

Effectiveness and impact of COVID-19 response and vaccination challenges in Namibia: a systematic review

Andrew Niikondo,¹ Omotayo Awofolu²

¹Office of the Deputy Vice-Chancellor, Teaching, Learning and Technology, Namibia University of Science and Technology, Windhoek; ²Department of Health Sciences, Namibia University of Science and Technology, Windhoek, Namibia

Abstract

Introduction: Namibia, as with many countries around the world is experiencing devastating impact of Covid-19 disease on the economy, psycho-social interactions, and well-being of the populace. These countries implemented several measures to limit the spread of the virus responsible for the severe acute respiratory syndrome (SARS-CoV-2). Namibia also put measures in place to curtail the spread and fatalities due to the virus. However, the nature and implementation strategies of Public Health regulations seriously have impact on preventing the spread and curtailing fatalities arising from the virus.

Objective: This article presents a report on the effectiveness and impact of Public Health measures instituted by the Health Authority towards curtailing the scourge of covid-19 on the general populace.

Method: Elements of the PRISMA protocol was utilised in the review which enabled the synthesis of data on focused area. Multifaceted databases on covid-19 such as Scopus, ScienceDirect, Google Scholar, World Health Organisation and the Ministry of Health and Social Services of Namibia (MoHSS) among others was used.

Result: A steady increase in covid-19 infection at an average rate of eleven (11) per day was noted in the country up till June 2021. Highest rate was linked to densely populated regions of Erongo and Khomas. Control measures for infection prevention and vaccination drive was ineffective majorly as a result of misinformation.

Conclusion: A paradigm shift of enhanced interaction with local populace for effective information dissemination is required towards limiting the scourge of the virus and hence, saving of lives.

Introduction

The Severe Acute Respiratory Syndrome 2 (SARS-CoV-2) is responsible for the Covid-19 or coronavirus disease. Typical symptoms include high fever, dry cough, continuous headache, and tiredness.¹⁻² The earliest reported incidence of COVID-19 in Namibia was on 13 March 2020 which led the Ministry of Health and Social Services (MOHSS) declaration of the outbreak on 14 March 2020. This was followed by sporadic increase in infection rate.³ Thereafter, the situation became worse as a result of reported high rate and number (in hundreds) of infection and hospitalisation due to ill-health as a consequence of COVID-19.

Currently, there are no specific and curative medicines for the treatment of COVID-19, however, the eventual development of vaccines provided a glimmer of hope for curtailing the spread and impact of the virus. and Namibia has been administering predominantly Sino Pharm, Astra Zeneca and John and Johnson vaccines. Despite these developments, restrictive public health measures such as stay-at-home, physical distancing, and quarantine where applicable are enforced not only in Namibia, but also in many countries around the world to reduce transmission of the virus. COVID-19 spreads from an infected person to others through respiratory droplets and aerosols (smaller droplets) created when an infected person: talks, sings, shouts, coughs, sneezes etc.

COVID-19 can also spread by touching something that has the virus on it, then touching your mouth, nose, or eyes with unwashed hands. COVID-19 virus can be transmitted before the on-set of symptoms while other people may have been infected but are asymptomatic. In view of little or no research and scientific information on the spread, preventative Public Health measures and hospitalization management procedure in many developing countries especially in Africa, there has been over reliance on WHO directives and information from developed countries such as USA, UK, and France. This situation gross left many developing countries including Namibia in vacuum towards coherent, effective, and decisive approach for the management of the menace of the virus.

Correspondence: Andrew Niikondo; P. Bag 13388 NUST, Windhoek, Namibia; Tel: +264- (0) 61-207 2322; aniikondo@nust.na

Key words: Pandemic, SARS-CoV-2, Virus, Public Health, Respiratory Droplets.

Contributions: AN conceptualised the manuscript, prepared the layout, and draft concept of the study. Further data search, collection, assessment, vetting and general writing of the manuscript was carried out by OA. Overall correction, review and inclusion of additional literature was done by AN.

Conflict of interest: the authors hereby declare no conflict of interest.

Acknowledgement: none.

Received for publication: 30 May 2023.

Accepted for publication: 22 November 2023.

Published: 18 December 2023.

This work is licensed under a Creative Commons Attribution NonCommercial 4.0 License (CC BY-NC 4.0).

©Copyright: the Author(s),2023

Journal of Public Health in Africa 2023; 14:2094

doi:10.4081/jphia.2023.2094

Perspectives of Covid-19 Management Approach: The Antecedent

Global Perspective

Apt management of the spread of COVID-19 virus across the globe require a multi-faceted approaches. The World Health Organisation has been at the forefront of issuing regulations towards preventing the spread of the virus. Such measures include the wearing of facial masks that covers the mouth and nose as part of a comprehensive package of prevention and control measures to limit the spread of SARS-CoV-2, the virus that causes COVID-19.⁴ Other measures include hand hygiene through regular washing of hands with soap, observing physical distancing of at least 1.5 metre from the next person, being the average distance, the virus laden aerosol can travel in air, avoidance of touching one's face, respiratory etiquette, adequate ventilation in indoor settings, testing, contact tracing, quarantine and isolation were initiated.⁵ Together, these measures are critical to prevent human-to-human transmission of SARS-CoV-2.

The Namibia perspective

Namibia, just as many of the sub-Saharan and African countries depend mostly on information and directives emanating from the global World Health body, the WHO for guidance towards managing the spread of COVID-19 virus in the country. This reliance can be attributed to paucity of local research drives for effective Public Health control and management measures. The country, as most of the developing countries also instituted preventative directives of wearing of masks, physical distancing, frequent hand washing, and limiting the sizes of gatherings. However, the effectiveness and impact of these control measures towards preventing and curtailing the spread of the virus, especially in low-income suburbs remain the big question. These behavioural management and control elements were largely meant to interrupt the chain of spread of the virus from one person to another especially in open and public places.

However, compliance with these measures are largely ignored by some members of the populace and hence, become ineffective in achieving the intended purpose.⁶ In developing countries, there is the perception that non-adherence to covid-19 regulations is related to socio-economic status especially among low-income people and within informal settlement communities. This perception may not necessarily be true or generalised. However, several factors such as misinformation may be attributed to the increasing number of cases of new infections. Windhoek, the capital city of Namibia is housed to about 268, 132, 000 inhabitants, which account for about one-ninth of the total population of 2,603,202 of the country based on projections of the latest United Nations data.⁷ In terms of global economic and income status, Namibia has been classified as middle-income country due to the per capital income status.⁸⁻⁹ The country is also regarded as one of the most unequal society in terms of income/wealth distribution.¹⁰⁻¹¹ The distribution of wealth among people sometimes dictates or influences the choice of area in which they live. More often than not, high income earners tend to live in residential areas that are well maintained with sufficient municipal services. Whereas low-income groups are synonymous with areas that are not as aesthetically pristine as those of the high-income groups. Low-income communities, especially in developing countries are generally assumed to be unplanned, crowded and devoid of aesthetic.¹²⁻¹³ The number of inhabitants per square meter and per household in these areas, especially in the informal settlement are quite high and

amenable to easy and uncontrolled spread of COVID-19 virus. In addition, it is quite difficult to monitor and enforce the basic preventative measures such as wearing of mask, safe hygiene practices such as regular washing of hands and safe distance keeping.

A causal relationship between population and the number of COVID-19 infections per local area revealed the disproportionate large number of infections emanating from these low-income suburbs. This trend may also be exacerbated by the increasing rural-urban migration influx of people to the capital city of Windhoek in search of jobs and improved standard of living. With limited resources and inability to secure employment, such local migrants end up living in squatters or informal settlements which may contribute to increase in infection rate within these communities. Namibia recorded 650 deaths that were linked to Covid-19 in the month of May 2021.¹⁴ During this period, the country's daily confirmed Covid-19 cases and deaths per million people has surpassed that of South Africa (SA), India, Brazil, and the United States.¹⁵ Namibia recorded 648,87 positive cases per million people, whereas South Africa stands at 254,31 per million people during the month of June 2021. This can be classified as alarming considering a country with a population of about 2.5 million inhabitants.¹⁶

The global drive towards preventing the spread of SARS-CoV-2 virus, hospitalisation and death is the massive vaccination of people. Quite a number of vaccines against the virus have been developed by biotechnology organisations in countries around the world. Some of these include AstraZeneca, Sinopharm, Pfizer, Johnson and Johnson, Sputnik V and Covaxin that has recently been authorised for emergency use in India. With the increased administration of vaccine to people across the world including Namibia, countries have started reducing and, in many cases, lifting restrictions on movements of people. This is expected to open up economies and usher in high level of social interactions with gradual return to pre-pandemic period.

However, this lofty expectation is being hampered by the anti-vaccine denialists and several misinformation about the vaccine across the world that tend to scare people from being vaccinated. This will definitely pose serious problem towards the attainment of "herd" immunity which many governments are aiming to achieve. In Namibia, there are similar resistance to government efforts to ensuring the vaccination of the populace. One-thirds of survey population in a study revealed unwillingness to be vaccinated due to safety concern.¹⁷ Hence, it becomes imperative to elucidate on

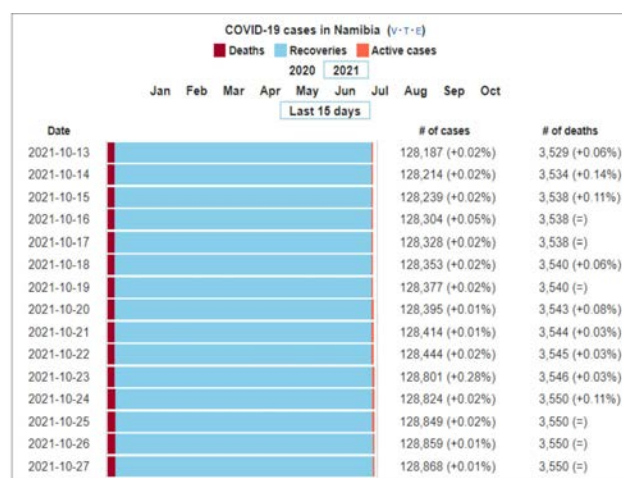


Figure 1. Covid-19 active, recovery and fatality cases in Namibia as of 27 October 2021 (<https://en.wikipedia.org>).

possible factors that may contribute to low drive towards vaccine uptake in the country.

Methods

Search Strategy and Selection Criteria

A systematic review of effectiveness and impact of Covid-19 response and challenges with respect to vaccination process in Namibia was carried out. Elements of the Preferred Reporting Items for Systematic Reviews and Meta-Analyses (PRISMA) protocol was utilised. This enabled the synthesis of data on the focus of the review with potential areas of further studies and enunciated later in the review. We utilised multifaceted sources of information on Covid-19 that are relevant to the national imperatives and the global discussion. By this, top data bases such as Scopus, Science Direct, Google Scholar, the World Health Organisation (WHO), the Ministry of Health and Social Services of Namibia (MoHSS) among others were searched. Use of data from these sources are vital for reliability and appropriate deductions on discussion. For substantiality of points of discussion, data (Tables and Figures) were directly accessed from these sources and utilised in the analysis and discussion of outcomes. For coherency, the focus of discussion has been structured to reflect relevant points that are aligned to the purpose of the review. Hence, the search terminology used include a mixture of terms such *trends of covid-19 infection in Namibia*, *covid-19 control measures in Namibia*, *covid-19 vaccination hesitancy*, *effectiveness of covid-19 management and covid-19 information dissemination*.

Inclusion and Exclusion Criteria

Basically, articles that are published in English language in all the above-mentioned searched data bases were included. All articles not published in English language, editorials and letters to editors were excluded.

Since the review entirely make use data and information from online literatures and do not involve human or animal participants, it is the opinion of authors that ethical consideration is not applicable.

Results

Trend of Covid-19 virus infection and vaccination drive in the country

As earlier mentioned, the first case coronavirus infection in Namibia was reported on 14 March 2020. This was followed by sporadic increase in cases at key hotspots such as borders and coastal areas. In spite of immediate preventative measures that were put in place by the health authority, the rate and hence, number of infections increased drastically. By the end of July 2020, about 2052 cases of coronavirus infections had been recorded in Namibia.¹⁸ Lately however, the country has been reported to be recording an average of eleven (11) new Covid-19 virus infections per day with a peak of 1% being the highest reported daily average by June 29, 2021. Recent record revealed about 128, 907 infections and 3,554 corona virus-related deaths (Figure 1) in Namibia.¹⁵

With the availability of vaccines, the expectation was that there will be gradual decrease in the rate of infection, hospitalisation, and fatalities. This was not the case as the 15-day record in the month of October 2021 revealed otherwise as shown in Figure 1.

Covid-19 surveillance and information dissemination pathways

The Centre for Disease Control of Namibia (CDC) under the MoHSS established a communication hotline on 15 March 2020. This was meant to provide assistance and responses to enquiries from the general public including symptomatic individuals.³ The government also utilised State-Owned broadcasting platform such as the Namibia Broadcasting Corporation and other MoHSS social media platforms.¹⁹ This was followed by the establishment of multi-disciplinary emergency response team for testing, surveillance, and monitoring of covid-19 issues in the country including border posts. The declaration of emergency enabled the government to all levels of educational institutions with gradual phased-in reopening plans. Several covid-19 virus testing centres were set up within governmental and private hospitals for handling the increasing rate of infection. The lockdown regulation was initially applied to the two main economic hub regions of Khomas and Erongo in view of the high rate of infection for about twenty-one (21) days. By May 04, 2020, the lockdown was applicable to all regions. Despite these measures, the cases of covid-19 in terms of infections and fatalities continue to increase across all regions but majorly in the two economic hubs of the country as revealed in Table 1.

Covid-19 control measures instituted by the Government of Namibia

One of the foremost control measures instituted by the government after confirmation of the first case on 14 March 2020 in Namibia was the suspension of air flights. A state of emergency

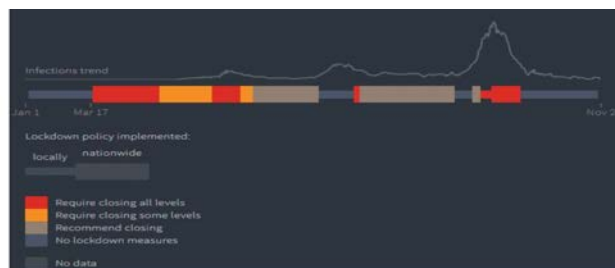


Figure 2a. Lockdown policy implemented for schools in Namibia. Source.¹⁵

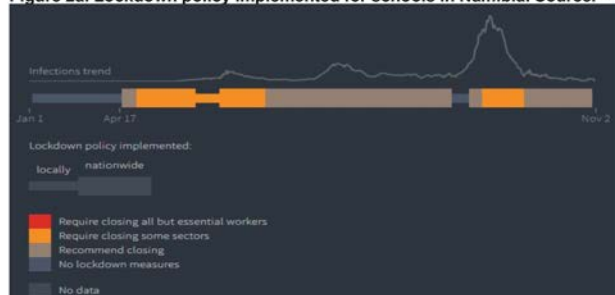


Figure 2b. Lockdown policy implemented for workplaces in Namibia. Source.¹⁵

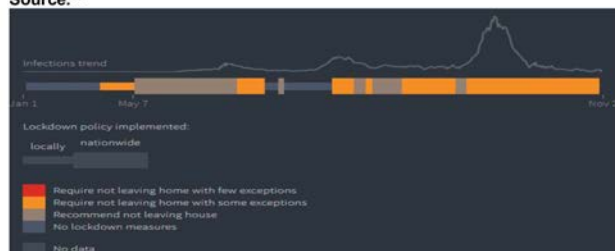


Figure 2c. Stay-at-home policy implemented for in Namibia. Source.¹⁵

was declared by the country's president on 17 March 2020 as a legal means of avoiding public reactions to limitation of citizens basic rights as enshrined in the constitution. This was later followed by the closure of all ports on entry on 18 March 2020. In order to further curtail the spread of the virus, all public and private schools were closed for about a month including prohibition of large gatherings that was reduced to not more than fifty (50) people at that time. Many developing countries such as China, Indonesia,

Philippines, South Africa, Kenya including Namibia also implemented limits on social gatherings and internal travel restrictions spanning a week to couple of months.²⁰ Some closure measures that was implemented by Government of the Republic of Namibia include the closure of schools, workplaces and stay-at-home as presented in Figures 2a to 2c. In addition, several health and safety protocols were provided by the Namibia Minister of Health and Social Services as part of the Public Health Covid-19 General Regulations under the Public and Environmental Health Act of 2015. These regulations include those involving the wearing of masks, public gatherings, restriction of movement (curfew), restriction on sale of liquor, resumption of business operations and activities, provisions relating to workplace, restrictions relating to certain activities, restrictions related to Entry into Namibia, restrictions on quarantine and COVID-19 testing, on public transport and regulation and that of Covid-19 deaths and burials.²¹

Possible militating factors against effective Public Health COVID-19 Virus control measures

In Namibia, the main channel of information dissemination on infectious diseases including COVID-19 virus is the Ministry of Health and Social Services (MoHSS). Apart from access to information through the website of the Ministry, information dissemination channel from the national health management level to regional and local health authorities is mainly through the relevant

district health commissioners to local health authorities. However, compliance to health directives and regulations at low-income and informal settlement are influenced by certain factors. Several factors such as educational level, socio-economic, cultural and behavioural/ attitude of people among others have been reported to exert high influence on compliance with governmental directives and regulations.²²⁻²³

Behavioural change theories and management of Covid-19

The use of behavioural theories for assessing the factors responsible for non-adherence to public health regulations and guidelines was encouraged.²⁴ Such procedures provide pathways for enquiries on pre-assessment strategies, measuring and monitoring parameters and subsequent evaluation. Among often used behavioural theories are the social cognitive theory (SCT), the transtheoretical model (TTM) of change, the health belief model (HBM), and the theory of planned behaviour (TPB).²⁵ However, behavioural changes are modulated by four (4) components which include biological, emotional, cognitive, and environmental functioning. Hence, behavioural changes may be influenced by either or a combination of these components.²⁶ In spite of these, social behaviour can be said to characterize the interactions that occur among individuals. It was however, pointed out that intentional non-adherence to public health regulations is strongly associated with anti-social psychological factors which has been linked to people living in high-risk, low-income, unplanned, and informal settlement environment.²⁷ A typical example of such informal settlement is as shown in Figure 3.²⁸

In order to ensure adherence to public health regulations and guidelines, it is important that these social factors are taken into consideration and public health information should reiterate collective responsibility for the benefit of the whole populace. Incidences of non-adherence to the basic covid-19 regulations of

Table 1 Distribution of confirmed covid-19 cases by region in Namibia as of 13 August 2021

Region	Total No. of Cases	Active Cases	Recoveries	Cumulative Deaths	Cumulative Deaths with Comorbidity	Non-Covid Deaths	Health Workers
Erongo	17 903	678	16 826	394	327	5	405
Hardap	7 336	83	6 999	254	158	0	122
Karas	7 443	59	7 243	141	124	0	225
Kavango East	5 391	30	5 186	175	112	0	244
Kavango West	578	32	532	14	11	0	38
Khomas	41 134	1 181	39 117	835	653	1	1 480
Kunene	3 378	82	3 226	70	58	0	90
Oshana	3 927	267	3 537	121	78	2	138
Omaheke	3 642	27	3 370	245	170	0	119
Omusati	4 874	269	4 414	191	118	0	171
Oshana	8 564	178	8 076	309	184	1	509
Oshikoto	6 382	175	6 049	156	124	2	312
Otjozondjupa	9 085	86	8 730	269	184	0	254
Zambezi	2 832	647	2 082	103	59	0	103
Total	122 469	3 794	115 387	3 277	2 360	11	4 210

Adapted from: WHO Namibia Covid-19 Situation Report No. 513.³⁰

social distance maintenance, staying at home and wearing of masks that covers the mouth and nose have been reported.²⁹ Similar incidences were also noted and reported in Namibia.³⁰ This anti-social non-adherence to public health safety and regulations in relation to prevention of the spread of covid-19 virus was characterised by overcrowding of Police holding cells by defaulters.³¹ However, arrest and detention of defaulters cannot be said to be the solution, rather it is the use of effective communication strategies that low-income, uneducated, unemployed members of the populace will relate to. Many of this group of people as earlier mentioned live in un-serviced and impoverished informal settlements.

Similar deduction can be made with respect to unwillingness and hesitancy to be vaccinated. Several individuals or groups of people have expressed unwillingness to receive the covid-19 vaccine across the world. The hesitancy or refusal to receive the vaccination have been reported to be associated with factors such as misinformation, educational level, low-income or poverty level and in some cases, ethnicity.³²⁻³⁶ Namibia has not been spared on the issue of covid-19 vaccination hesitancy as a result of misinformation. For example, in early April of 2020, a report on the social media claimed that the 5G network that was launched by the Namibia's largest telecommunication operator is linked to covid-19. The operator, MTC denied the claim and clarified that Namibia does not even have 5G installed yet.³⁷

Discussion

Following the detection and reporting of the first case of coronavirus infection in Namibia, several measures involving restricting the movement and activities of people was implemented by the Government of Namibia. These measures are similar to those that were applied by other countries across the world. These include closure of schools, stay at home, restricting the number of people that can interact or gather together, including family members, local and regions restrictions of movement, closure of borders among other were implemented. Due to the cosmopolitan nature of regional capital cities in some regions, the rate and number of SARS-CoV-2 virus had been higher in these cities. These include the capital city of Windhoek (41, 134) in the Khomas region and Walvis Bay (17, 903) in the Erongo region of Namibia as shown Table 1. These places were among the earlier cities where lock-

down/restriction on movements of people was implemented as a strategy of curtailing the spread of the virus.

The lockdown of these two populated major "hotspots" was seen as a strategic attempt to prevent the spread of the virus to other less populated regions and the rural areas especially in the northern part of the country. This was an attempt to prevent this category of people from being infected since they are seen as more vulnerable to the impact of the virus. This strategy was evident from the statement made by a top government official who stated that "limited interaction between rural and urban dwellers is one of the factors designed to protect rural communities, against the full impact of the third wave of Covid-19 due to limited interaction between urban and rural dwellers".

In terms of the effectiveness of communication for improved testing for the SARS-CoV-2 virus and vaccination against the disease, many challenges were encountered by the government and health authorities. The challenges centred mostly on misinformation on the use and safety of the vaccine. The outcome of a survey in Namibia revealed that one-third of respondents were not willing to be vaccinated due to safety concerns.³⁰ Although, there was a period of unavailability of vaccines in the country, this unwillingness to receive the vaccine is contributing to low rate of vaccination with about 6.3% of the population having received the first dose and only 1.6% are fully vaccinated as of July 2021.³⁰ Some of the factors responsible for the unwillingness to be vaccinated may be attributed to a reported case in the (social) media that the death of an individual was linked to or was due to the vaccine.³⁸

The vaccination hesitancy also extend to members of the armed forces, some of whom refused to be vaccinated compulsorily where in a petition, immediate stop to the mandatory vaccination of members of the Namibian Defence Force (NDF) was demanded.³⁹ Most worrying however, on the issue of unwillingness was the refusal by some health workers to also be vaccinated.⁴⁰ The implication of this to the general public, especially the less educated members are of great concern. The drive towards achieving 60% vaccination of the population by the government may not be achieved.

Namibia recorded a daily vaccination of between 3000-4000 people with over 20 000 people per week across the country between the months of July and September 2021. This figure has declined to less than 1 900 per day and less than 10 000 per week across the country. The WHO attributed this low vaccination rate to the spread of misinformation, and concern over safety and effi-



Figure 3. One of several unplanned and high-risk informal settlements in Windhoek, Namibia. Source³³

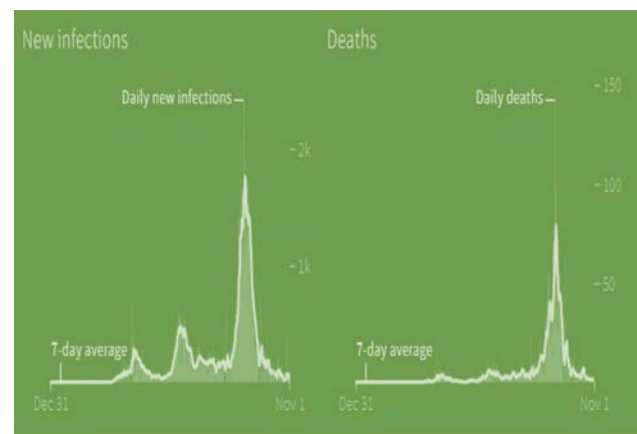


Figure 4. Trend of reported new infections and death in Namibia. Source¹⁵

cacy of the vaccine.⁴¹ The impact of misinformation on the spread of covid-19 and the resultant fatalities is not peculiar to Namibia but across the globe.⁴²⁻⁴⁴

From the above, it is apparent that drastic and effective measures are required to be implemented in order to dissuade the false and misinformation that are propagated by few uninformed and denials of numerous scientific evidence that are available on the safety of the vaccines. Some control and mitigating measures that can be put in place and implemented for improved number and rate of vaccination include rigorous and effective community education and awareness drive. This can be in the form of organising community-wide information and awareness sessions with the purpose of convincing them of the safety of the vaccines, hence resolving the misinformation and scare that was created through individuals and the media. By this, evidence can be presented to community members. These sessions can also be used as vaccination campaign towards achieving the intended 60% vaccination of the population.

In order to influence the behaviour of people, especially those that are highly prone to misinformation, certain interventions are required. Although, there is currently no data in the country that link or elucidate on the demographic suburb-based model of non-adherence to covid-19 regulations and unwillingness to be vaccinated, extrapolation is always based on educational and socio-economic strata of the society. If this assumption is to be considered, the focus of such assessment will be on section of the population that live in low-income, unplanned, and informal settlement as depicted in Figure 3.

Inexplicably however, the uneducated and poor people living in poverty in the informal settlements seems to display nonchalant attitude towards being infected by the virus. This attitude might have been influenced by community in which they live. These are usually “shacks” built with rusted corrugated sheet, woods, and plastics. The unplanned environment, which are mostly crowded foster closer social interactions among the informal settlers. It was noted that at the on- set of the pandemic in Namibia in March 2020, the government of Namibia paid special preventative Public Health attention to people in the informal settlements who constitute about 40% of the country’s population.⁴⁵⁻⁴⁸ However, their attitudes, perception and social interaction dynamics are not in tandem with governmental covid-19 Regulations. These are people that share same glass and cigarette when consuming alcoholic beverages. General expectations are high cases in number of infections, hospitalisation, and fatalities among this group of people. On the contrary, informal settlers believe that those that are infected and hospitalised by the virus are people from protected, affluent, and covid-19 Regulations intensive areas. These perceptions may be contributing to the apathy among people in these communities to adhere to the rules of Covid 19. This extrapolation will be the focus on the next investigation.

Conclusion

Effective communication of healthcare issues especially those involving covid-19 pandemic is essential for the general well-being of the society. Health communication strategies could be verbal or written with the purpose of empowering individuals, community members and the general populace in order to make informed decision. It is important that the government, through the Ministry of Health and Social Services of Namibia implement information dissemination strategy that are localised. This entails community-based information diffusion at the community level in addition to the use of radio broadcast, distribution of information

pamphlets in local languages. Through this, dispelling of wrong information leading to improved adherence of health regulations and rate of vaccination will be achieved.

References

1. Read JM, Bridgen JRE, Cummings DAT, et al. Novel coronavirus 2019-nCoV: early estimation of epidemiological parameters and epidemic predictions. *MedRxiv* 2020; <https://doi.org/10.1101/2020.01.23.20018549>.
2. Hui DS, IA E, Madani TA, et al. The continuing 2019-nCoV epidemic threat of novel coronaviruses to global health - the latest 2019 novel coronavirus outbreak in Wuhan, China. *Int J Infect Dis* 2020; 91:264–6
3. WHO(a). World Health Organisation, Namibia- Namibia Launches COVID-19 Communication Centre. Regional Office for Africa, 2021; <https://www.afro.who.int/news>.
4. WHO(b). World Health Organization. Mask use in the context of COVID-19 Interim guidance, 2020; <https://apps.who.int/iris/bitstream/handle/10665/337199/>.
5. Issakhov A, Zhandulet Y, Omarova P, et al. A numerical assessment of social distancing of preventing airborne transmission of COVID-19 during different breathing and coughing processes. *Sci Rep* 2021; 11: 9412; <https://doi.org/10.1038/s41598-021-88645-2>.
6. Hills S, Eraso Y. Factors associated with non-adherence to social distancing rules during the COVID-19 pandemic: a logistic regression analysis. *BMC Public Health* 2021; 21:352.
7. UNWPP. United Nation World Population Prospects. United Nations population estimates and projections, 2019; Namibia Population (Demographics, Maps, Graphs); <https://worldpopulationreviews.com/countries/namibia-population>.
8. TWB. The World Bank. The World Bank in Namibia, An Overview, The World Bank Group; Namibia Overview: Development news, research, data 2021; World Bank.
9. The Namibian. Geingob not happy with Namibia’s middle-income status. *Business News*, 2013; News; www.namibian.com.na/index.php
10. Levine S, Van Rooy G, Roberts B, et al. Income Poverty, and Inequality in Namibia. Discussion Paper No 1: 2006 Multi-Disciplinary Research and Consultancy Centre University of Namibia, Windhoek.
11. Herbert J. “Poverty, Unemployment and Inequality in Namibia. TEMTI Series of Economic Perspectives on Global Sustainability, TEMTI – Commission on Environmental, Economic and Social Policies CEESP / IUCN; 2012; <http://www.iucn.org>.
12. Alsan MM, Westerhaus M, Herce M, et al. Poverty, Global Health and Infectious Disease: Lessons from Haiti and Rwanda. *Infect dis Clin. North Am.* 2011; 25:611-622.
13. Quinn SC, Kumar S. Health Inequalities, and Infectious Disease Epidemics: A Challenge for Global Health Security. *Biosecur Bioterro.* 2014; 12:263-273.
14. Petersen S, Ngatjiheue C. 650 deaths, over 30 000 cases in one month in Namibia. *The Namibian Newspaper*: 2021.
15. Reuters. Namibia Covid-19 Global Tracker, 2021; <https://graphics.reuters.com/world-corona-virus-tracker-and-maps/countries-and-territories/namibia>
16. Worldometer. Namibia Population. Retrieved from: <https://www.worldometers.info/world-population/namibia-population/>
17. WHO(c). World Health Organisation. A comprehensive COVID-19 response from Government, WHO and partners

- keeps community transmission at bay and protects health services for the vulnerable, WHO 2021; <https://www.afro.who.int/news>
18. Bushira KM, Ongala JO. Modelling Transmission Dynamics and Risk Assessment for COVID-19 in Namibia Using Geospatial Technologies. *Trans Indian Nat. Acad. Eng* 2021; 6:377–394; <https://doi.org/10.1007/s41403-021-00209-y>
 19. Marenga R, Amupanda JS. The Coronavirus and Social Justice in Namibia. *South African J of Political Studies* 2021; 48:206-225.
 20. Hale TN, Angrist R, Goldszmidt et al. “A Global Panel Database of Pandemic Policies (Oxford COVID-19 Government Response Tracker)”, *Nature Human Behaviour* 2021; 5: 529–538.
 21. GRN. Ministry of Health and Social Services: Statement on the 22nd Covid-19 briefing. Announcement of amendments to public health Covid 19 general regulations: Public and Environmental Health Act, 2015: Minister of Health and Social Services.
 22. Zalmanovitch Y, Vashdi DR. The relationship between socio-economic factors and responsiveness gaps in primary, preventative and health promotion services. *Health Expect* 2015; 18:2638-2650; doi: 10.1111/hex.12238.
 23. Lin Y, Zhong P, Chen T. Association Between Socioeconomic Factors and the COVID-19 Outbreak in the 39 Well-Developed Cities of China. *Front. Public Health* 2020; 8:546637; doi: 10.3389/fpubh.2020.546637.
 24. Trifiletti LB, Gielen AC, Sleet DA, Hopkins K. Behavioral and social sciences theories and models: are they used in unintentional injury prevention research? *Health Education Research* 2015; 20: 298-307.
 25. Glanz RK, Bishop DB. The Role of Behavioural Science Theory in Development and Implementation of Public Health Interventions. *Annu. Rev. Public Health* 2010; 31:399–418.
 26. Fishbein M, Triandis H, Kanfer FH, Baum A, Revenson TA, Singer JE. Factors influencing behaviour and behaviour change. *Handbook of Health Psychol* 2001; 3-18.
 27. Eraso Y, Hills S. Intentional and unintentional non-adherence to social distancing measures during COVID-19: A mixed-methods analysis. *PLOS ONE* 2021; <https://doi.org/10.1371/journal.pone.0256495>.
 28. Erastus N. Namibia’s ghetto life: Half a million live in shacks countrywide. *The Namibian News*. 2020; pp 1; <https://www.namibian.com.na/203451/achive-read/>
 29. Kamran A, Naeim M. Behavioural change theories: a necessity for managing COVID-19. 2020; <https://www.ncbi.nlm.nih.gov/pmc/articles/PMC7574837/>
 30. WHO(c). World Health Organisation Surveillance, (13 Mar-13 Aug) Highlight/ Situational Update, WHO 2021.
 31. Beukes J, Tlhage O. Cells too full to house Covid-19 violators. *The Namibian Sun Newspaper*, 2021.
 32. Robinson E, Jones A, Lesser I, Daly M. International estimates of intended uptake and refusal of COVID-19 vaccines: a rapid systematic review and meta-analysis of large nationally representative samples. *Vaccine* 2021;39:2024–2034. doi:10.1016/j.vaccine.2021.02.005
 33. Thanapluetiwong S, Chansirikarnjana S, Sriwannopas O, et al. Factors associated with COVID-19 Vaccine Hesitancy in Thai Seniors. *Patient Prefer Adherence* 2021; 15:2389-2403; <https://doi.org/10.2147/PPA.S334757>
 34. Okubo R, Yoshioka T, Ohfuji S, et al. COVID-19 vaccine hesitancy and its associated factors in Japan. *Vaccines* 2021; 9:662, doi:10.3390/vaccines9060662
 35. Fridman A, Gershon R, Gneezy A, Capraro V. COVID-19 and vaccine hesitancy: a longitudinal study. *PLoS One* 2021;16: e0250123. doi:10.1371/journal.pone.0250123.
 36. Soares P, Rocha JV, Moniz M, et al. Factors associated with COVID-19 vaccine hesitancy. *Vaccines*. 2021; 9:300. doi:10.3390/vaccines9030300.
 37. Ngutjinazo O. "MTC slams 5G rumours". *The Namibian* 2020; www.namibian.com.na.
 38. GRN. Republic of Namibia, High Court of Namibia main Division, Windhoek; Judgement. *Shikongo v Minister of Health and Social Services (HC-MD-CIV- ACT-DEL-2017/03939)* [2021] NAHCMD 231, <https://view.officeapps.live.com/>.
 39. Mbathera E, Ngatjiheuee C. The Namibian. Soldiers Threaten Govt Over Forced Vaccination 2021; <https://www.namibian.com.na/6214144/archive>.
 40. Jason L, Nakale A. The New Era. Anti-vax health workers warned ... govt vows to crack down on Covid misinformation 2021; <https://www.neweralive.na/posts/anti-vax>.
 41. Tjitemisa K. The New Era. Vaccine hesitancy concerns Shangula. 2021; 27, www.neweralive.na.
 42. Agle J, Xiao Y. Misinformation about COVID-19: evidence for differential latent profiles and a strong association with trust in science. *BMC Public Health* 2021; 21:89, <https://doi.org/10.1186/s12889-020-10103-x>
 43. Barua Z, Barua S, Aktar S, et al. Effects of misinformation on COVID-19 individual responses and recommendations for resilience of disastrous consequences of misinformation. *Prog. In Disaster Sc.* 2020; 8, <https://doi.org/10.1016/j.pdisas.2020.10.0119>
 44. Cuan-Baltazar JY, Muñoz-Perez, MJ, Robledo-Vega C, et al. Misinformation of COVID-19 on the internet: infodemiology study. *JMIR Pub. Health Surveill*, 2020; 6:2, Article e18444, doi: 10.2196/18444.
 45. Scharrenbroich A., Shuunyuni H. Namibia Housing Action Group (NHAG) and Shack Dwellers Federation of Namibia (SDFN). 2019 Annual Report. <https://sdinet.org/wp-content/uploads/2021/02/SDFN-NHAG>.
 46. Marenga R, Amupanda JS. The Coronavirus and Social Justice in Namibia. *South Afr. J Pol. Sc* 2021; 48:206-225, doi.org/10.1080/02589346.2021.1913803.
 47. Julius E, Nuugulu S, Julius LH. Estimating the Economic Impact of COVID-19: A Case Study of Namibia. *Munich Personal RePEc Archive (MPRA)*; MPRA Paper No. 99641, 2022; <https://mpa.ub.uni-muenchen.de/99641>.
 48. UNDP. United National Development Programme. The Socio-Economic Impact Assessment of COVID-19 in Namibia, UNDP Namibia Annual Report 2020; <https://www.na>