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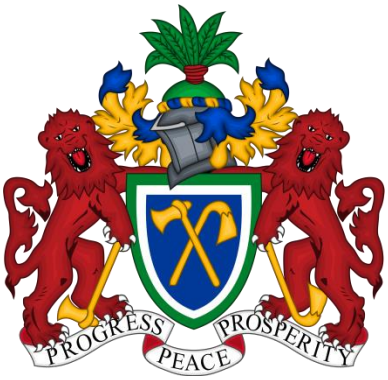

The State House

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FOCUS ON COVID-19: IMPACT ON VACCINATIONS

ABSTRACT

The coronavirus continues to stretch healthcare deliveries directly and indirectly. Due to the attention shifted towards treatment of infected people and efforts geared towards prevention of the virus, other essential health services such as childhood vaccinations continue to be disrupted. Literature suggests that this pose a significant danger of infectious disease outbreaks in the near future, and that there are several factors that could lead to lower vaccinations rates in both the short- and long-term aftermath of the pandemic. In The Gambia, the vaccination rates for 2020 has already dropped significantly compared to the same period last year. This especially poses a risk to the young children and might lead to increasing infant and under-five mortality rates, which although declining, are at relatively high levels. In a simple projection model, we make conduct a scenario analysis of future outbreaks of infectious diseases and make different assumptions regarding the reduction in vaccine coverage rates, the effective reproduction number and the government response. Our findings suggest that future regional outbreaks can be significantly curbed by implementing emergency vaccination responses. These vaccinations could be given proactively to make up for the low rates in 2020, or at the very latest at the onset of a new outbreak. Against this background we suggest the Ministry of Health together with government stakeholders and donor partners formulate a strategy for conducting proactive regional vaccination outreaches and building preparedness for rapid emergency vaccinations should an outbreak occur.

INTRODUCTION[1]

The COVID-19 pandemic has affected all walks of life, either directly by the virus itself or indirectly by the measures taken to contain the spread of the virus. As at July 3rd, 2020, close to 11 million cases had been reported globally, with Africa being the only region except Oceania with less than 500,000 cases. This situation has redirected much of the world's efforts in all fields towards defeating the pandemic which continues to ravage economies and exert immense pressure on healthcare systems.

Healthcare deliveries in highly affected countries are being stretched, while in countries with a limited number of cases, most efforts in the health sector are working to prevent yet prepare for a surge. While this is natural given the rapid developments and unknown territory the pandemic presents, there are growing risks to neglecting other parts of the healthcare system. The longer the pandemic goes on, the greater the cost to these disruptions and to putting other patients on hold, and the greater the risk to increased deaths from other diseases.

A World Health Organization (WHO) survey of 155 countries during a three-week period in May, revealed that more than half of the countries reported reduced services for Non-Communicable Diseases (NCD). This means cancer and diabetes patients amongst others have not been receiving adequate treatment. The devil in the details confirmed that it is worse in low-income countries.[2]

The WHO predicts that malaria deaths in sub-Saharan Africa could double in 2020 compared to 2018. Furthermore, the WHO, UNICEF and Gavi (formerly Global Alliance for Vaccines and Immunization) projects that at least 80 million children under the age of one are currently at risk of vaccine-preventable diseases such as measles, mumps, rubella, polio, yellow fever, typhoid, cholera and tetanus, as routine childhood immunisation services have been disrupted in at least 68 countries[3].

This is worrying as vaccinations have saved millions of lives against infectious diseases and is one of the most sustainable ways of healthcare deliveries. It has been argued that only clean water performs better in overall healthcare.[4] With a high coverage rate, vaccines prevent diseases

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[1] The considerations presented in this Focus Note belongs to the authors and do not necessarily reflect the views of the Department of Strategic Policy and Delivery or the Office of the President.

[2] https://news.un.org/en/story/2020/06/1065172

[3] https://www.who.int/news-room/detail/22-05-2020-at-least-80-million-children-under-one-at-risk-of-diseases-such-as-diphtheria-measles-and-polio-as-covid-19-disrupts-routine-vaccination-efforts-warn-gavi-who-and-unicef

[4] Plotkin & Plotkin. (2004). A short history of vaccination. doi:10.1073/pnas.1400472111

and results in fewer medical services. Vaccines have worldwide eliminated smallpox and significantly limited the impact of the above-mentioned diseases. They have both personal and public good effects as the more people who are vaccinated the more herd immunity there is for a range of diseases.

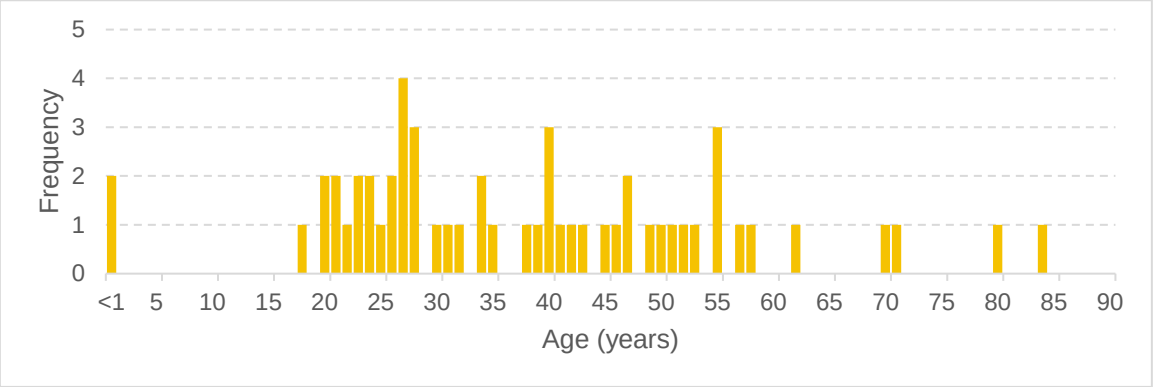
In The Gambia, disrupted vaccination programmes and reduced coverage rates are also risks that deserves attention given the costly consequences that could arise unless the situation is managed. Information from the Ministry of Health (MOH) indicates that the downward trend in child vaccination numbers have already begun in 2020. Fear of COVID-19 exposure at clinics and conspiracies about fake vaccines and vaccine trials are some of the reasons why more children have incomplete vaccination programmes. Less coverage obviously increases the risk of outbreaks in infectious diseases, especially in children under five, and increased child mortality. This is a risk to the SDG goal #3 of reducing infant mortality rate.

In recognition of the increased threat of disease outbreaks in infants and children, the Global Vaccine Summit on June 4 raised over GBP7 billion to protect an estimated 8 million children and infants. Although children constitute low risk of COVID-19, its indirect effect on them could be serious if supplementary programs are not put in place to remedy the situation.

THE COVID-19 SITUATION IN THE GAMBIA

As of July 1st 2020, the number of confirmed coronavirus cases in The Gambia reached 55, most of which are imported from Senegal. Experts have long known that the most severely affected by the disease are the elderly. However, people of all ages can be infected by the disease. The figure below shows the age distribution of the COVID-19 cases in The Gambia.

Figure I. Age distribution of the Cases of COVID-19 in The Gambia, as at July 1st 2020.



Data source: MOH

The frequency bars show that the age distribution is fairly even between 20-60, but with a bit more concentration around 20-30. Then there are a few cases between ages 60-80, and three cases under 20, of which two are children under one year of age. As such, children in The Gambia have so far been spared of COVID-19 infections. However, with the vaccination rates dropping, the same children could become victims of other infectious diseases like measles, tuberculosis, or rubella, in the aftermath of the pandemic.

EMPIRICAL BACKGROUND

LITERATURE REVIEW

Outbreaks of infectious disease are common in the aftermaths of natural disasters, wars and epidemics. Takahashi et al. (2015) stress the dangers of disruptions to vaccination programmes in the context of the West African Ebola outbreak. If vaccination programmes are disrupted other avoidable diseases like measles could re-emerge and cause additional deaths that could have been prevented. Measles is very transmittable and usually one of the first vaccines to be disrupted in crisis situations due to the relatively high age at which children receive the first dose. Using geo-located, cross sectional data the authors project that an 18-month disruption to the healthcare systems of Sierra Leone, Guinea and Liberia, with a 75 percent reduction in measles vaccinations could cause a measles outbreak of about 100 000 additional cases and 5200 additional deaths. Furthermore, they estimate that 600,000 – 700,000 children could miss out on the pentavalent vaccine (Diphtheria, Tetanus, Pertussis (DTP), Hepatitis B (HepB), and Haemophilus influenzae B (Hib)), tuberculosis vaccine (BCG), and the oral polio vaccine (OPV).[5] This emphasizes the importance of continuing vaccination programs even in times of crisis.

"For developing countries, pandemics and epidemics such as the COVID-19 and EVD exert unbearable strain on their evolving health systems. Health services were severely affected by the Ebola outbreak in Sierra Leone as /…/ the number of people not being treated for malaria, cholera and measles reportedly increased significantly over the period"

Besides completely missing out on the vaccine, it is common that child vaccinations are simply delayed, potentially causing insufficient immunity. Odutola et al. (2015) study the factors that increase the risk of delayed vaccinations in The Gambia. The paper studies a survey data sample of 1154 observations from the western region of the country and finds that 63 percent of children were late in receiving at least one vaccination. The vaccine which was most timely given was BCG (94 percent on time), and the least timely given were the third dose of OPV and the third dose of DPT vaccine (40 percent on time). Using logistic regressions the authors find that some factors increasing the probability of delay in vaccinations include: the child being born at home instead of a health clinic, the mother being unemployed, the father being illiterate, being the third or later child, and using public transport to get to the health clinic.[6] Some of these factors are important to keep in mind during and after the Covid-19 pandemic as more scepticism towards the healthcare system and fear of coronavirus exposure may cause more mothers to give birth at home rather than going to the hospital, unemployment has already increased, and almost certainly some human capital will be lost as children miss out or drop out of school since their closure - potentially

[5] Takahashi et al. (2015). The growing risk from measles and other childhood infections in the wake of Ebola. doi:10.1126/science.aaa3438

[6] Odutola et al. (2015). Risk factors for delay in age-appropriate vaccinations among Gambian children. doi:10.1186/s12913-015-1015-9

increasing illiteracy. As such the pandemic may have both short- and long-term effects on the immunisations and spread of other diseases.

The issue of timely vaccinations is particularly important to reduce under-five mortality. While vaccination coverage rates in The Gambia are very high, the infant and under-five mortality are also fairly high (3.9 and 5.8 percent respectively[7]). Miyahara et al. (2016) have studied the timeliness of first child vaccinations (HepB, BCG, OPV) in The Gambia using data from Farafenni region from 2004-2014. They show that while WHO recommend these first vaccinations to take place at birth or as soon as possible after birth, only 1.1 percent receive the vaccine at birth and 5.4 percent within the first week (while the coverage rate at 6-12 months is around 93 percent). The risk associated with delayed HepB vaccination in particular is mother-to-child transmission, which could lead to chronic infection and liver disease which may require antiviral treatment.[8] This does not only constitute a direct health risk to the child but will also lead to increased costs to the family and the economy.

THE INDIRECT IMPACT OF EBOLA IN WEST AFRICA

In 2014-2015 three West African states of Sierra Leone, Guinea and Liberia were devastated by the Ebola Virus Disease (EVD) caused by the *Zaire ebolavirus*. The measures taken, similar to current social distancing in place for the coronavirus, impacted the socio-economic life of the population. One such impact was the reduced number of hospital and clinic visits for maternal and child health services, including necessary vaccinations against preventable diseases such as measles, which were under control in the affected countries prior to the outbreak.[9] In 2014 and 2015, Liberia and Guinea experienced a sharp decline of more than 25 percent in the monthly number of children vaccinated against measles, while there was no reported decline in Sierra Leone.[10]

For developing countries, pandemics and epidemics such as the COVID-19 and EVD exert unbearable strain on their evolving health systems. Inpatient health services were severely affected by the Ebola outbreak in Sierra Leone as both facility inpatient admissions and major surgeries declined over 50 percent.[11] Additionally, the number of people not being treated for malaria, cholera and measles reportedly increased significantly over the period.[12] As a result, West Africa saw a substantial increase in the mortality rates of diseases such as malaria, HIV/AIDS and tuberculosis.[13]

VACCINATION COVERAGE IN THE GAMBIA

Vaccination is one of the most effective means of disease control, and The Gambia has been among the pioneers of vaccination campaigns in sub-Saharan Africa. For example, the first organized measles

[7] UN IGME. (2019). https://childmortality.org/data/Gambia, retrieved 30.06.2020.
[8] Miyahara et al. (2016). Barriers to timely administration of birth dose vaccines in The Gambia, West Africa. doi:10.1016/j.vaccine.2016.05.017
[9] Sandouno et al.(2017).Effect of Ebola Virus Disease on Maternal and Child Health Services in Guinea:A Retrospective Observational Cohort Study. doi:10.1016/S2214-109X(17)30078-5
[10] Masresha et al.(2020). The Impact of a Prolonged Ebola Outbreak on Measles Elimination Activities in Guinea, Liberia and Sierra Leone, 2014-2015. doi:10.11604/pamj.supp.2020.35.1.19059
[11] Bolkan et al.(2014). Ebola and Indirect Effects on Health Service Function in Sierra Leone doi: 10.1371/currents.outbreaks.0307d588df619f9c9447f8ead5b72b2d
[12] BBC, (2014). Ebola drains already weak West African health systems. https://www.bbc.com/news/world-africa-29324595
[13] Wenzel et al.(2016). Africa saw a substantial increase in the mortality rates of diseases such as malaria, HIV/AIDS and tuberculosis. doi: 10.3201/eid2203.150977

vaccination was done in 1967 as part of the West Africa Smallpox Eradication program.[14] All children aged four months to six years were vaccinated with assistance from the US Agency for International Development. There is a very low prevalence rate for infectious diseases due to the robust vaccination programs in country. One such gain, is the elimination of polio. The Gambia's last wild polio case was way back in the 1980s and was declared polio free by the WHO in 2005.

In general, The Gambia has achieved very high vaccination coverage in the most common Expanded Program on Immunization (EPI) vaccine preventable diseases. The vaccines include BCG, DPT 1 and 3, Measles (MCV) and Polio (IPV1 and POL3). As shown in the table below, for all vaccines except MCV2 and IPV1, the coverage rate was above 90 percent throughout 2014-2018.

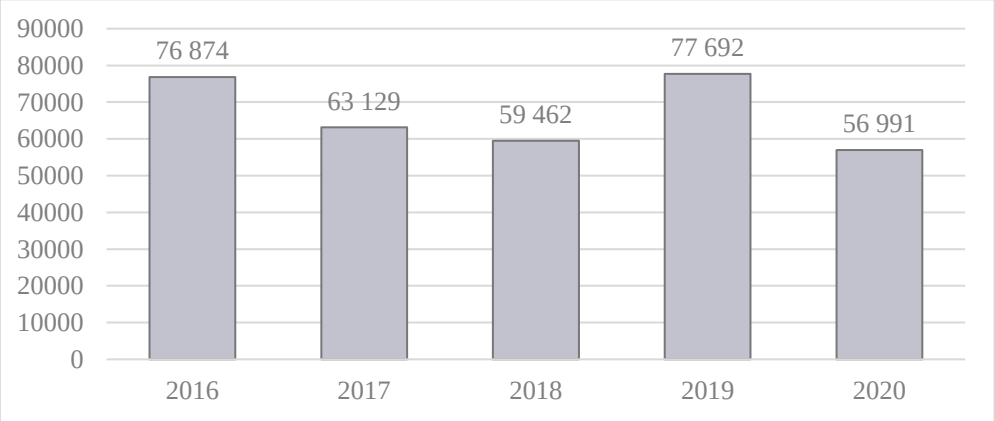
Table I. Vaccination Coverage Rates, The Gambia, 2014 -2018

Disease	***Vaccines***	**2014**	**2015**	**2016**	**2017**	**2018**
Tuberculosis	*BCG*	0.96	0.98	0.98	0.94	0.94
Diphtheria Pertussis Tetanus	*DPT1*	0.98	0.99	0.99	0.93	0.94
	DPT3	0.96	0.97	0.95	0.92	0.93
Measles	*MCV1*	0.96	0.97	0.97	0.9	0.91
	MCV2	0.73	0.77	0.79	0.68	0.71
Polio	*IPV1*		0.71	0.95	0.2	0.61
	POL3	0.97	0.96	0.95	0.92	0.93

Data Source: Official country estimates from WHO monitoring system, 2019.

However, in the light of the pandemic it is possible that these high coverage rates have not continued into 2020. In fact, when looking at the total number of vaccinations for five common EPI diseases between March-May each year, we see that the numbers have been dropping. Figure II below, shows that the three-month period in 2020 recorded the lowest number of vaccinations over the five years reported, with a significant drop from 2016 and 2019 levels.

Figure II. Total number of EPI vaccinations between March-May, in 2016 to 2020.



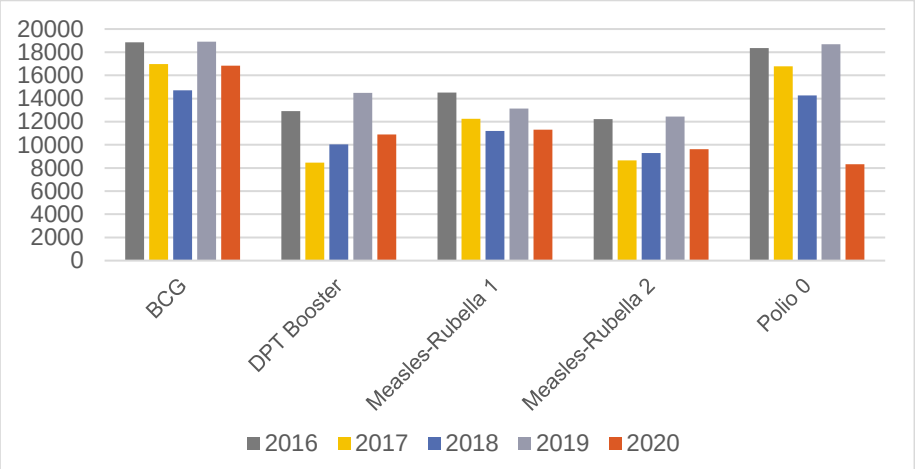
Data source: MOH

[14] Williams & Hull, (1983). Status of Measles in the Gambia, 1981. https://www.jstor.org/stable/4453044?seq=1, retrieved 03.07.2020.

In addition to the falling number of vaccinations, the Government Local Funds (GLF) for vaccinations has been unutilized by MOH this year. Last year the ministry spent around GMD27 million of their GMD30 million allocated fund for vaccines. This year, with the same budget allocation, nothing has been spent on vaccinations as of June 30th 2020.

While the number of vaccinations between March-May generally has decreased in 2020, there is some variation between vaccines, as can be seen in Figure III below. Polio 0 vaccination rates have dropped drastically in the same months over last five years, with a reduction of about 10 000 cases, and concerningly low levels in 2020. Similarly, the Measles-Rubella 1 vaccination has registered a negative trend from 2016 to 2018 falling from about 14 500 vaccinations to 11 200, then slightly increasing in 2019 to 13 100 vaccinations before falling to about 11 300 vaccinations in 2020. A similar trend was also observed for BCG vaccination, which fell from approximately 18 800 in 2016 to 16 800 in 2020. In general, all the vaccines had a significant drop in number of vaccinated children from 2019 to 2020 between March and May.

Figure III. Total Number of Children receiving five common Vaccines between March-May over the last 5 years.



Data Source: MOH

Preliminary investigation into the low coverage of polio vaccination in the first quarter of 2020 have revealed that, this low coverage is due to the health sector running out of polio vaccine stock in the Gambia due to COVID-19 travel restrictions.

If left unmitigated, the preliminary low vaccination coverage in 2020 may lead to a surge in the number of infectious diseases, severely affecting the children of The Gambia. With under-five mortality at 57 per 1,000 live births as of 2018[15], an outbreak in measles, hepatitis or

"If left unmitigated, the preliminary low vaccination coverage in 2020 may lead to a surge in the number of infectious diseases, severely affecting the children of The Gambia. With under-five mortality at 57 per 1,000 live births as of 2018, an outbreak in measles, hepatitis or diphtheria will increase the number of under-five deaths if extra measures are not taking to meet the vaccination targets"

[15] MICS. (2018). Multiple Indicator Cluster Survey 2018, The Gambia.

diphtheria will increase the number of under-five deaths if extra measures are not taking to meet the vaccination targets. The next section explores the potential dangers of the mentioned reduced vaccination programs under different scenarios and assumptions on vaccination coverage and infection rates in 2019 to 2021.

SCENARIO ANALYSIS

In this section we present a scenario analysis which aims to illustrate the potential risk of disrupted vaccination programs and the importance of preparedness and prevention from outbreaks. Using an extremely simplified and modified version of the Imperial College London dynamic model for COVID-19, we have applied our version to regional data which allows us to estimate the number of cases in case of an outbreak of infectious disease. Please note that these estimates are solely to be understood for their illustrative purposes and should not be interpreted as accurate projections of the future outbreaks of infectious disease. It is impossible to predict the likelihood, timing and magnitude of any future outbreak, however, with this scenario analysis we wish raise awareness to guide policymakers in managing this risk. The model allows us to make assumptions regarding the future coverage rates, the response and the effective reproduction number (Re). The Re is the number of people that one infected person would pass on the disease to, in a population where some are immune. It is computed by multiplying the basic reproduction number (same as Re but for a population where no one is immune) with the portion susceptible people in the population (which is computed using regional vaccination coverage rates). Since the vaccination coverage rates varies between years and region, each region has different Re number each year. For our purposes, we have assumed an “average infectious disease” when computing the Re, meaning we have used an average basic reproduction number for tuberculosis, diphtheria, pertussis and measles. For simplicity, we have assumed that only children under five are susceptible to the disease and have used the 2018 distribution of children under five across regions from the Multiple Indicator Cluster Survey (MICS) dataset.

In Figures IV & V below, the vaccination rates for 2019 are averages of the regional vaccination rates for the previously mentioned diseases, reported by MOH. Due to the pandemic causing fear and disruptions to vaccination programs, we assume the coverage rates are reduced by 30 percent in 2020, compared to 2019 levels. Due to improvements with regards to the COVID-19 situation, and efforts to step up vaccinations, the coverage rates are then assumed to increase by 25 percent in 2021, from the previous year. Please note that the vaccination rate only affects the children who are less than one year old, as these vaccinations are taken within the first year of life. However, the susceptible population are between 0-5 years old. As such, the vaccination coverage rate for the whole susceptible population will depend on the vaccination rates from the past five years, and as such a reduced vaccination rate in 2021 will have long term impacts unless its compensated for.

Figure IV. Number infected (left axis) and Vaccination rate (right axis) per Region and Year.

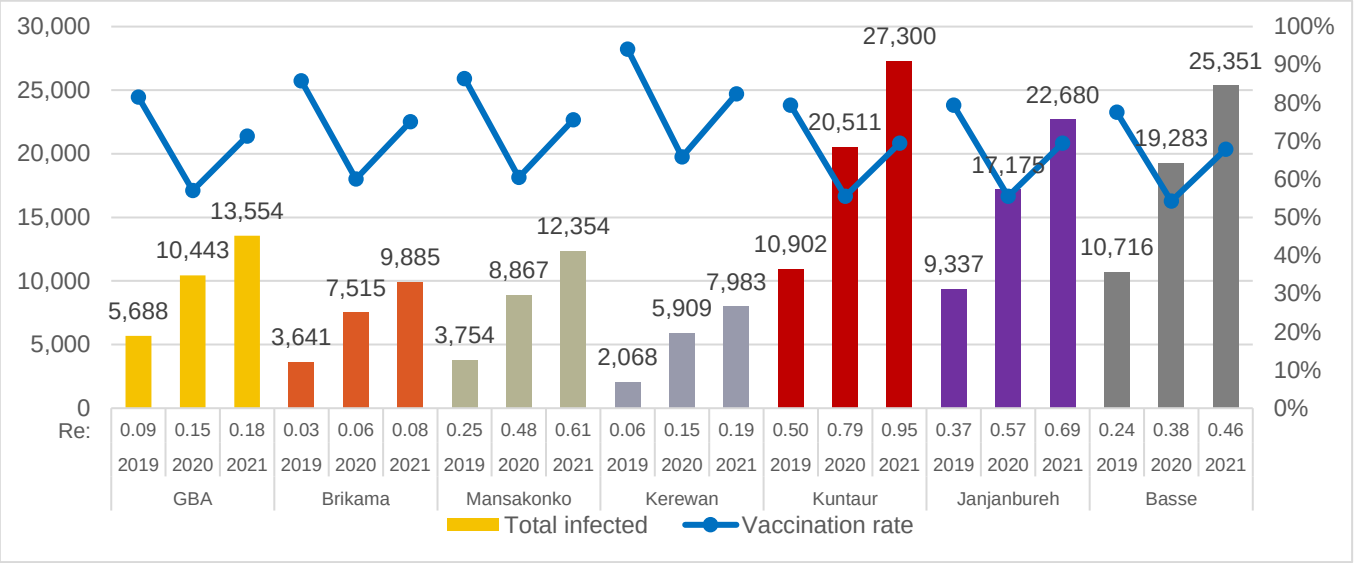


Figure IV above shows the estimated number of infected people across the regions of The Gambia with the assumption that there will be no government response to curb the situation. As we can see, Kerewan has the highest vaccination coverage rates (94, 66 and 82 percent respectively in 2019, 2020 and 2021), and the lowest number of infected people. Brikama has the lowest Re values but a much larger population, leading to a higher number of cases. Kuntaur, Janjanbureh and Basse have the lowest vaccination rates and would be worst affected by potential outbreaks in any of the years. The figure tells us that if there was an outbreak of an infectious disease in Kuntaur in 2021, about 27 000 could be infected unless there is proactive or rapid response.

Figure V. Number infected (left axis) and Vaccination rate (right axis) with Emergency Vaccination Response.

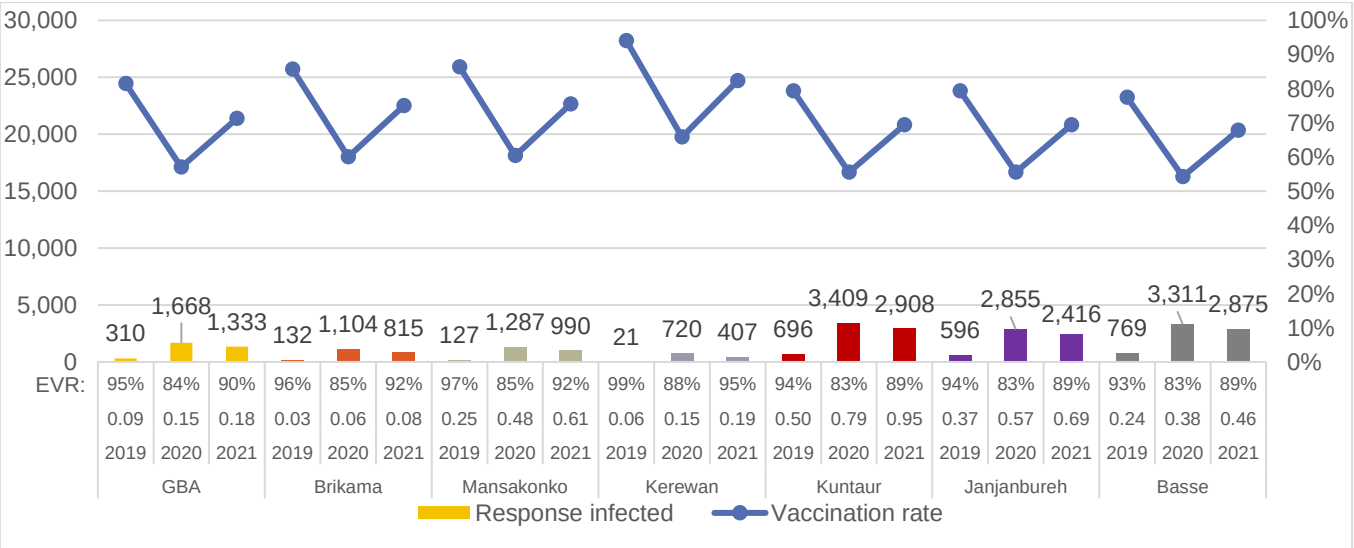


Figure V above illustrates an alternative scenario where there is an emergency vaccination response (EVR) before or when an outbreak occurs that reduces the susceptible population by the indicated percentage. The effectiveness of the EVR varies between regions as they have different initial coverage rates. A region wi

a higher initial coverage rate has fewer susceptible individuals and thus the EVR needs to reach fewer people, likely making it easier and more effective. Under this scenario, the number of infections from an outbreak in Kuntaur in 2020 is expected to reach 3,409 children compared to 20,511 infections if left unmitigated. Overall an emergency vaccination response is expected to greatly reduce the number of child infection in all the regions for 2020 and reverse the trend of increasing infections from 2020 to 2021 observed in the first scenario.

DISCUSSION

Delays and disruptions in healthcare are natural consequences of the rapid emergence of the pandemic earlier this year causing all efforts to be focused on limiting the spread and curing the infected. However, the longer the disruptions in other parts of the healthcare system continues, the greater is the risk for other dangers. In The Gambia, MOH has identified lower childhood vaccination rates since the outbreak of the pandemic. Parents are scared to go to the clinics due to potential increased COVID-19 exposure, and fear conspiracy theories is spreading. If the problem is left unattended and the rates continue to decline, the risk of an outbreak of another infectious disease in the aftermath of the pandemic will increase. The total coverage rates for the period March-May are the lowest in over five years, and for five of the most common vaccines the rates have dropped significantly compared to last year.

The literature shows that there are both direct and indirect effects of the pandemic on the vaccination rates. While the direct effects are the lower coverage rates we are observing now, the indirect effects are the risk factors to delayed and missed vaccinations that might occur due to increased unemployment, lower literacy levels, and non-clinical childbirths, which are factors related to delays in vaccinations. Both these short- and long-term factors needs to be taken into consideration in order to reduce the risk of future outbreaks and epidemics of infectious disease.

Our scenario analysis suggests that the low coverage rates this year would make the regions vulnerable also next year and the years to come. However, it also shows that an outbreak could be avoided or curbed by a rapid EVR prior to, or at the outset of, an outbreak of infectious disease. The number of infected people would fall from roughly 12,000 to 1,200 on average.

While EVR could serve as a great strategy for preparedness, part of the problem is also information, or rather lack thereof. With the coronavirus, new sources of fear and hesitancy towards vaccinations have got a grip of the communities. It is important that the right information and knowledge is provided in all modes of communication and that misinformation is identified and corrected.

RECOMMENDATIONS

The COVID-19 pandemic has put a lot of strain on the healthcare system already, and will likely continue to do so for some time. In the meantime, the childhood vaccination rates are falling, with effects that could be felt for many years to come. If left unmitigated the low rates could cause future outbreaks of vaccine-preventable diseases that will cost lives, extra healthcare spending, lost productivity and incomes. As such, we recommend that the MOH together with relevant government stakeholders and development partners formulate and execute a strategy to increase vaccinations in 2021, make up for the lost ones in 2020, and plan for the long-term effects of the pandemic on childhood vaccinations. The strategy might consist of several elements, including some form of proactive community outreach EVRs and improved communication and education regarding the importance of complete vaccination programs. Tackling the pandemic and preventing other infectious diseases should not be a zero-sum game.

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