016/j.tmaid.2020.101645).
 36. Kapata N, Ihekweazu C, Ntoui F, Raji T, Chanda-Kapata P, Mwaba P, Mukonka V, Bates M, Tembo J, Corman V, Mfinanga S, Asogun D, Elton L, Arruda LB, Thomason MJ, Mboera L, Yavlinsky A, Haider N, Simons D, Hollmann L, Lule SA, Veas F, Abdel Hamid MM, Dar O, Edwards S, Vairo F, McHugh TD, Drosten C, Kock R, Ippolito G and Zumla A. Is Africa prepared for tackling the COVID-19 (SARS-CoV-2) epidemic. Lessons from past outbreaks, ongoing pan-African public health efforts, and implications for the future. *International Journal of Infectious Diseases* 2020; 93: 233-236.
 37. Okonofua FE, Eimuhi KE and Omonkhua AA. COVID-19: Perspectives and Reflections from Africa. *African Journal of Reproductive Health.* 2020; 24 (1): 10.
 38. Nkengasong JN and Mankoula W. Looming threat of COVID-19 infection in Africa: act collectively, and fast. *Lancet* 2020; 395 (10227): 841-842.
 39. Nuwagira E and Muzoora C. Is Sub-Saharan Africa prepared for COVID-19? *Tropical Medicine & Health* 2020; 48 (1): 1-3.
 40. Dyer O. Covid-19: Africa Records Over 10,000 Cases as Lockdowns Take Hold. *BMJ* 2020; 369: 1.