

Status of the COVID-19 pandemic in Kenya: Evidence from national case-based surveillance, serosurveillance and hospital-based clinical surveillance

KEY MESSAGES

- Kenya is experiencing a second rise in PCR confirmed COVID-19 cases
- The proportion of PCR confirmed cases occurring in rural counties has increased over time.
- The increase in cases in Nairobi can be partly attributed to an increase in numbers tested since mid-September
- Preliminary findings from antibody testing from several sources indicates that prevalence of exposure to SARS-CoV-2 has significantly increased over time, especially in Nairobi and in Mombasa.
 - Overall crude prevalence of antibodies to SARS-CoV-2 in blood donors was **5.6%** by 27th May 2020 (3,098 samples) and this has increased to **13.3%** by 4th August 2020 (3,651 samples).
 - In Nairobi blood donors, crude antibody prevalence over the same period increased from **8.9%** to **21.5%** and from **9.3%** to **17.1%** for Mombasa blood donors
 - Antibody testing of residual blood samples from 196 mothers attending antenatal clinic visits at Kenyatta National Hospital (KNH) suggests that **46%** have been exposed to SARS-CoV-2 infection at the time of sample collection between 30th July 2020 and 25th August 2020
 - Antibody testing of 183 healthcare workers (HCW) at Kenyatta National Hospital in Nairobi suggests that **41%** have been exposed to SARS-CoV-2 infection at the time of sample collection between 30th July 2020 and 28th August 2020.
 - The contents of this brief are aimed at providing rapid advice for immediate decision making. Additional ongoing analyses will provide standardized and adjusted estimates of seroprevalence
 - Nationally representative population-based seroprevalence surveys are required to accurately estimate the percentage of the Kenyan population that has been exposed to SARS-CoV-2 infection.
- Clinical surveillance of all-cause admissions in 14 county hospitals up to end of September 2020 shows that the number of patients admitted is not higher than what was observed during the same months in previous years.
- The total number of adult inpatient deaths in the surveillance hospitals has remained constant during the pandemic
- There is evidence of extensive spread of the epidemic, with the epidemic likely past its peak in Nairobi and central Mombasa, and the spreading through semi-urban and rural Counties explaining the secondary increase in cases.
- We cannot be sure how much of the change in positive test rates is due to variation in testing practice. Data on hospital cases is a priority for monitoring the epidemic.

INTRODUCTION

Kenya is on the 34th week of the COVID-19 pandemic since the first confirmed case on the 13th of March 2020. Updated evidence on the status of the pandemic is useful in informing government response. In this brief, we summarize the latest findings from three linked packages of work that KEMRI-Wellcome Trust is conducting arising from a request from and collaboration with the Ministry of Health. These are a) national case-based surveillance of SARS-CoV-2 b) serological surveillance for anti-SARS-CoV-2 antibodies, and c) hospital-based clinical surveillance.

A: NATIONAL CASE-BASED SURVEILLANCE OF SARS-CoV-2

- Kenya is experiencing a second rise in cases following the initial rise and fall between June and September. How can this be explained?
- Recent modelling work suggested that the decline in the first epidemic period in September was largely within the main urban and surrounding semi-urban counties. This was likely due to a reduction in the

number of people in the population that are susceptible because a large proportion of the population (30-40%) had already been infected. It was predicted that the epidemic would move to the more rural counties.

- Data are available for the daily PCR test positive and negative results by county and sub-county from the Ministry of Health. This has allowed a more detailed investigation of the observed patterns.

Findings from National case-based surveillance of SARS-CoV-2

- The first epidemic period in Kenya was predominantly in the urban settings, less so the semi-urban counties and least in rural counties (Figure 1).
- Rural counties and some urban sub-counties are now contributing considerably more to the current rise in cases

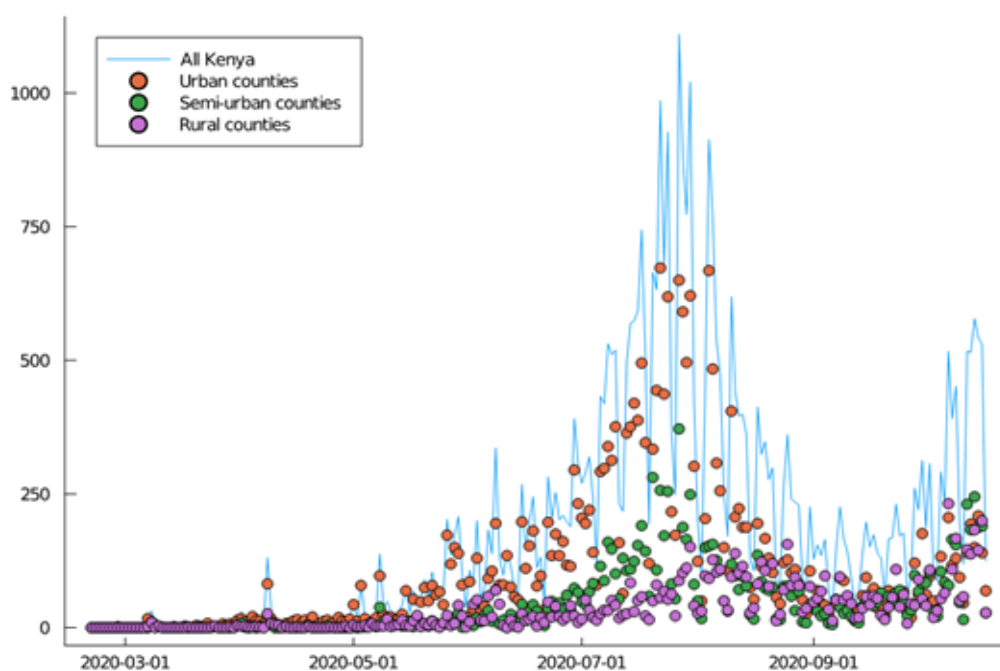


Figure 1: Trends in case numbers for urban, semi-urban and rural counties

- There has been considerable change in the numbers tested over time and there may be associated changes in testing strategy which could partly explain the trends. The recent rise in cases is being accompanied by increasing numbers of tests, particularly in Mombasa and Nairobi from early and mid-September, respectively (Annex 1 and 2)
- The proportion of tests PCR positive has also increased in recent weeks for example in Nairobi (Annex 1), and the rest of the country (excludes Mombasa, Nairobi, Kajiado, Machakos and Kiambu) (Annex 4).
- The rise in proportion positive might also reflect changes in those who are being tested and their likelihood of being positive (The ministry of Health has indicated a shift to a more targeted approach to testing high risk and symptomatic populations).
- Overall, the current case pattern is consistent with the earlier modelling findings

B. SEROLOGICAL SURVEILLANCE FOR ANTI-SARS-CoV-2 ANTIBODIES

- Active virus infection can be detected by running PCR tests on nose/throat swab samples. The test stays positive for about two weeks.
- Whether a person has been infected before can be detected by testing the blood for antibodies. Antibodies are thought to stay positive for several months
- Testing a sample of the population for antibodies tells us how many people have already been exposed to the virus at some time in the past.
- KEMRI-Wellcome has developed an antibody test based on protocols developed in the USA
- The antibody test correctly classified 901 of 910 pre-pandemic samples as seronegative, and 166 of 179 samples from SARS-CoV-2 PCR positive individuals as seropositive. This means the assay has a specificity of 99.0% (95% CI 98.1-99.5%) and sensitivity of 93% (95% CI 87.9-96.1%).

- The ideal way of estimating exposure to COVID-19 in the Kenyan population would be visiting randomly selected, nationally representative sample of homesteads to collect and then test blood samples.
- While efforts to conduct population level SARS-CoV-2 antibody surveys are in progress, results from SARS-CoV-2 antibody testing of blood donors and other populations such as women attending antenatal clinics can provide insights into the cumulative exposure of the Kenyan population to this virus and the spread of the COVID-19 pandemic in the country.
- The findings presented in this brief represent preliminary unadjusted seroprevalence. Ongoing analyses will report standardised and adjusted estimates.

i. SARS-CoV-2 antibody prevalence among blood donors in Kenya

- There are two batches of blood samples used in this analysis. The first batch consists of 3,098 samples earlier reported on and donated between 30/04/2020 and 16/06/2020 (median 27/05/2020). The second batch consists of 3,651 samples donated from 14/05/2020 to 30/09/2020 (median 04/08/2020)

Findings from SARS-CoV-2 antibody surveillance among blood donors

- The overall crude SARS-CoV-2 antibody prevalence among blood donors has increased 2.4-fold over time from 5.6% to 13.3%
- The crude antibody prevalence was similar for both sexes in the two periods
- Two of the three urban counties with the highest antibody prevalence in the first collection, Mombasa and Nairobi both had more than a 2-fold increase in antibody prevalence from 9.3% to 17.1% and 8.9% to 21.5% respectively (Table 1).
- A notable increase in antibody prevalence is also seen for Kwale, Kilifi, Counties in Nyanza other than Kisumu, in the Rift Valley and other Counties in the Eastern/North Eastern regions.
- An additional 3397 blood donor samples from batch 2 are still undergoing testing. So, some of these results may change.

Table 1. SARS-CoV-2 Antibody prevalence in Kenyan blood donors by region/County by period of collection

Region	County	Batch 1 (30/04 to 16/06/20)			Batch 2 (14/05 to 30/09/20)		
		N	Number of SARS-CoV-2 positive	Crude Seroprevalence % (95%CI)	N	Number of SARS-CoV-2 positive	Crude seroprevalence % (95%CI)
Coast	Mombasa	550	51	9.3 (7.0-12.0)	1102	189	17.1 (15.0-19.5)
	Kwale	236	12	5.1 (2.7-8.7)	253	52	20.6 (16.0-26.0)
	Kilifi	485	24	4.9 (3.2-7.3)	252	35	13.8 (10.1-18.7)
	Others	252	3	1.2 (0.2-3.4)	156	10	6.4 (3.5-11.5)
Nairobi	All	235	21	8.9 (5.6-13.3)	153	33	21.5 (15.8-28.8)
Central	All	105	7	6.7 (2.7-13.2)	884	77	8.7 (7.0-10.8)
Eastern/ N. Eastern	Machakos	145	9	6.2 (2.9-11.4)	81	4	4.9 (1.9-12.4)
	Others	97	2	2.1 (0.3-7.3)	61	6	9.8 (4.5-20.2)
Nyanza	Kisumu	197	14	7.1 (3.9-11.6)	9	0	-
	Others	245	16	6.5 (3.8-10.3)	78	15	19.2 (11.9-29.5)
Rift valley	Uasin Gishu	376	3	0.8 (0.1-2.3)	-	-	-
	Others	105	5	4.8 (1.6, 10.7)	500	51	10.2 (7.8-13.2)

ii. SARS-CoV-2 antibody prevalence among mothers attending antenatal care (ANC) at Kenyatta National Hospital (KNH)

- The Kenya Demographic and Health Survey in 2014 reported that 96% of pregnant Kenyan women had attended at least 1 ANC visit.
- ANC visits at KNH should represent a relatively unbiased selection of the female population of child-bearing age within the KNH catchment area.
- The analysis is based on a sample of 196 residual blood samples of mothers attending ANC at KNH between the 30th July and 25th August

Findings from SARS-CoV-2 antibody surveillance among KNH ANC attendees

- Antibody testing suggests that 46.4% of mothers have been exposed to SARS-CoV-2 virus.
- Further analyses including samples collected from ANC clients in other parts of the country over a similar period will explore possible reasons for the difference in seroprevalence among ANC clients and blood donors

iii. SARS-CoV-2 antibody prevalence among Health Care Workers at Kenyatta National Hospital

- Antibody testing among HCW can tell us how many of them have been exposed to SARS-CoV-2. However antibody testing cannot conclusively determine whether exposure to the virus occurred during the course of their work or from interactions with other members of the community.
- This analysis is based on a sample of 183 HCW at Kenyatta National Hospital who volunteered to provide their blood samples for testing.
- Additional samples are being collected from HCW at KNH and other sites in Kenya to provide a better understanding of the frequency and pattern of infection among HCW.

Findings from SARS-CoV-2 antibody surveillance among KNH healthcare workers

- Antibody testing suggests that ~41% of HCW at Kenyatta National Hospital have been exposed to SARS-CoV-2 infection.
- There might be differences in risk of exposure to SARS-CoV-2 by cadre among HCW however the numbers are too few to examine the differences conclusively.
- The exposure is similar to that seen among expectant mothers at ANC visits, suggesting that exposure may be from the community.

C: SENTINEL SYNDROMIC SURVEILLANCE OF SEVERE ACUTE RESPIRATORY INFECTIONS IN KENYA

- Sentinel surveillance provides data to allow for timely and accurate monitoring of COVID-19 in Kenya and provide an early warning signal of the likelihood of the pandemic to overwhelm the capacity of the health system.
- The number of hospitalised cases of severe acute respiratory infection (SARI) may be indicative of the disease burden in the population, assuming good access to care.
- Sentinel clinical surveillance for SARI has been established in 14 government county hospitals¹ as an extension of an existing partnership between KEMRI-Wellcome Trust Research Programme (KWTRP), Ministry of Health (MOH), Kenya Paediatric Association, and participating county hospitals across the country known as the Clinical Information Network.

Key findings from sentinel syndromic surveillance of SARI

- There was a notable decline in all-cause admissions in March coinciding with the start of the pandemic and immediate introduction of containment measures
- The number of hospital admissions has been increasing from June to September
- At the end of September 2020, on average, the inpatient numbers were not higher than those observed at a similar period in 2018 and 2019 (Figure 2).
- Recent health worker strikes in various counties has had a negative effect on hospital admissions
- Approximately one in three patients admitted to the sentinel surveillance hospitals presented with signs

¹ Naivasha CH, Bungoma CRH, Migori CRH, Kakamega CRH, Machakos CRH, Kisumu CH, Embu CRH, Busia CRH, Mama Lucy, Homa Bay CRH, Kiambu CRH, Kitale CRH, Mbagathi CRH, Kilifi CRH

of severe acute respiratory illness. This ratio has remained constant over the period of the surveillance

- The number of inpatient deaths has remained relatively stable during the pandemic.
- Testing rates among admitted inpatients remain low which hinders interpretation.
- We are aware of reported pressure on private hospitals for bed space, but this is not supported by our sentinel surveillance of Government facilities.
- Hospital-based surveillance with representation from all counties is required to accurately monitor the trends of severe cases in the country.

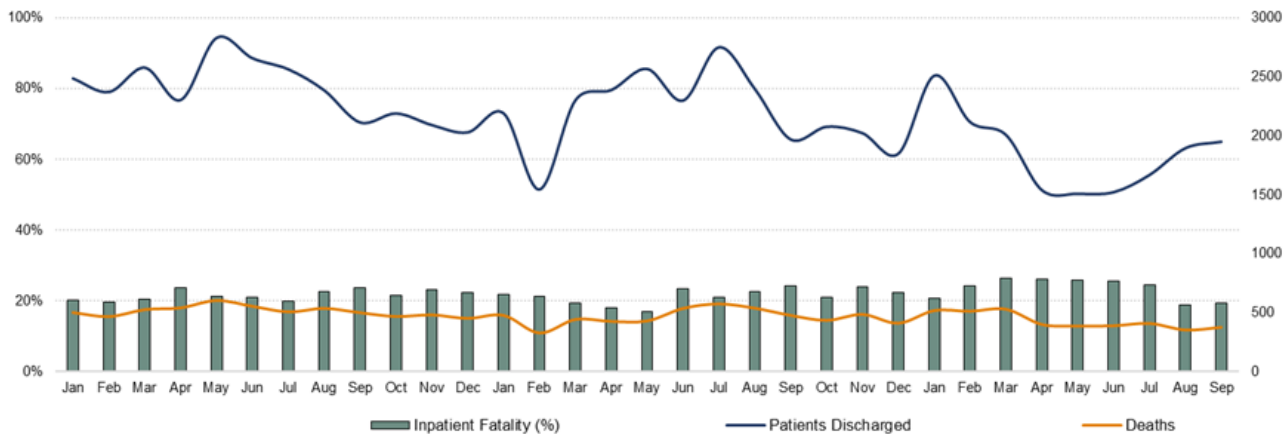
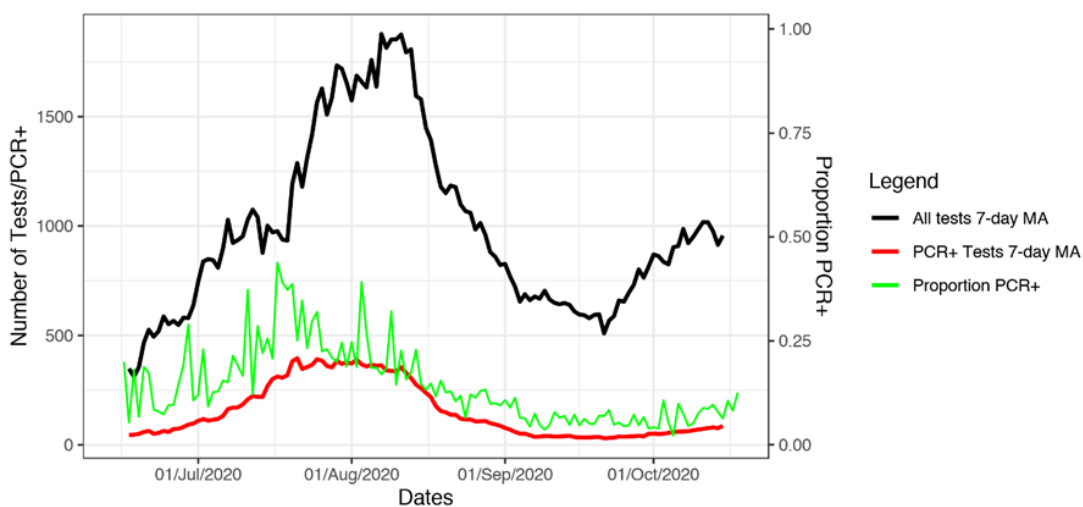
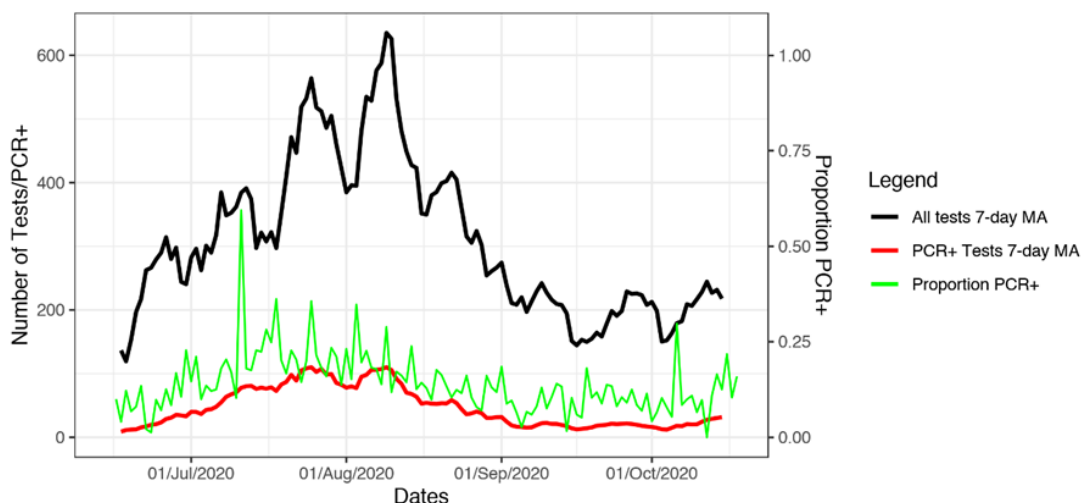


Figure 2: Trends in discharges and deaths in hospital-based sentinel surveillance sites from January 2018 to September 2020

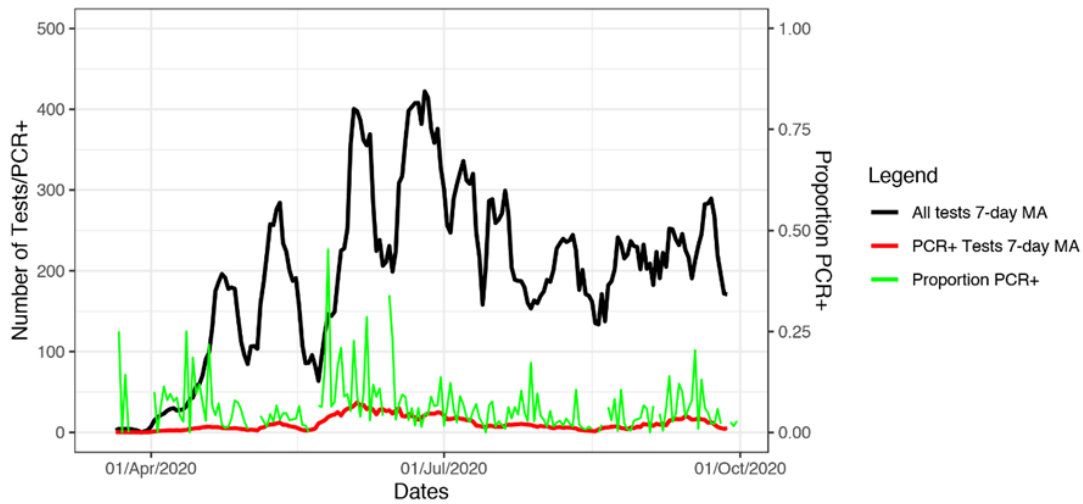
Annexes



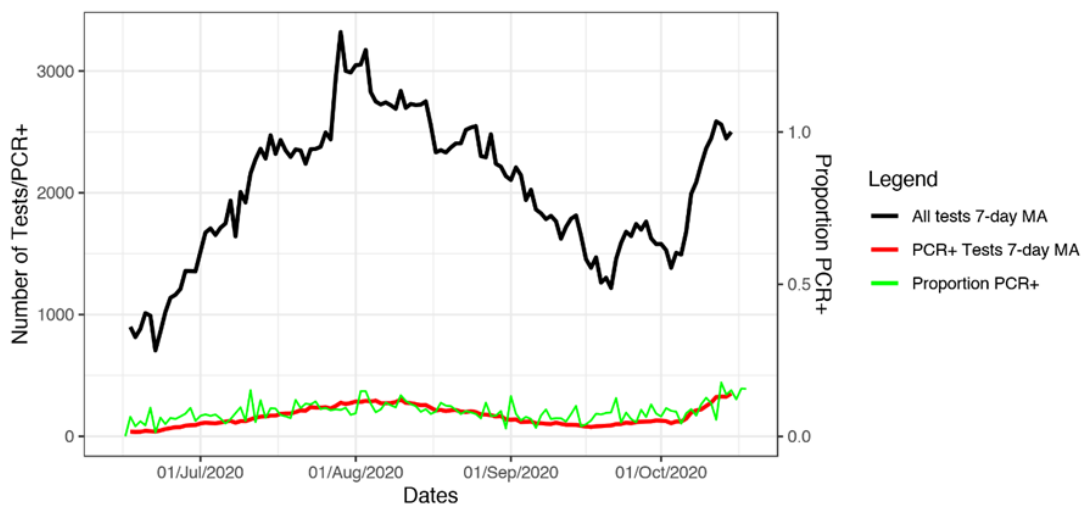
Annex 1: Number of tests and proportion positive in Nairobi County



Annex 2: Number of tests and proportion positive in Kiambu, Kajiado and Machakos Counties



Annex 3: Number of tests and proportion positive in Mombasa County



Annex 4: Number of tests and proportion positive in rest of Kenya

Acknowledgements

- MOH - PHEOC, Presidential Policy and Strategy Unit
- Kenya National Blood Transfusion Services
- Kenyatta National Hospital
- KEMRI-Wellcome Trust CIN team, Communications, KPA/KEPRECON, CHAIN Network
- Participating County and Hospital teams
- University of Oxford
- London School of Hygiene and Tropical Medicine
- University of Warwick
- Florian Krammer, Icahn School of Medicine at Mount Sinai
- WHO SOLIDARITY II network.

Funding for this work came from: Foreign, Commonwealth and Development Office (FCDO), East African Research Fund, Wellcome, National Institute for Health Research (NIHR), Bill and Melinda Gates Foundation, Medical Research Council (MRC). The views expressed are those of the authors and not necessarily those of the funding agencies.



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