

# The first 100 days of the COVID-19 epidemic in Mali: a descriptive analysis

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## Research Article

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# Abstract

**Background** Since the detection of the first cases of COVID-19 in Mali, the ministry of health provides daily released of information and situation report including information on the number of testing, confirmed cases, case-contacts, recovered patients, COVID-19 related deaths; and the geographic locations affected by the epidemic. The objective of this study was to analyze this information and to examine the relation between the number of confirmed cases and the number of testing, case-contacts, recovered patients and COVID-19 related deaths.

**Method** From the daily released of information and situation reports, the data related to the number of testing, confirmed cases, case-contacts, recovered patients, COVID-19 related deaths; and the affected geographic locations were extracted on an Excel file before being analyzed with SPSS 25 software. The analyses were essentially descriptive including Spearman correlation test and Chi 2 test for statistical significance ( $p \leq 0,05$ ).

**Results** The analyses include 14,938 testing, 2,260 PCR confirmed cases, 12,864 case-contacts, 1,502 recovered patients and 117 deaths reported during the first 100 days of the epidemic, particularly from March 25 to July 2, 2020. The results show low level of testing and demonstrate a positive correlation between the number of confirmed cases and the number of testing, case-contacts, recovered patients and deaths. These results suggest that Mali could have more confirmed cases by increasing testing, particularly among case-contacts.

**Conclusion** The results can help to understand the evolution of the epidemic, call for more testing and contact tracing of COVID-19 cases. They can also contribute to improving data quality and response to COVID-19.

## Introduction

Effective public health intervention relies on the quality of health information (1-3). In the fight against epidemics, health information is even more important given the speed of transmission of these diseases, their health and non-health consequences, and the need for effective intervention (4-7). As part of the fight against COVID-19, information is regularly provided by countries to inform national and international opinion on the evolution of the epidemic. In Mali, this information is communicated as a daily released of information and situation report by the National Institute of Public Health (INSP), the coordinating agency of the Ministry of Health and Social Affairs (MSAS) for COVID-19 control. These reports inform the national and international opinion on the evolution of COVID-19 situation and are considered to be among the most official communication tools on COVID-19 in Mali. This study aims to analyze the data shared through the daily released of information and situation reports provided by INSP during the first 100 days of the epidemic. Analyses of the reports will provide valuable information for understanding the real magnitude and evolution of the epidemic. It will also contribute to improve the quality of the data

related to COVID-19 by identifying the gaps in the information communicated for effectively guide intervention aiming to slow or stop the evolution of the epidemic.

## Method

We focused on the indicators informed by the COVID-19 coordination Agency and published regularly through daily released of information and situation reports on Covid-19. Specifically, we focused on the testing, confirmed cases, case-contacts, recovered patients and COVID-19 related deaths; and the geographic locations affected by the epidemic. The number of testing is the number of nasal swab specimen tested for SARS-CoV-2 using RT-PCR to detect the presence of viral RNA (8). Confirmed cases are individuals (asymptomatic or symptomatic) whom nasal swab specimens have been tested positive by RT-PCR. Asymptomatic cases are those with no clinical sign, while symptomatic cases are those presenting a single or multiple clinical signs (8). The well-known clinical signs attributable to COVID-19 are: fever, cough, myalgia, dyspnea, nasal congestion, headache, rhinorrhea, sore throat, vomiting, diarrhea, red eye, anosmia, ageusia and discomfort (9-12). There are evidences that asymptomatic cases are the most common and may account for 50-80% of cases. A case-contact is a person who had been in contact with a confirmed case two days before and who begins to show signs up to 14 days after onset (8). Recovered patients are confirmed cases who remain negative after two consecutive RT-PCR tests. COVID-19 related deaths are COVID-19 confirmed cases who died before recovery, or found positive after a post-mortem testing (8).

Daily released of information on Covid-19 shared by the Coordination Agency for COVID-19 control during the first 100 days of the COVID-19 epidemic were downloaded from the official website of MSAS. Situation reports have been obtained from the Coordination Agency for COVID-19 control. It was possible to include more released of information and situation reports, but those of the first 100 days were sufficient to get an overview on the evolution of COVID-19 in Mali. Thus, from the released of information and situation reports of the first 100 days, the data related to the above-mentioned indicators were extracted on an Excel file before being analyzed with SPSS 25 software. The analyses were essentially descriptive including Spearman correlation test and Chi 2 test for statistical significance ( $p \leq 0, 05$ ).

## Results

### Descriptive analyses

The number of testing during the first 100 days of COVID-19 epidemic was 14,938. The daily mean of testing was 149.4; the median 126.5 and the mode zero (see Table 1).

**Table 1:** Trend of testing; and confirmed cases, case-contacts, recovered patients and COVID-19 related deaths during the first 100 days of COVID-19 in Mali

	Testing	Confirmed cases	Case-contacts	Recovered Patients	Covid-19 related deaths
Mean	149.4	22.60	128.64	14.02	1.17
Median	126.50	19.00	114.00	14.00	1.00
Mode	0.00	19.00	7.00 <sup>a</sup>	0.00	0.00
Standard deviation	137.51	16.74	96.60	13.03	1.295
Minimum	0.00	2.00	0.00	0.00	0.00
Maximum	654.00	81.00	536.00	61.00	6.00
Total	14938.00	2260.00	12864.00	1502.00	117.00

The total number of confirmed cases was 2,260.0, with a mean of 22.6 cases a day, a median of 19.0 and a mode of 19.00. The total number of recovered patients was 1502.00, the mean 14.02, the median 14.00 and the mode 0.00. The total number of COVID 19 related deaths was 117.00 with a mean of 1.2 deaths a day, a median of 1.00 and a mode of 0.00. The total number of case-contacts traced during the study period was 12,864.00. The mean was 128.6 contacts traced a day and the median 114.0. The trend curves of the number of testing, confirmed cases, case-contacts, recovered patients and COVID-19 related deaths all had a sawtooth pattern. Figure 1 shows the trend curve for confirmed cases. Examining the various distributions, only the number of confirmed cases and the number of COVID-19 related deaths had a normal distribution (see Figure 1). Descriptive analyses also showed that 5.17% of the confirmed cases died during the first 100 days of COVID-19.

Finally, the descriptive analyses showed that 42 geographic locations from 9 regions were affected by the epidemic (see Table 2). These 9 regions include Bamako, Tombouctou, Mopti, Koulikoro, Kayes, Kidal, Sikasso, Gao, Segou. The regions with the most confirmed cases were Bamako, Tombouctou and Mopti. The regions of Sikasso and Ségou were among the least affected regions.

Table 2: Distribution of confirmed cases, COVID-19 related deaths and lethality by geographic location

Localiy	Confirmed cases	COVID-19 related deaths	Lethality%
<b>Bamako District</b>	<b>1071</b>	<b>68</b>	<b>6,35</b>
Commune I	130	7	5.38
Commune II	98	4	4.08
CIII	95	14	14.74
CIV	219	4	1.83
CV	231	16	6.93
CVI	298	23	7.72
<b>Tombouctou region</b>	<b>522</b>	<b>9</b>	<b>1.72</b>
Tombouctou	483	9	1.86
Goundam	11	0	0.00
Djiré	19	0	0.00
Rharous	9	0	0.00
<b>Mopti region</b>	<b>235</b>	<b>22</b>	<b>9.36</b>
Mopti	144	12	8.33
Douentza	23	4	17.39
Sévaré	10	0	0.00
Kona	2	0	0.00
Koro	10	1	10.00
Youwarou	4	1	25.00
Bankass	6	2	33.33
Djenne	13	0	0.00
Bandiagara	22	2	9.09
<b>Koulikoro region</b>	<b>166</b>	<b>3</b>	<b>1.81</b>
Kalabancoro	92	2	2.17
Kati	71	0	0.00
Koulikoro	2	1	50.00
Fana	1	0	0.00
<b>Kayes region</b>	<b>106</b>	<b>4</b>	<b>3.77</b>

Kayes	53	2	3.77
Kéniéba	33	0	0.00
Yelimane	4	2	50.00
Kita	5	0	0.00
Sadiola	1	0	0.00
Diamou	9	0	0.00
Bafoulabé	1	0	0.00
<b>Kidal region</b>	<b>47</b>	<b>0</b>	<b>0.00</b>
Kidal	47	0	0.00
<b>Sikasso region</b>	<b>43</b>	<b>4</b>	<b>9.30</b>
Sikasso	7	2	28.57
Yanfolila	3	0	0.00
Koutiala	33	2	6.06
<b>Gao region</b>	<b>47</b>	<b>2</b>	<b>4.26</b>
Gao	46	2	4.35
Ansongo	1	0	0.00
<b>Ségou region</b>	<b>23</b>	<b>5</b>	<b>21.74</b>
Ségou	18	4	22.22
San	2	1	50.00
Niono	2	0	0.00
Markala	1	0	0.00
<b>Ménaka region</b>	<b>0</b>	<b>0</b>	<b>0</b>
<b>Taoudenit region</b>	<b>0</b>	<b>0</b>	<b>0</b>
<b>Total</b>	<b>2,260</b>	<b>117</b>	<b>5.18</b>

## Correlation analysis

Correlation analyses showed that the number of confirmed cases was positively correlated with the number of testing, case-contacts, recovered patients and COVID-19 related deaths (see Table 3). In other words, during the first 100 years of COVID-19 the increase in the number of confirmed cases was

correlated with the increase in the number of testing, case-contacts, recovered patients and COVID-19 related deaths.

Table 3: Correlation between the number of tested samples; and confirmed, recovered, dead and contacts cases

			Confirmed cases	Tested samples	Cured cases	Deceased cases	Contact cases
Rho de Spearman	Confirmed cases	CorrelationCoefficient	1.000				
		Sig. (bilatéral)	.				
	Tested samples	CorrelationCoefficient	.587**	1.000			
		Sig. (bilatéral)	.000	.			
	Recovered patients	CorrelationCoefficient	.429**	.618**	1.000		
		Sig. (bilatéral)	.000	.000	.		
	Dead cases	CorrelationCoefficient	.261**	.219*	.202*	1.000	
		Sig. (bilatéral)	.009	.029	.044	.	
	Contact cases	CorrelationCoefficient	.189	.039	-.033	.106	1,000
		Sig. (bilatéral)	.060	.699	.748	.294	.

\*\* . The correlation is significant at the 0.01 level (bilateral).

\* . The correlation is significant at the 0.05 level (bilateral).

## Discussions

The results showed that during the 100 first days of COVID-19 epidemic, Mali reported 2,260 confirmed cases. The saw-tooth distribution of these cases seems to reflect the variability in the number of testing meaning that the real distribution of COVID-19 cases needs to be known as the real distribution of the tested people needs to be known. The daily released of information and situation reports do not report the number of tested people. They only report the number of tested samples. Here, it is important to note that for diseases such as COVID-19, the number of tested samples is not the number of tested people as a person may provide more than one specimen for confirmation and monitoring purpose. Thus, the 14,726 tested samples do not correspond to 14726 people. Based on that, less than 1% of the Malian population estimated as 18 million was tested during the first 100 days of the epidemic (13). With this information, it is difficult to say that the testing efforts undertaken in Mali during the first 100 days provide an overview on the real magnitude of the epidemic. Without this overview, it is difficult to control that epidemic. Evidence indicates that such overview is crucial to control epidemics such as COVID-19 (14).



Correlation analyses showed that there was a positive correlation between the number of confirmed cases and the number of testing. In other words, Mali could have more positive cases by testing more people. Thus, the 2,260 confirmed cases that have been reported may underestimate the real magnitude of the epidemic. This undermines any assumptions that African countries have few cases of COVID-19 or that Africans are more protected against the disease. If they were tested effectively and on a large scale, there would necessarily be more cases to support or refute the hypothesis of natural protective immunity in Malian population. There is evidence that the spread of diseases such as COVID-19 is more a matter of policy and epidemic management failures than biological factors (15). A large well-organized testing program, combined with extensive efforts to isolate infected people and trace and quarantine their contacts has been keys to the success in controlling the COVID-19 epidemic in South Korea (15).

In addition to underestimating the real magnitude of the epidemic, daily released of information and situation reports do not provide the proportion of asymptomatic or symptomatic patients with mild, moderate, severe or critical symptoms (5, 16). The clinical characteristic of confirmed cases is important in terms of public health intervention and public risk communication as 3% to 6% of the cases may progress to the critical phase of the disease (17-20). In Mali, the health authorities gave information on the confirmed cases without giving further details on the severity of the cases which could influence the adoption of preventive measures against COVID-19. Another important gap in the information provided on COVID-19 situation is the inconsistency in the number of recovered cases and the lack of details about their trajectory. Tracking confirmed cases is very important as 12% to 19% of the cases of COVID-19 may go through hospitalization (17-20). From the daily released of information and situation reports, it is difficult to determine the actual number of confirmed cases who recovered from hospitalization or at home.

It should be also noted that contact cases are not routinely tested in Mali. Because of a weak contact-tracing policy, several cases of COVID-19 may have escaped the system, especially given the fact that many contaminated people remain asymptomatic for some time or forever (21-24). It could thus favor pre-symptomatic or asymptomatic transmission, defined as the transmission of the virus from an infected person showing no signs at the time of testing to an uninfected person (25).

Likewise, the number of COVID-19 related deaths is also underestimated. In order to better estimate the lethality, it is necessary to know the actual extend of the epidemic through a large-scale ante-mortem or post-mortem testing strategy. In Mali, a systematic post-mortem testing strategy was not adopted and could contribute to a better estimation of the lethality.

With regard to the geographic distribution of COVID-19, daily released of information and situation reports provided information only on the geographic location of confirmed cases. Also, several geographic locations close to Bamako seem to be less affected than some geographic locations quite far from Bamako (the epicenter of the epidemic). These geographic locations include Tombouctou, Mopti and Kidal which are located from 600 to 1500 Km from Bamako. This question is puzzling. Its Answer

requires further investigation to better understand the dynamics of the spread of the virus through geographic locations.

## Conclusion

This analysis of Mali COVID-19 reports shows that the country reported low numbers of COVID-19 cases during the first 100 days of the epidemic. However, this is not necessarily indicative of low prevalence or successful control but insufficient virus testing and contact tracing. It suggests that Mali needs to do more COVID-19 viral testing by screening more people in ante-mortem and post-mortem, particularly among contact cases. It also highlights the need for improving the identification, location and follow-up of confirmed, contact, recovered and dead cases. Addressing these issues will help to understand the evolution of COVID-19 epidemic and to improve communication by adapting the content of daily released of information and situation reports to the needs of populations and health actors, contributing to reducing the spread of the epidemic and preserving populations' health.

## List Of Abbreviations

COVID-19: Coronavirus disease 2019

PCR: Polymerase chain reaction

SPSS: *Statistical Package for the Social Sciences*

SARS-Cov 2: Severe acute respiratory syndrome coronavirus 2

INSP: National Institute of Public Health

MSAS: Ministry of Health and Social Affairs

RNA: Ribonucleic acid

RT-PCR: *Reverse transcription polymerase chain reaction*

Sig.: significance

## Declarations

### Ethics approval and consent to participate

Not applicable, because the study focused only on data from the daily released of information and situation reports on COVID-19, which are publically shared by the Coordination Agency for COVID-19 control and available on the website of the Ministry of Health and Social Affairs and at the National Institute for Public Health.

## **Consent for publication**

Not applicable.

## **Availability of data and materials**

The datasets used and analysed during the current study are available from the corresponding author on reasonable request.

## **Competing interests**

The authors declare that they have no competing interests.

## **Funding**

Not applicable.

## **Authors' contributions**

BAL was responsible for the design, drafting, analysis of data, and editing of the manuscript.

MAAA contributed to the design, drafting, analysis of data, and editing of the manuscript

TMM contributed to the design, drafting, analysis of data, and editing of the manuscript.

YC was responsible for reviewing and editing the manuscript and overseeing the data analysis.

CLF contributed to the design, drafting and editing of the manuscript.

FBT contributed to the analysis of data and editing of the manuscript.

NHD contributed to the analysis of data and editing of the manuscript.

IB was responsible for providing analytical advice, reviewing and editing the manuscript.

AB was responsible for providing analytical advice, reviewing and editing the manuscript.

HS was responsible for reviewing and editing the manuscript and overseeing the data analysis.

SD was responsible for reviewing and editing the manuscript and overseeing the data analysis.

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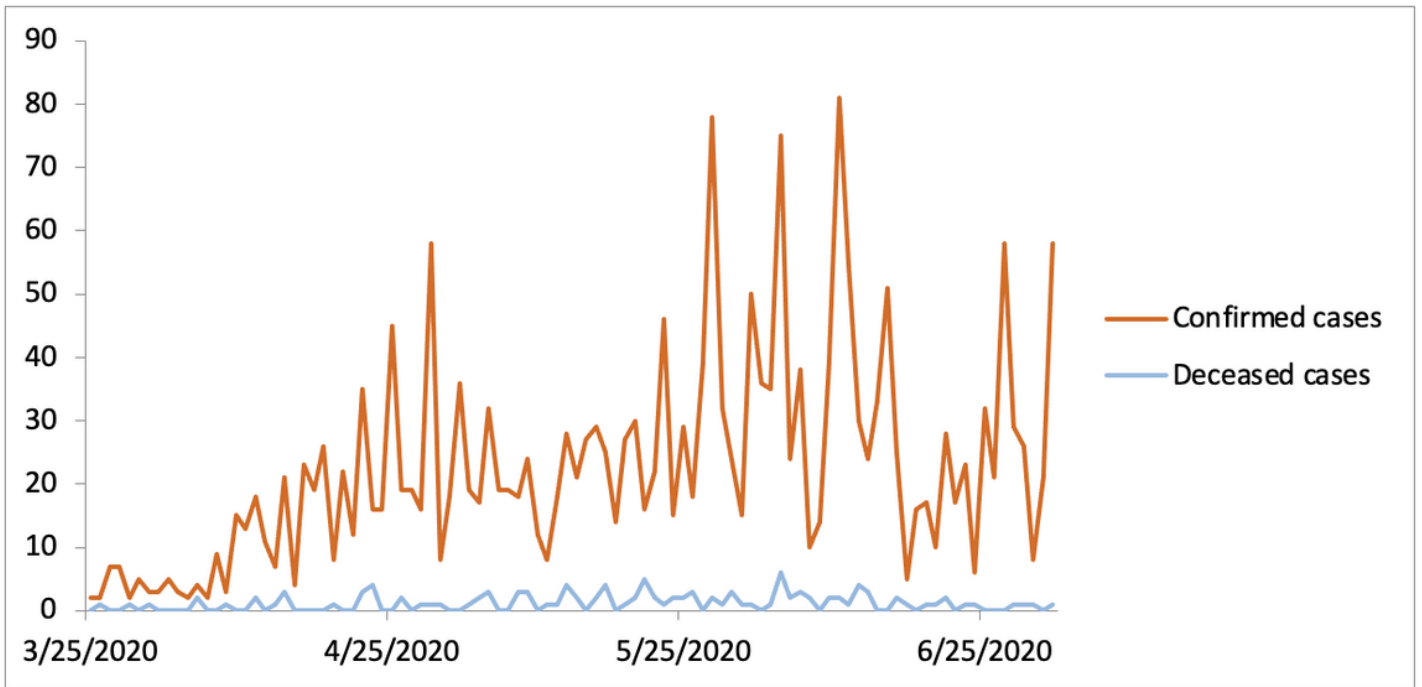
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## Figures



**Figure 1**

Evolution of confirmed cases and COVID-19 related deaths during the first 100 days of the epidemic in Mali