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Analyzing the ultimate impact of COVID-19 in Africa

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1. Introduction

A pandemic, as an expression, is a worldwide disease outbreak where there is no vaccine. It causes substantial absenteeism, changes patterns of commerce, and has limited immediate medical solutions, interrupting supply chains; all of which can have devastating effects on the operations and sustainability of small transportation organizations. This raises the question: is pandemic preparedness different from other possibly catastrophic hazards (e.g. hurricanes, earthquakes, hazardous materials spills)? Yes, because disasters influence infrastructure and effect physical damage to people and structures, but pandemics affect all society and human resources.

In China, about 80,151 cases of Covid-19 were detected in early 2020 (BBC News, 2020). They were detected and confirmed in Wuhan city, China (Li et al., 2020). Internationally, more than 10,566 additional cases were detected and confirmed in 72 countries (Egypt Today, 2020). On January 30, the World Health Organization declared the coronavirus outbreak a Global Public Health Emergency, automatically using ArcGIS GeoEvent Server to push updates to a single feature service multiple times per day. It spread to Africa on 14 February 2020. The first confirmed case was in Egypt (Li et al., 2020; Egypt Today, 2020).

Compared to the 2002/2003 SARS-CoV and the 2012/2014 MERS-CoV (Middle East Respiratory Syndrome-related coronavirus), the coronavirus spread extremely quickly. While MERS took about two years to infect 1000 people, and SARS took roughly 4 months, the novel SARS-CoV-2 reached that figure in just 48 days (Boulos and Geraghty, 2020). The proportion of daily deaths by region is shown in Fig. 1. It can be seen that there was a huge spread in Asia in April and May, with the first African appearance in May (peaking in July).

The World Health Organization released a statement on the second meeting of the International Health Regulations Emergency Committee regarding the outbreak of novel coronavirus (2019-nCoV), in Geneva, Switzerland, on 30 January 2020 (World Health Organization website, 2020). One of the biggest impacts has been the reduction in passenger transport demand, due to a combination of government lockdowns and fears of contracting and spreading the virus when using mass transport modes (Tirachini and Cats, 2020; Elhenawy et al., 2020).

Cases had begun their reduction from the end of July, subsequently increasing in October; whereas deaths rates continuously increased, as seen in Fig. 2, giving an indication of successful government policies in terms of popular response, where little low medical care was needed to save people. This graph shows cumulative totals of confirmed cases and
COVID-19 deaths for Africa. Governments apply public and transport lockdown policies to reduce number of cases resulting from direct contact with closed areas (Milken Institute website, xxxx). A regression analysis by Asweto et al. of the actual cases confirmed that the maximum public mobility and the residential mobility decreased by 38.15% and 23.17% respectively. Also, about 1% change in a public transport mobility resulted in 167 fewer daily cases, while total lockdown resulted in 581 fewer daily cases (Asweto et al., 2020). At the end of July, the transport lockdowns policies were reflected in the reduced number of cases (Le et al., 2020).

Public transport is the backbone of cities, providing an essential service to keep cities moving. It is also an investment that creates jobs while reducing carbon emissions, making roads safer and improving people’s access to jobs and other activities (Policy Responses, 2020). There is a mutual effect from the beginning of the virus spread; the public transport decision makers go towards closers as a restriction of a travel behavior according to statistics of contributes to the number of cases and deaths.

Human transport habits such as accessibility constraint can control numbers of covid-19 cases (see Fig. 2). Many studies go towards studying the indirect effect of mobility and accessibility on the spread of the Covid-19. It is determined that the greater the accessibility of a certain geographical area, the easier the virus reaches its population (Carteni et al., 2021). Others try to find a relationship between the number of patients and the balance of human mobility. They indicate a positive relationship between the percentage of elderly population and the number of cases, assuming that the well-connected areas are more likely to be infected first and have more infections (Carteni et al., 2020).

In the last few months, many new words and expressions have insidiously made their way into our collective vocabulary. Earlier, “lockdown”, “furlough”, “pandemic” and “social distancing” were unfamiliar terms. The virus is still very much present. There is a need to flatten the curve and avoid another peak. There are many questions: Are there sufficient local trains, metro trains, and public buses to ensure social distancing? Are they safe and sanitized every few hours? Unfortunately, there is no confidence yet, especially in developing countries, with little awareness from citizens needing to make their usual trips.

All over the world, public transport has become a facility not just for specific people but for all urban residents. It is one of the sustainable strategies. Lockdowns are also putting an incredible strain on public transit systems worldwide. Transit ridership is down between 50 and 90% (Welle and Avelleda, 2020). In developed countries, the strict lockdown imposed in the UK in (Egypt Today, 2020) has led to a 95% decrease in underground journeys in London. Africa has different tools to deal with such a crisis, given its poor resources, which require attention.

There are many data resources for African countries, such as the International Health Regulations Monitoring and Evaluation Framework, which says that Africa ‘performs worst in almost every area’ while Universal Health Coverage (UHC) confirms that Africa fares worse than the rest of the world. All these organizations intended to analyze the impact of disease. However, by 30 (Egypt Today, 2020), cases in Africa remained low compared to other regions (see Fig. 1 Our World Data website, 2020). Based on anonymized mobile phone data, South Africans in all provinces reduced their mobility substantially in response to the government’s lockdown orders, causing reduction in number of cases (Carteri and Makhura, 2021).

Healthcare in Africa is not at a high level. According to an Africa Centers for Disease Control and Prevention (Africa CDC) report, only 10 African countries provide free and universal health care to their citizens, while healthcare in 22 countries is neither free nor universal. Despite this, transport sectors in most African countries follow the same restrictions systems that appear to decrease virus spread. In Africa, many such authorities aim at collecting data by the day to assist policy makers in finding the perfect solution (Africa Centers for Diseases Control and Prevention, 2020).

Analyzing the mutual impact of such disease encompasses the public transport closures, school closures, trip restrictions, and restrictions to internal movement. Also, the direct impact of the pandemic on the travel behavior and mobility such as on the number of visitors to transit stations and parks and outdoor spaces has been analyzed. Data from an Oxford study has been used with real-time updates on each day for four months (Ibrahim Index of African Governance, 2020). This study considers the monthly effect in the last days of each month to show changes of the effect.

The previous section was an overview of Coronavirus and its profound effects all over the world generally, especially Africa. It can be noticed to it is clear impact between transport policies on the crisis and the spreading of the pandemic. This study takes such impact as a main issue. The study determines the effect of Covid-19 on government decisions. The travel behavior and policies in April, May, June, and July are demonstrated and discussed depending on the available data on

![Fig. 1. Proportion of daily deaths by region (%). Source: ECDC Covid-19 tracking project, https://www.ecdc.europa.eu/en/geographical-distribution-2019-ncov-cases.](https://www.ecdc.europa.eu/en/geographical-distribution-2019-ncov-cases)
maps from Our World Data website and collected data of the pandemic effects in Africa. The research will be organized into four parts, excluding the introduction and conclusion, as follows: changes of the pandemic statistics in Africa; travel behavior and policy responses in Africa; the direct impact of the pandemic on travel behavior and mobility; and the potential economic situation.

2. The changes of the pandemic statistics in African countries

The continent benefited from the somewhat slow arrival of the virus in Africa. This gave its 54 countries a window to develop testing and treatment capabilities, and 33 sub-Saharan African countries have testing facilities, compared to only two in January (in South Africa and Senegal). In Nigeria, the NCDC publishes daily reports with updates on cases, while providing a toll-free phone number and WhatsApp for inquiries and advice. The South African National Institute of Communicable Diseases also has a toll-free number (BBC, 2020).

There are not many confirmed cases in East Africa, with quarantine largely a precaution in Kenya, in the North, East and West of the country. Uganda has imposed self-isolation at home for passengers who need to be quarantined upon arrival at Entebbe Airport. The impact of public transport policies and other policies on coronavirus spreading is shown in the number of cases in Fig. 3. It can be seen that cases increased in April, May, June, and July for all countries, with a noticeably high increase for South Africa. July saw a noticeable decrease in most countries.

2.1. Number of Covid-19 cases in African countries

2.2. Number of confirmed Covid-19 deaths

According to Oxford COVID-19 Government Response Tracker for last days of the four months April, May, June, and July 2020 as shown in Fig. 4 (Our World Data website, 2020). Southern African countries have lowest change compared with other countries, which may reflect the former’s low healthcare.

Some countries such as Burkina Faso took precautionary measures, deciding to impose a curfew from seven in the evening until five in the morning and to close all air borders. The Senegalese government took strict measures, such as closing borders and suspending flights, except for cargo and medical flights, as well as closing schools, universities and mosques.

3. Travel behavior and policy responses in Africa

For the last four months, in Africa, policy responses attempted to limit the spread of Covid-19 by restricting (wholly or partially) people from movement, depending on pandemic risk. Policies implemented were stay at home restrictions, school and workplace closures, and restrictions to internal movement.

3.1. Stay at home restrictions

Stay at home meant a ban on any trips from the time of the virus’s first appearance, gradually decreasing to partial prohibition on to travel (Bendavid et al., 2021). Fig. 5 shows the restrictions distribution of staying at home from required to recommended restrictions. Decisions from policy makers are range between recommended, required (except essentials), and required (few exceptions) according to the number of daily cases in each country. In April, few exceptions operated in all southern countries because of high spreading with low healthcare; this was changed to recommended in June and July when the number of daily cases decreased to about 23%. In other areas risk continuity required more cautious procedures.

3.2. School and workplace closures

Most countries tend towards closing schools and workplaces as these are the most regular activities involving human contact, and addressed use of private cars or public transport (Rodrigue, 2020). Fig. 6 shows the policy categories descending required (all levels), required (only some levels), and recommended according to its importance in the specified month. As shown, for all areas, required (for all levels) operated in April and May because of high incidence of cases, but this converted to a recommended restriction only in south areas as reaction to the reduction in number of cases in June and July. Once government noticed the reduction in cases, it reduced the restriction needing level.

3.3. The internal movement restrictions

Strict limits to reduce internal movement operated in high risk areas, while movement restriction was recommended where risk was less. Fig. 7 shows that the measured countries still use the internal movement restrictions.

![Graph showing total confirmed cases and deaths in Africa](xxxxx).
restriction as a policy to restrict the spread of disease. This restriction is considered the most effective one among all others, in terms the noticeable effect on reducing the number of new daily cases in July (Milken Institute website, xxxx). In April and May, more than 90% of countries required or recommended movement restriction, whereas in June and July “required” reduced to about 60% of all areas, suggesting the positive impact of government restrictions.

All the above restrictions reduce spreading of the virus by enforcing lockdowns and physical distance between people. They can be classified into precautionary restrictions such as avoiding home, school and work; and internal movement restrictions and subsequent restrictions (depending on the pandemic case) such as public transport stations and closures that will be studied as the impact of pandemic on travel behavior and mobility. Both are needed to complete the pandemic management protocol. Low numbers of people needing to travel means high mobility of people and vehicles. The next paragraphs show the impact of the pandemic on travel behavior and mobility.

4. The direct impact of the pandemic on travel behavior and mobility

Two characteristics (public transport stations and parks & outdoor spaces) were chosen to represent travel behavior. Public transport closures statistics serve as an indication of mobility. All data is for the same days (at the end of each month): April, May, June, and July 2020.
Fig. 5. the changes of staying at home restrictions.

Fig. 6. the changes of school and workplaces closure restrictions.
4.1. Public transport stations and parks & outdoor spaces

The number of visitors to transit stations has changed relative to the period before the pandemic. Fig. 8 illustrates the number of visitors of most cities. The movement restrictions had been reduced as the spread of the pandemic slowed spreading during the study period. Such change is apparent since the beginning of the pandemic. It may be concluded that this is an effect of the national travel restrictions that more or less stopped travel for people and manage using private cars. It can be observed that all countries which recommended the restriction have subsequently relaxed it, indicating the positive relationship.

4.2. Public transport closures

Mobility is the ability to move or be moved freely, safely and affordably between where one lives and where one wants to go. Because of coronavirus, closures in public transport were policies adopted to reduce infection spreading during the beginning and peak period. They

Fig. 7. The changes of internal movement restrictions.

Fig. 8. The changes of internal movement restrictions.
are used here as an indication of mobility. When closures decrease, mobility in public transport increases (Organization, 2020). The trend of closures during May to July, when the pandemic was at its peak, is shown in Fig. 9. For example, in Egypt, at the end of May 2020, public transport was closed or prohibited; but by the end of July, reduced volume was recommended, giving more mobility to users. It was recommended to use such policy in south of Africa all the time. Small distance between people in transport mode with low healthcare makes a fear of the virus spreading.

Since the measures relating to public transport, the spread of the pandemic had reduced from 21% to 34% during the four months. This can be attributed to the implementation of policies after the infection first appeared, restricting movement and emptying roads at most hours of the day. By reducing the use of private and polluting vehicles and encouraging soft mobility, human powered (non-motorized) or small e-mobility modes (e.g., e-bike, e-scooter etc.) have been encouraged. Hence, there is a mutual effect between the pandemic and transport policies, summarized in Table 1.

Although there are problems arising from this crisis, there are many benefits, both in the short-term and long term. In the short term, public and active transport could deliver efficient mobility services after the lockdown, supporting economic growth. In the longer term, investments in public and active transport could pay off in a number of ways. For example, the introduction of a bike sharing scheme in Washington DC has reduced traffic congestion by 4% (Grimes, 2020), resulting in significant cuts in congestion-related CO₂ emissions. Encouraging a shift away from car use might also reduce serious traffic-related accidents, and associated costs. In California, one silver lining of the Covid-19 lockdown has been a halving of traffic collisions and related injuries, saving the state $40 million per day (Kerlin, 2020).

The long-term implications and impacts of COVID-19 on public transport and shared mobility and in general mobility behavior cannot be fully assessed at the present moment. It is clear, however, that all possible efforts need to be made to ensure that measures are taken by governmental agencies, public transport and share mobility companies.

5. The potential economic situation with Covid-19 in Africa

The Covid-19 crisis undoubtedly affects economic growth. Many studies contribute towards explaining such effects, such as the African

| Policy | Outcomes | Impact |
|--------|----------|--------|
| Stay at home restrictions | • Reduce exposure among people | • Minimize Covid-19 spreading |
| | • Reduce transmission | • Fix social prosperity |
| | • Maximize mobility on roads | • The emergence of distance work and education |
| | • Reduce crowding | • Increase public awareness |
| School and workplace closures | • Allow government to prepare hospitals and source supplies | • Minimize Covid-19 spreading |
| The internal movement restrictions | • Reduce the probability of infection and number of cases | • Harmful economic impact |
| Public transport stations and parks & outdoor spaces | • Enhance safety of private car usage | • Minimize Covid-19 spreading |
| Public transport closures | • Encourage using bikes and walking | • Solve parking problems |
| | • Active differentiation between public and clean modes | • Manage high mobility |
| | • Reduce crowding on public transport | • Reduce air pollution |
| | • Aid decision makers in choosing the effective policy, according to pandemic statistics | • Cooperative agreements |

Fig. 9. The changes of the public transport closures during the COVID-19 pandemic.
Development Bank Group assessment paper on the macroeconomic and welfare effects of Covid-19 in Africa (Habib et al., 2012). The Group adopts a micro–macro sequential simulation approach to model the trade, tourism, and financial flows (African Developing Bank Group website, xxxx). They predict that pandemic scenarios could push African countries into recession, with real GDP growth rates reduced by 3.4% in the worse-case scenario (Habib et al., 2012). The World Bank reports that South Africa’s gross domestic product (GDP) fell by 51% from the first to the second quarter of 2020, and suggests that approximately 26 to 40 million sub-Saharan Africans affected by the pandemic may fall into poverty (GIGA Focus Africa, xxxx).

As for predictions of lockdown effects in future, the International Growth Centre IGC predicts that if full lockdowns were long-lasting in all sub-Saharan African countries, 77 million people, including 10.9 million children, could fall into extreme hunger (Teachout and Zipfel, 2020). The situation in Africa and the existing and potential economic repercussions on it can be illustrated by the following points:

- Emerging markets are damaged by a significant decline in Chinese demand, and a sharp drop in commodity prices. Investors are particularly displeased in the capital markets in South Africa, since many companies in the country have been exposed in their dealings with China (Gopaldas, 2020). These factors have an immediate impact on the levels of demand for African agricultural and livestock exports, such as Namibian meats, Rwandan coffee, Kenyan tea and citrus fruits from South Africa.
- Currencies came under pressure. These include the Nigerian currency (naira), because oil accounts for 90% of Nigerian exports (Lagos and Cotterill, 2020). The reduction in the oil demand, in the first quarter of 2020, has been assessed at 6% in a report prepared by the World Bank (Alanezi et al., 2020; Rajput et al., 2020).
- The effect on the tourist sector can be seen in the approximately 46% decrease in the number of travelers and tourists between China and Africa. Many African airlines launched a significant number of regular flights to transport students, workers and tourists between the two sides; observers expect this sector will be severely affected, perhaps until the end of 2020.
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- The effect on the tourist sector can be seen in the approximately 46% decrease in the number of travelers and tourists between China and Africa. Many African airlines launched a significant number of regular flights to transport students, workers and tourists between the two sides; observers expect this sector will be severely affected, perhaps until the end of 2020.

6. Conclusions

Covid-19 is the most significant new disease affecting the world. There is a mutual impact between the disease and the restriction policies because if there is no disease, there is no need for restrictions; and if there are no restrictions, the pandemic will spread and create real crisis. This can be seen from the statistics in the last month that encouraged decision makers to reduce restriction requirements.

This research discusses the direct impact of the COVID-19 pandemic in Africa in terms of the travel behavior, mobility impacts and effects of restriction procedures. The recorded statistics for the most affected four months are employed. Additionally, the effects of changes on travel behavior and policies recommended are shown in terms of the recorded number of infected people each month. The impact of the virus spreading on travel behavior is reflected in the number of visitors to transit stations. The main reasons for its impact on mobility are the risk and safety of travel modes.

Three main impacts of Covid-19 are, as mentioned: the mobility index, the spread of the virus, and the potential economic situation. This study gives a view about what has happened in Africa, and the effect of procedures taken by decision makers on the transport, environment, and on economic fields. It is too early to know the long-term effects but the study contributes towards the ongoing research on the pandemic’s direct and indirect impacts, especially on travel behavior and mobility. Enhanced health care levels will be required. As the transport policies and the number of cases begin to decrease, mutual impact is identified. Many studies have analyzed the transit policies and their impact on the number of cases. A change of approximately 1% in public transport mobility results in 167 fewer daily cases, while total lockdown (decided by the government after the disease had spread) results in 581 fewer daily cases.

The World Bank shows the economic impact in the reduction of GDP by 3.4%. About 26 to 40 million sub-Saharan Africans affected by the pandemic may fall into poverty, and this may reach 77 million people if lockdowns continue. Additionally, the reduction in the oil demand is about 6%. These data show the mutual influence between the crisis and the transport sector.

Finally, it can be concluded that governments should consider the closure a first step towards the plans that have proven their efficiency in developed countries, such as micro-mobility, artificial intelligence and others. The following recommendations are offered:

1. Activating early warning and immediate intervention mechanisms of the African Peace and Security Council; and establishing regional follow-up and coordination centers.
2. Exchanging information at the continental level, and with all countries of the world.
3. Immediate intervention by the World Health Organization and the United Nations, to provide the continent with expertise, money and information.
4. African countries should benefit from the experiences of the epidemics that struck them before Covid-19, including AIDS and Ebola, in two respects; developing health infrastructure and restructuring their economies, with a view to reduced dependence on exporting raw materials, and to achieving self-sufficiency.
5. Preventing the spread of the virus through lockdowns in order to permit more time for preparation of hospitals, source supplies, as well as learning from treatment innovations perfected elsewhere.
6. For the public transportation sector, decision makers should implement novel policies to control the spread of disease, with minimum loss.
7. Given the importance of health care, Southern Africa would benefit from the adoption of such policies for the duration of the pandemic. This will create social and economic pressures.

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