



UNIVERSITY OF
KWAZULU-NATAL™

INYUVESI
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GLOBAL IMPACT OF COVID-19: LESSONS FROM SOUTH AFRICA

DR RICHARD LESSELLS
HOPE/CHANT CONFERENCE

25 AUGUST 2020



EDGEWOOD CAMPUS



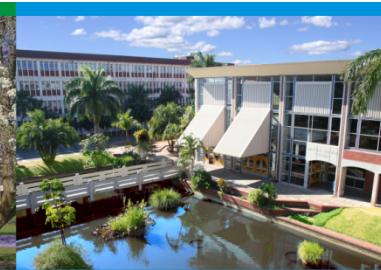
HOWARD COLLEGE CAMPUS



NELSON R MANDELA SCHOOL OF MEDICINE



PIETERMARITZBURG CAMPUS

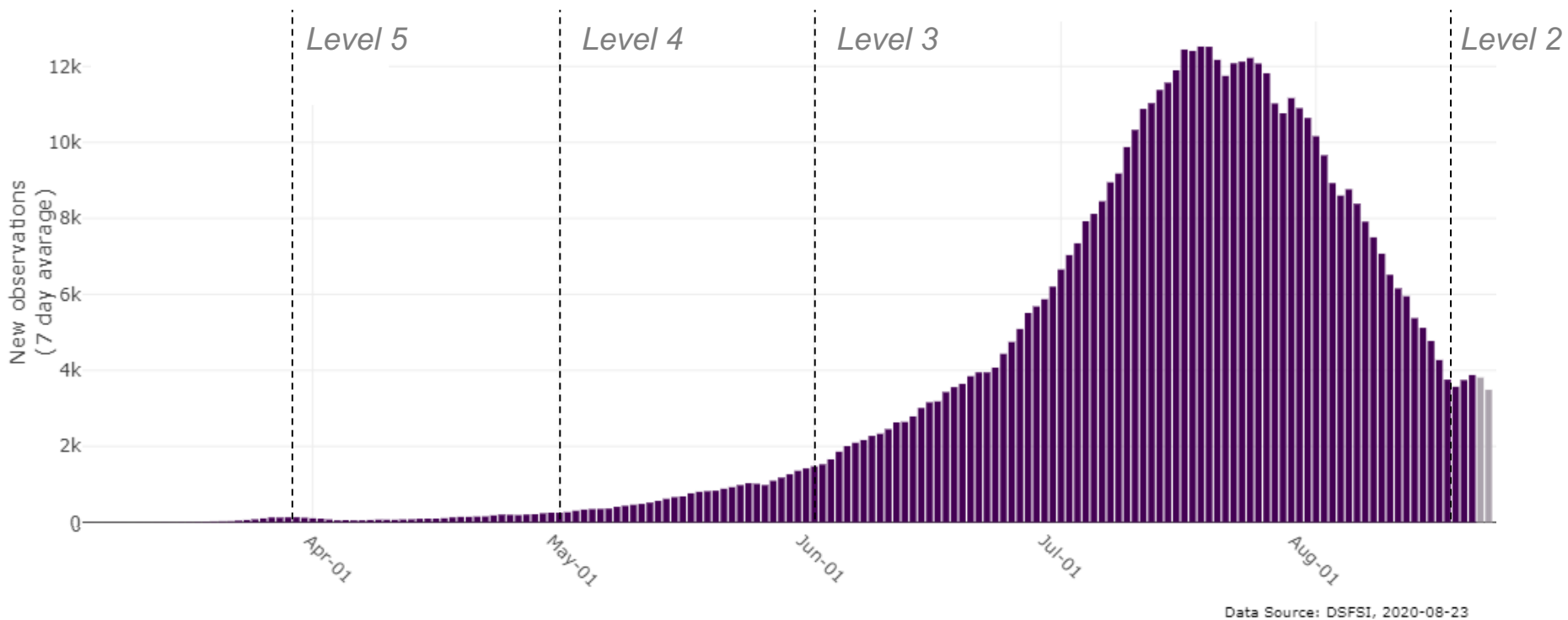


WESTVILLE CAMPUS

UKZN INSPIRING GREATNESS

COVID-19 in South Africa

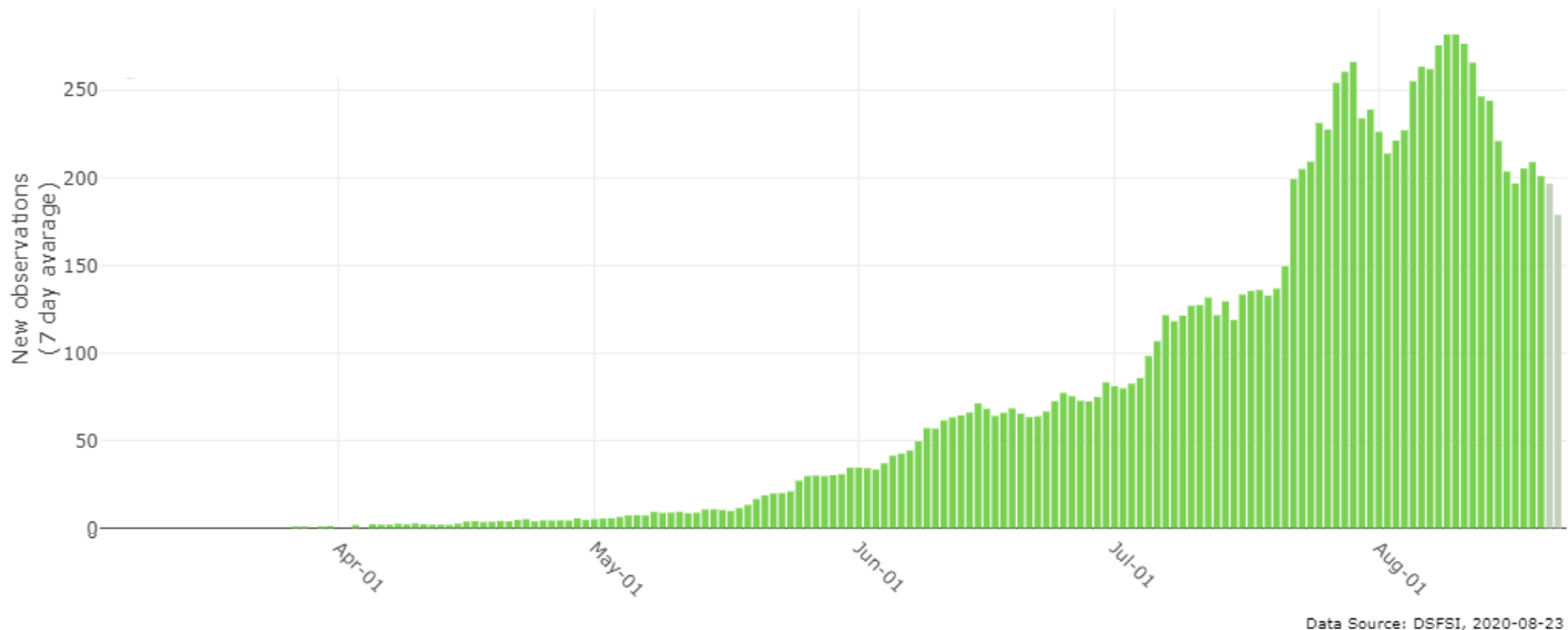
Daily new confirmed cases (7-day rolling average)



Total ~610 000 confirmed cases as of 23 August

COVID-19 in South Africa

Daily new deaths (7-day rolling average)



Total ~13 000 reported COVID-19 deaths as of 23 August

Estimated 36 500 excess deaths 6 May - 11 August

Nosocomial SARS-CoV-2 outbreak

AAAS Become a Member

Science Contents News Careers Journals

SHARE



A coronavirus outbreak at St. Augustine's Hospital in Durban, South Africa, caused 119 infections and 15 deaths. AP PHOTO

Study tells 'remarkable story' about COVID-19's deadly rampage through a South African hospital

By Linda Nordling | May. 25, 2020, 4:30 AM

- On 4 April asked to support investigation of an outbreak at a large private hospital in Durban
- At that time, 13 cases had been confirmed in hospital inpatients & staff (3 patient deaths)
- Main aim was to understand introduction & transmission of virus



Yunus Moosa



Tulio de Oliveira

Methods



Review of
medical records



Hospital walk through
to understand patient
locations and flow



Interviews with
staff involved in
patient care



Desktop review
of policies &
procedures



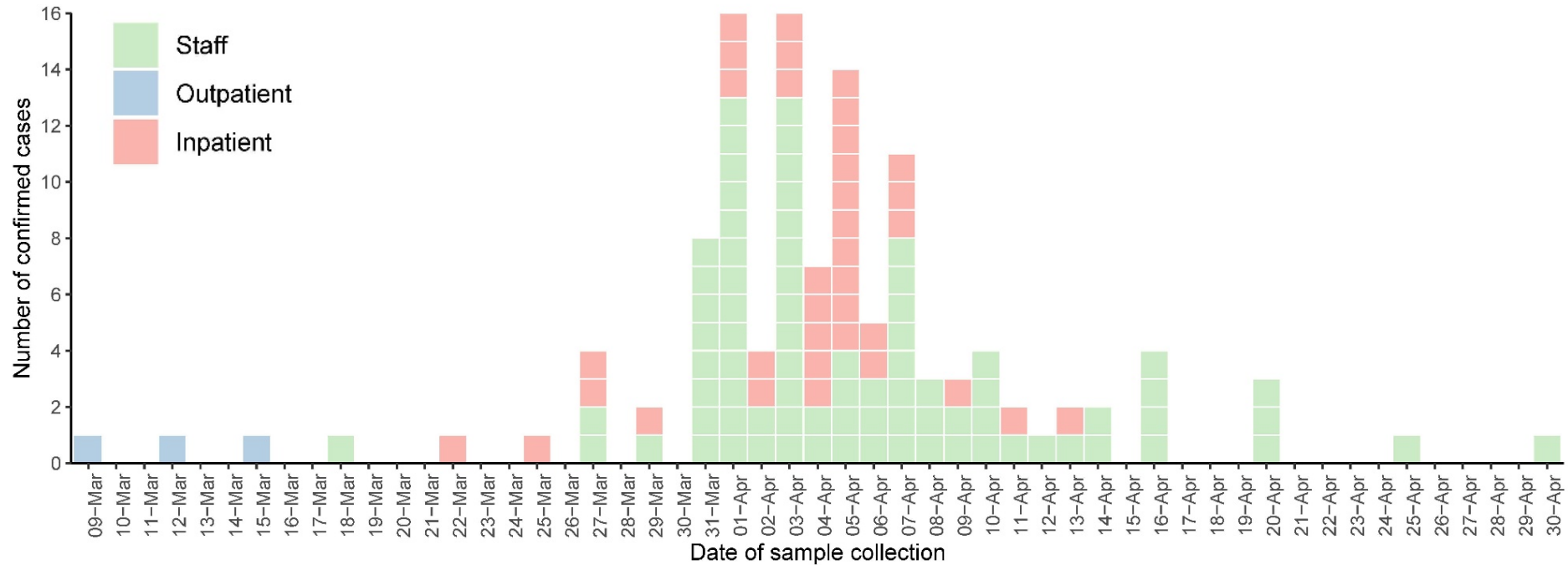
Discussions with
management and
IPC team



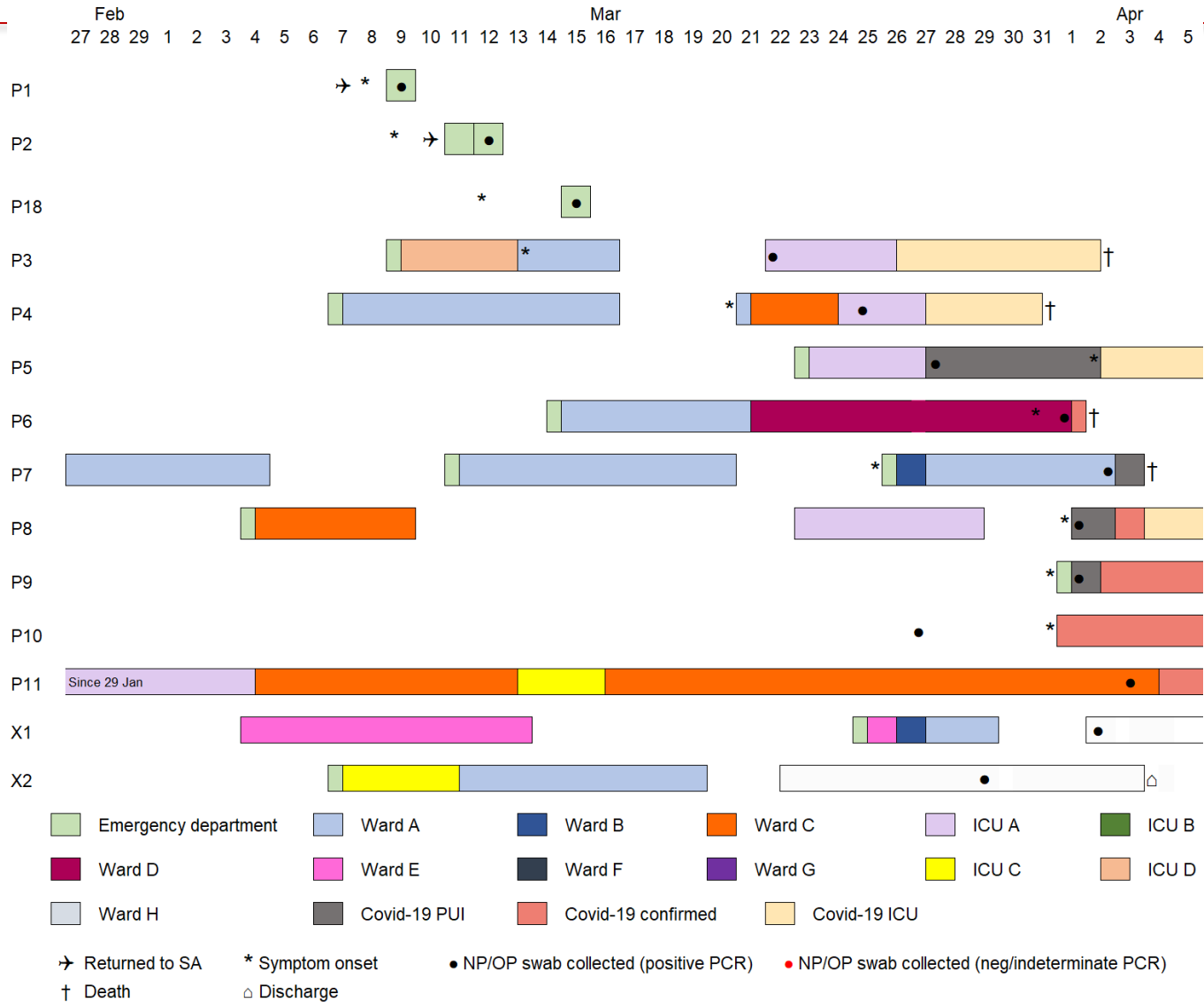
SARS-CoV-2
sequencing &
phylogenetic analysis

Epidemiological curve

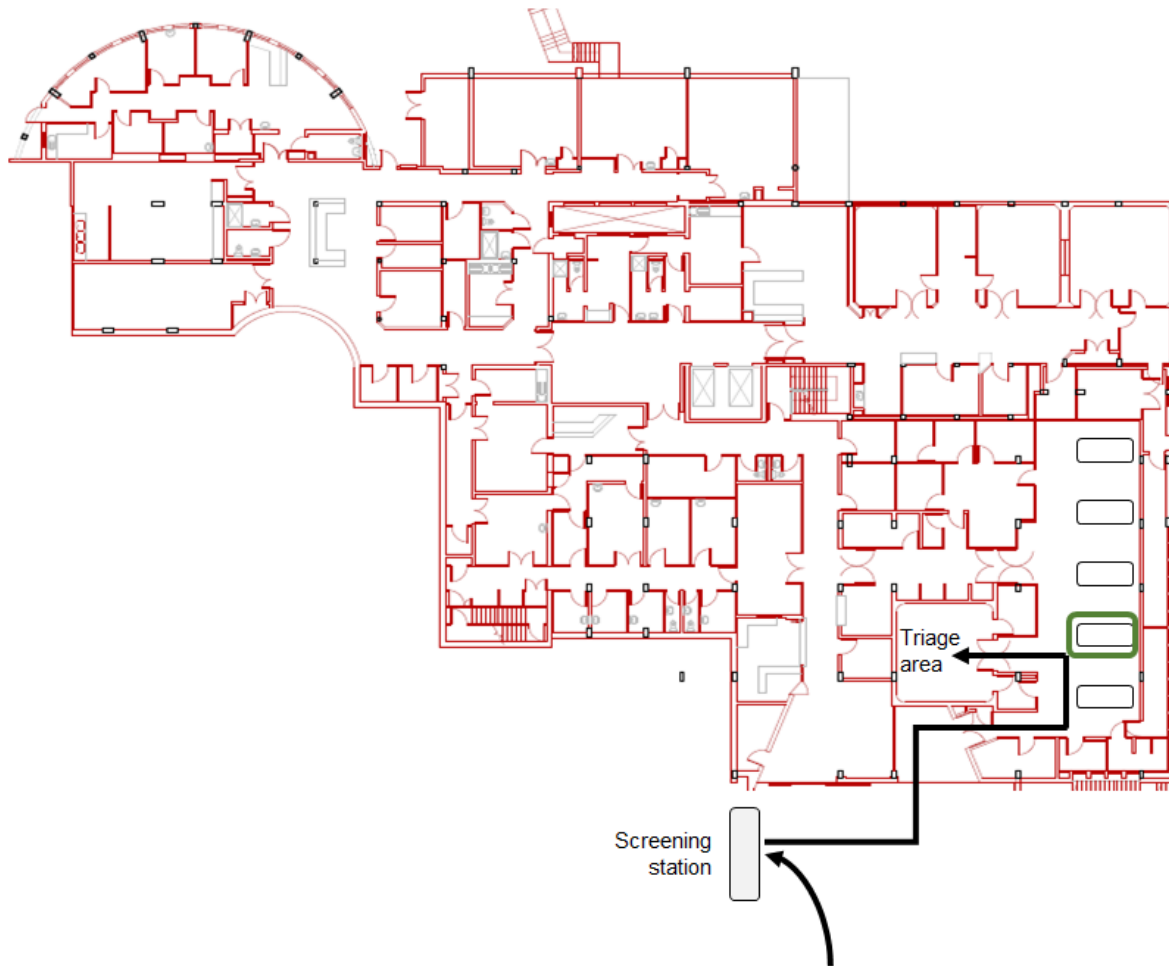
119 confirmed cases (39 patients, 80 staff) up to 30 April



Initial timeline – patient cases



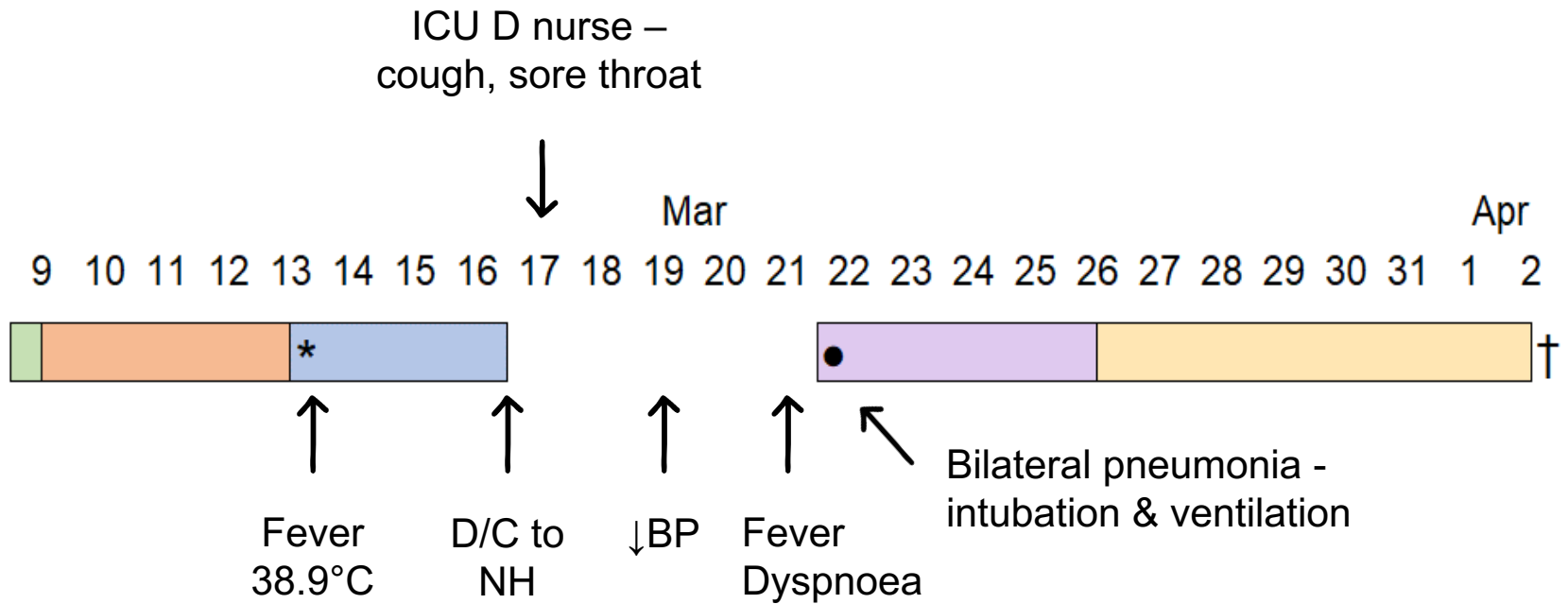
Putative introduction of SARS-CoV-2 into hospital



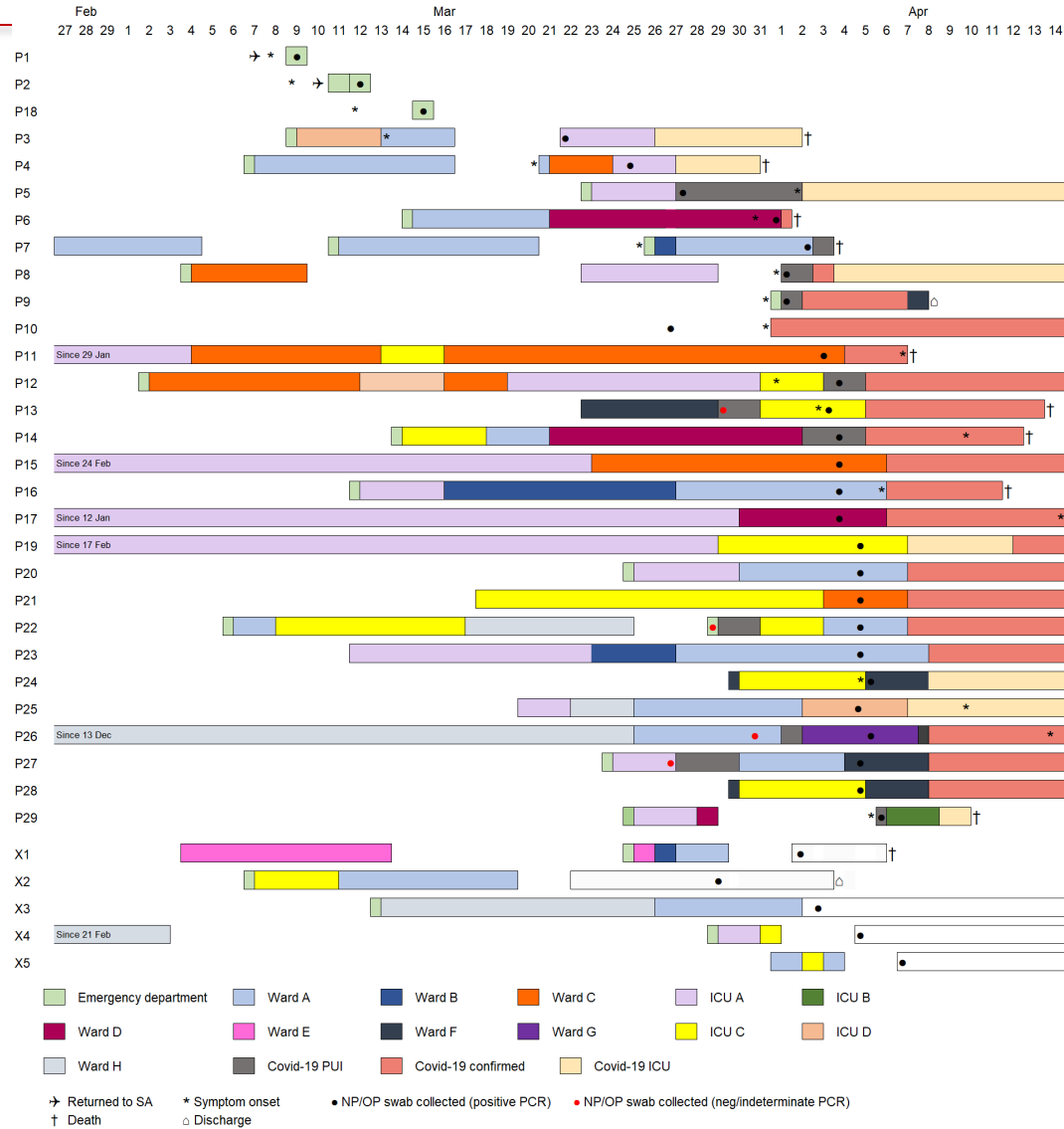
Summary of events 9 March

1. P1 attends ED at 1745 and is screened at station outside entrance – reports recent history of travel and respiratory symptoms
2. P1 diverted into isolation/triage room through side entrance
3. Five staff members interact with P1 (doctor, 2 x nurses, Ampath nurse, radiographer)
4. Dr A assesses and triages P1 wearing appropriate PPE in a single clinical interaction
5. Nurse collects swabs from P1; radiographer performs portable chest; Ampath nurse enters room for dispute around payment
6. P3 arrives at ED by ambulance at 1932 with suspected stroke – taken to resus bay (bed opposite entrance to isolation/triage room)
7. Dr A assesses P3 (having seen other patients in between P1 and P3)
8. P3 taken to X-ray department for CT head scan
9. P1 leaves triage area and ED at 2100
10. P3 transferred from ED to cardiac ICU at 2105
11. Terminal cleaning (3 step) of triage room followed by UV-C treatment same night

P3 clinical progression



Full timeline – patient cases



Putative transmission chains

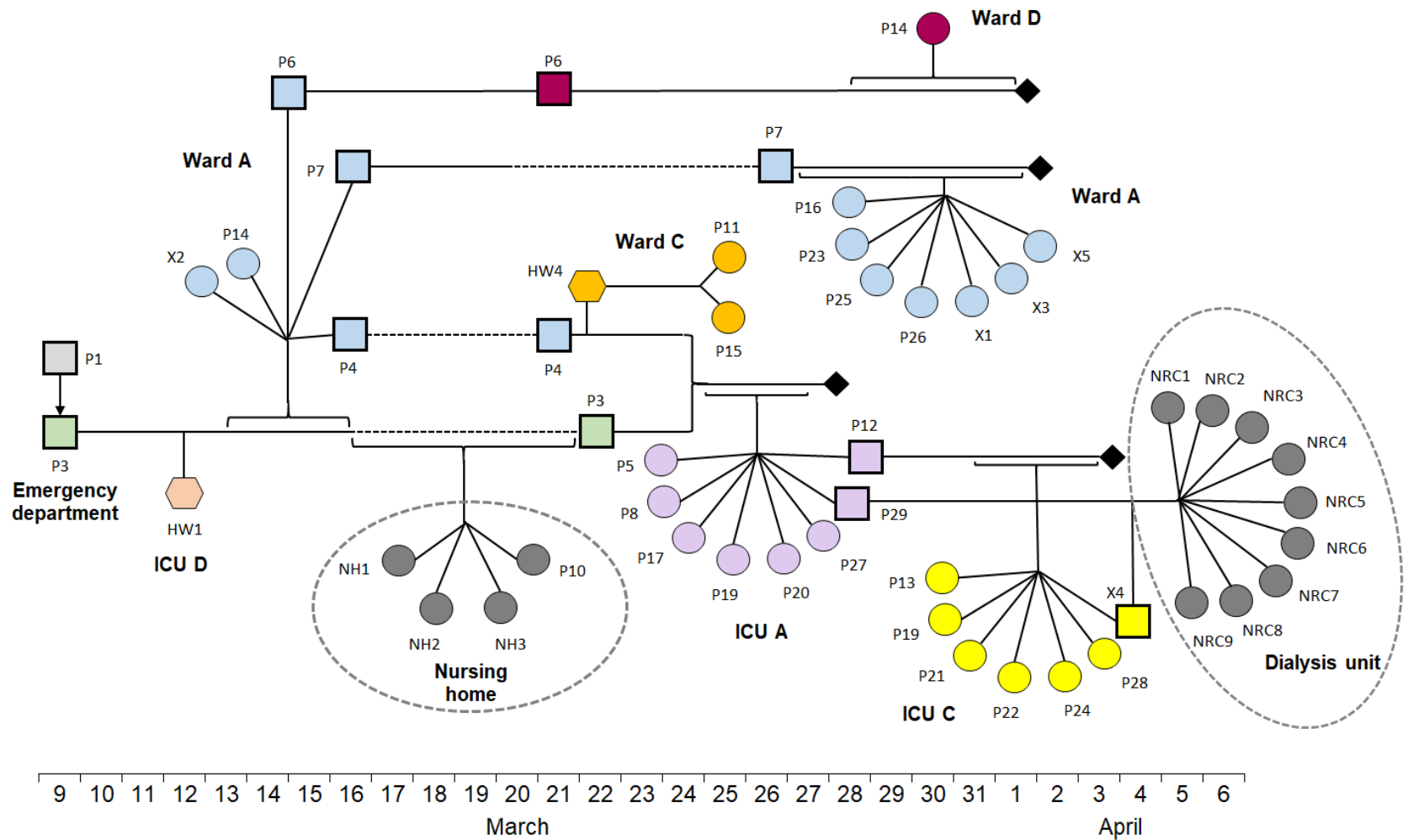
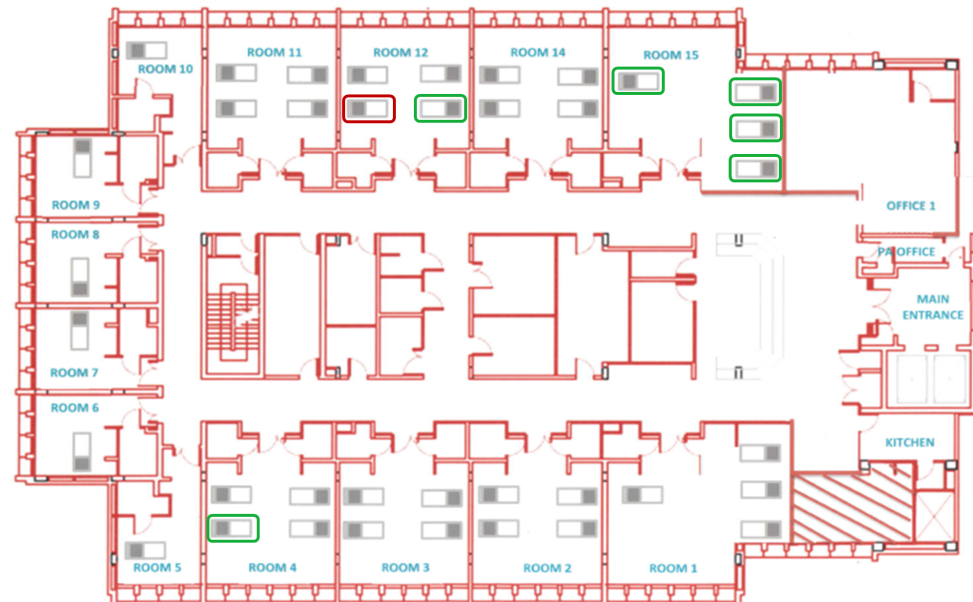
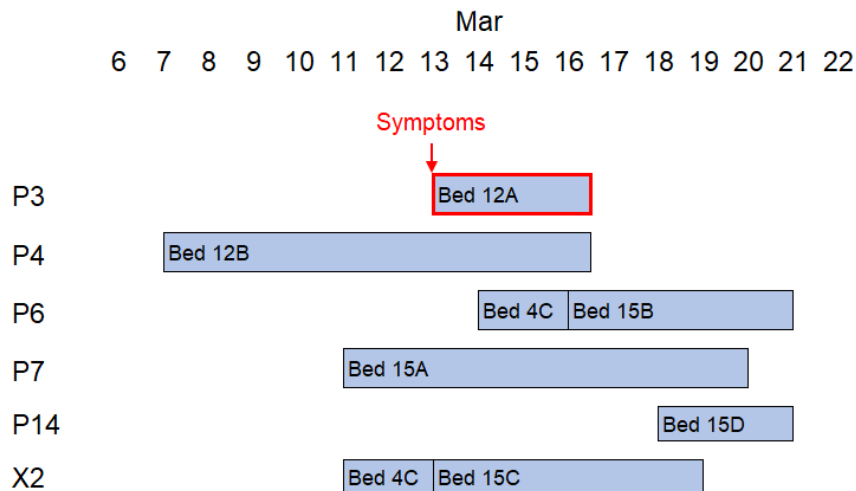


Figure shows the putative waves of transmission centred on different hospital wards and other institutions from 9 March onwards. Coloured squares represent patients that are sources of transmission; coloured circles represent patients that become infected. Only two health care worker infections are shown (HW1 & HW4) as illustrative cases.

Detail of transmission waves

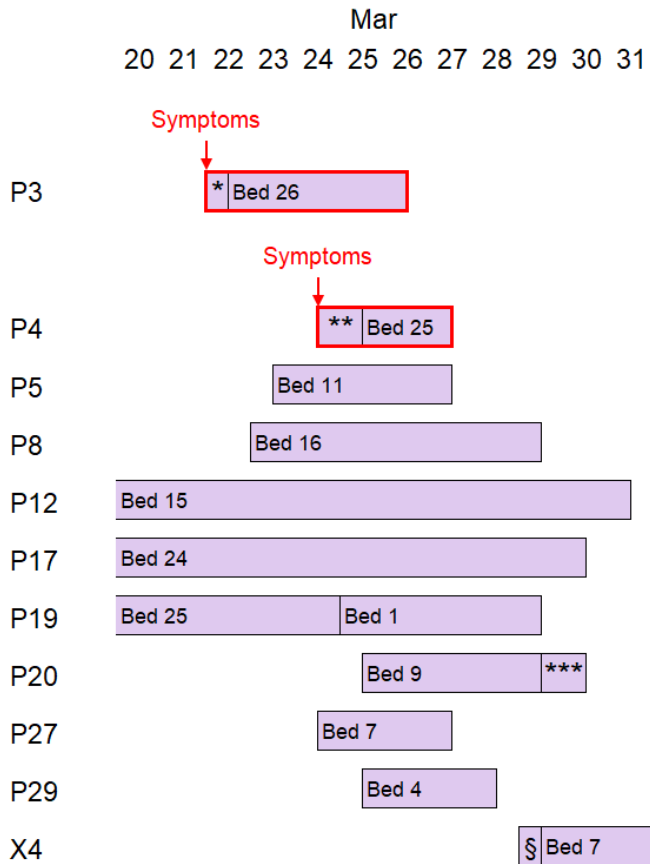
Ward A



First confirmed case in health care worker from this ward – symptom onset 23 March, tested 31 March (nurse, worked directly with P3)

Detail of transmission waves

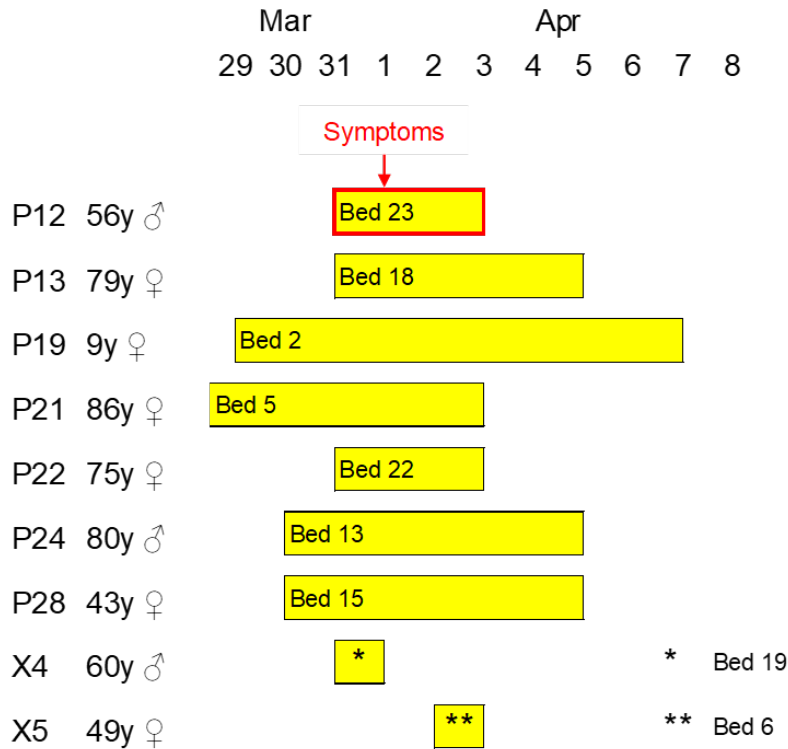
ICU A



First confirmed case in health care worker from this ward – symptom onset & tested 27 March (nurse, did not work directly with P3/P4 but assisted)

Detail of transmission waves

ICU C



First confirmed case in health care worker from this ward – tested 3 April

Patient deaths

- Case fatality rate amongst inpatient cases 38% (15/39)
- Median age 79 years (IQR 69-84)
- All had comorbidities; 13/15 had multimorbidity
- Most common comorbidities: hypertension (n=11), diabetes mellitus (n=7)
- Four patients received experimental therapies, including chloroquine, azithromycin, lopinavir/ritonavir
- Only four were intubated/ventilated

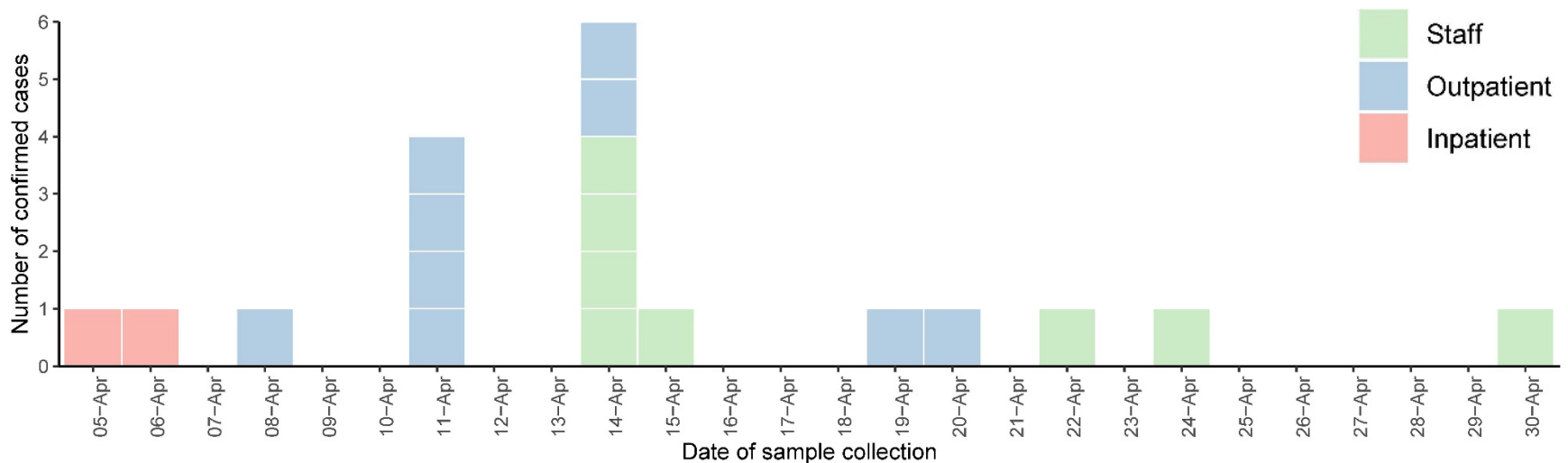
Infections in staff

- 80 staff infections (~5% of all tested during outbreak)
- Most (78%) staff infections were in nurses or nursing students
- Most but not all infections were in staff involved in direct patient-facing roles – confirmed cases in administrative staff, kitchen staff
- Frequency of nurse/nursing student infections correlated with wards with highest intensity of patient-patient transmission – ICU A (n=18), Ward A (n=9), Ward C (n=6) and ICU C (n=6)
- No infections documented in staff on COVID-19 ICU

Dialysis Unit

Hypothesis – two patients acquired infection as inpatients on ICU A & ICU B, then resumed outpatient dialysis 1 Apr & 3 Apr

Additional 17 infections (9 patients and 8 staff members) – most patients were in same dialysis shift as two index cases



Case fatality rate (for patients) 45% (5/11)

Putative transmission chains

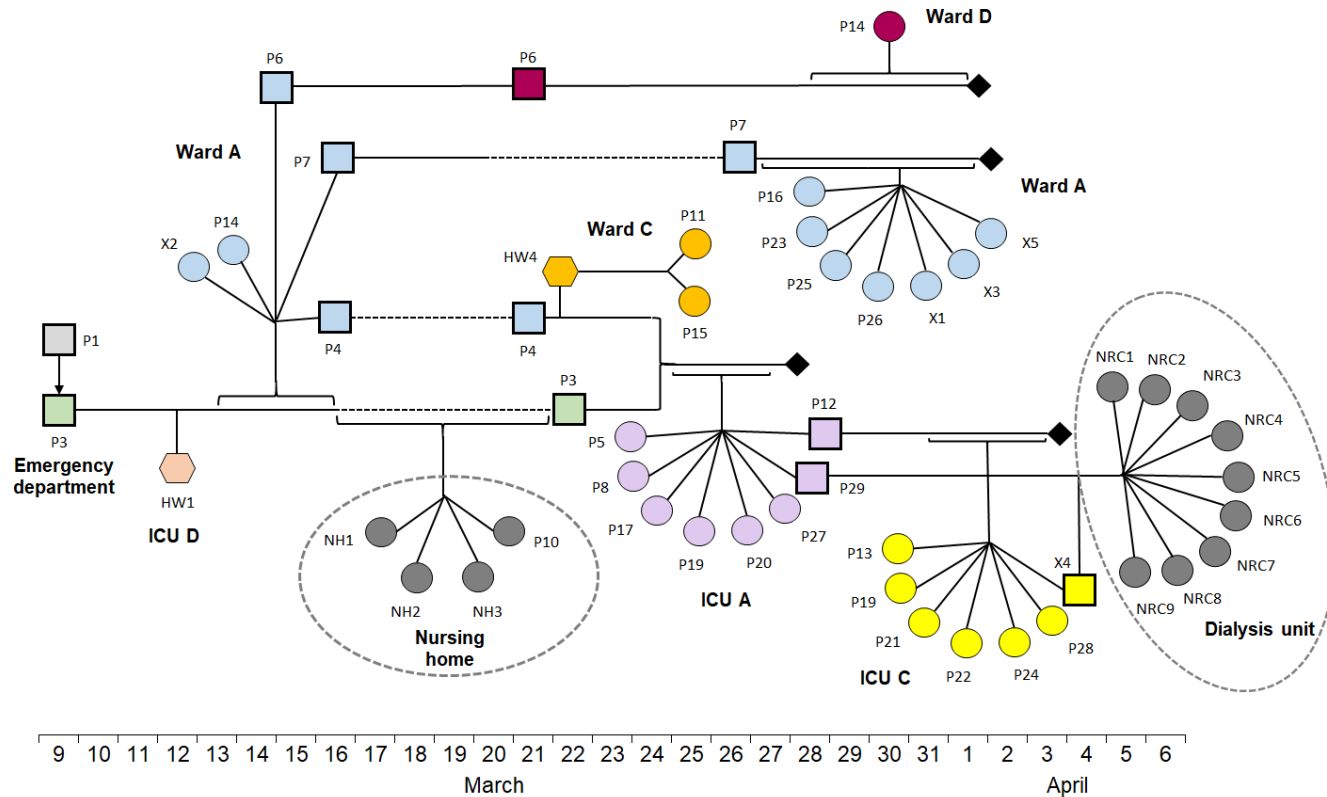


Figure shows the putative waves of transmission centred on different hospital wards and other institutions from 9 March onwards
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 Only two health care worker infections are shown (HW1 & HW4) as illustrative cases

We estimate that up to 135 infections may have been associated with this nosocomial outbreak arising from a single introduction of SARS-CoV-2

Accounted for ~14% of all cases in KwaZulu-Natal reported by 30 April

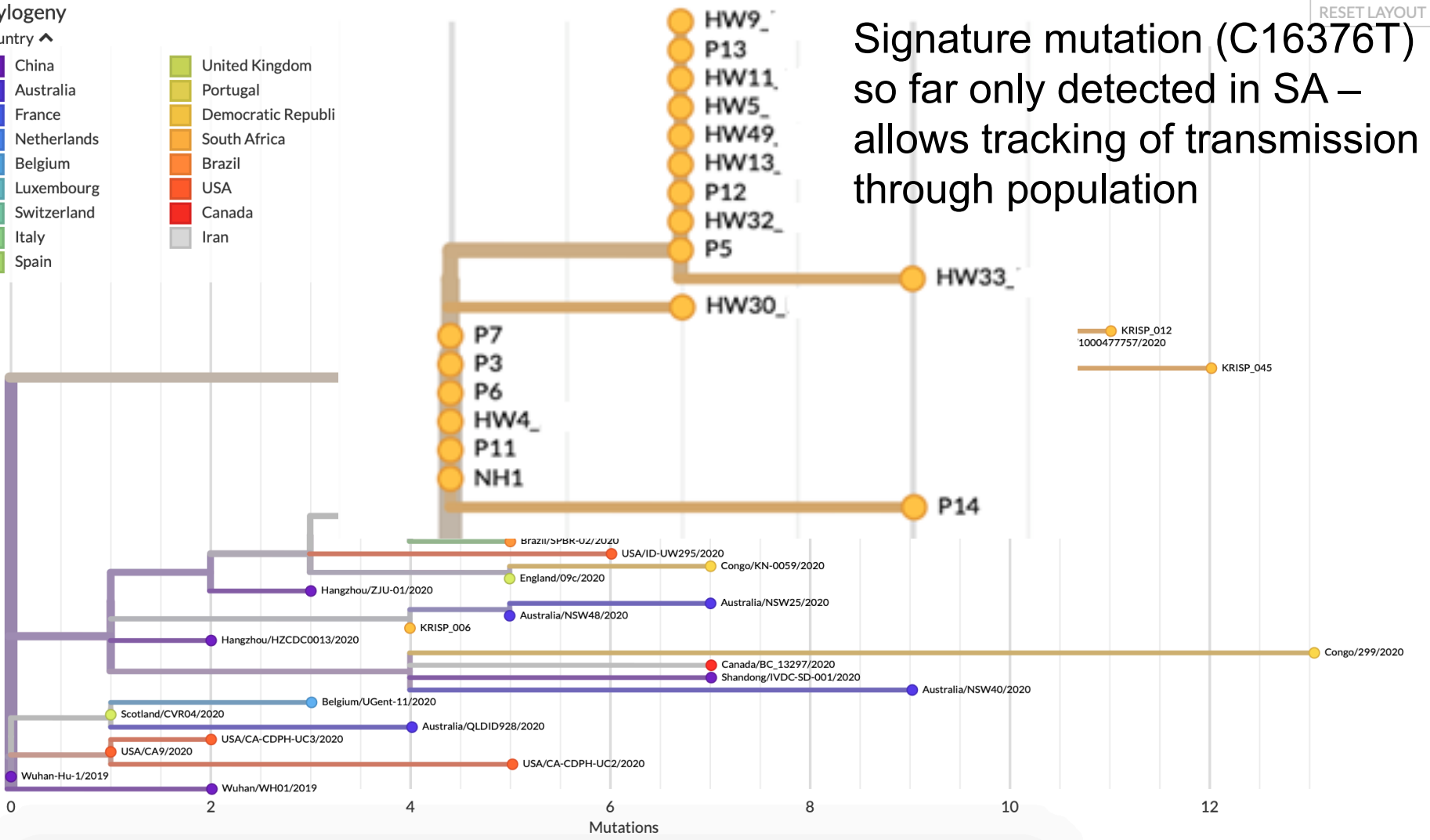
SARS-CoV-2 phylogenetic analysis

Showing 61 of 61 genomes sampled between Dec 2019 and Apr 2020.

Phylogeny

Country ^

- China
- Australia
- France
- Netherlands
- Belgium
- Luxembourg
- Switzerland
- Italy
- Spain
- United Kingdom
- Portugal
- Democratic Republi
- South Africa
- Brazil
- USA
- Canada
- Iran



Signature mutation (C16376T)
so far only detected in SA –
allows tracking of transmission
through population

Summary

- Large nosocomial outbreak triggered by a single introduction in the ED
- Strong evidence of patient-to-patient, patient-to-HCW, and HCW-to-patient transmission; and of contribution of pre-symptomatic transmission
- Evidence to implicate different modes of transmission
- Highlights how easily and rapidly SARS-CoV-2 can spread in a healthcare environment, exposing weaknesses in IPC systems & practices
- Demonstrates the potential for nosocomial transmission to be a major amplifier of community transmission – genomic epidemiology may help to characterize this

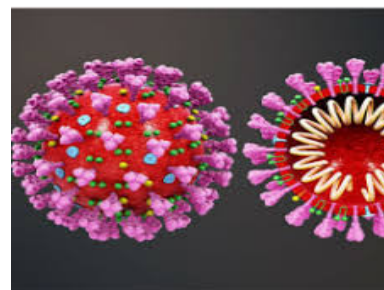
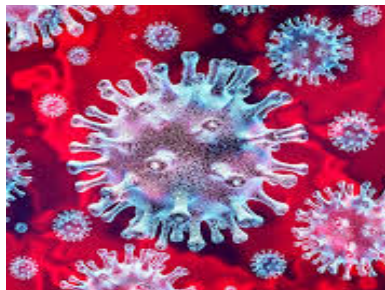
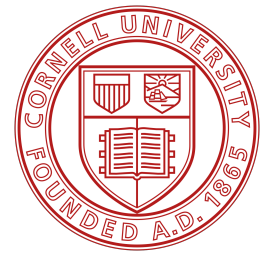
Current context

- As of 13 August, 27 360 confirmed cases and 240 reported deaths in health care workers (mostly public sector)
- ~5% of all confirmed cases
- ~2% of all deaths

Global Impact of COVID-19: Lessons from Haiti



VANESSA ROUZIER, MD
HOPE/CHANT CONFERENCE
25 AUGUST 2020



Preparing for the COVID-19 Storm in Haiti

- COVID-19 was novel and poorly understood:
 - Asymptomatic transmission
 - 80% mild illness compared to AIDS or cholera
 - Mild febrile illness for 3-4 days: Cold, runny nose, fever for 3-4 days are not reasons to miss work as “one day off from work means one day off from food”
 - Rampant myths and misinformation in social media that “COVID-19 would not come to Haiti as it was “for other populations in other countries”
 - International context of “Nations NOT united” [F. Crémieux, J.W.Pape, *Liberation Tribune*, Paris, France, May 26, 2020]
 - Local context of major political turmoil, economic collapse, social upheaval and major insecurity

Economic Context

Already the poorest country in the region

- 2010 Earthquake: loss of 120% of country GDP
- 2010 Cholera epidemic: 10,000 deaths
- 2016 Hurricane Matthews (\$4.0 billion)
- 2019 political unrest that led to total « lockdown » for 3 months

Impact of control measures to counter the COVID-19 pandemic

- Closing of airports, schools, export factories, frontiers with the DR
 - Decrease economic activities
 - Worsening unemployment
 - Decrease by 25% remittances from the Diaspora
 - Devaluation of the local currency (gourde)
- 2019 drought
 - Reduction of local production
 - Increase in food prices
 - Increasing malnutrition (infants and pregnant women)

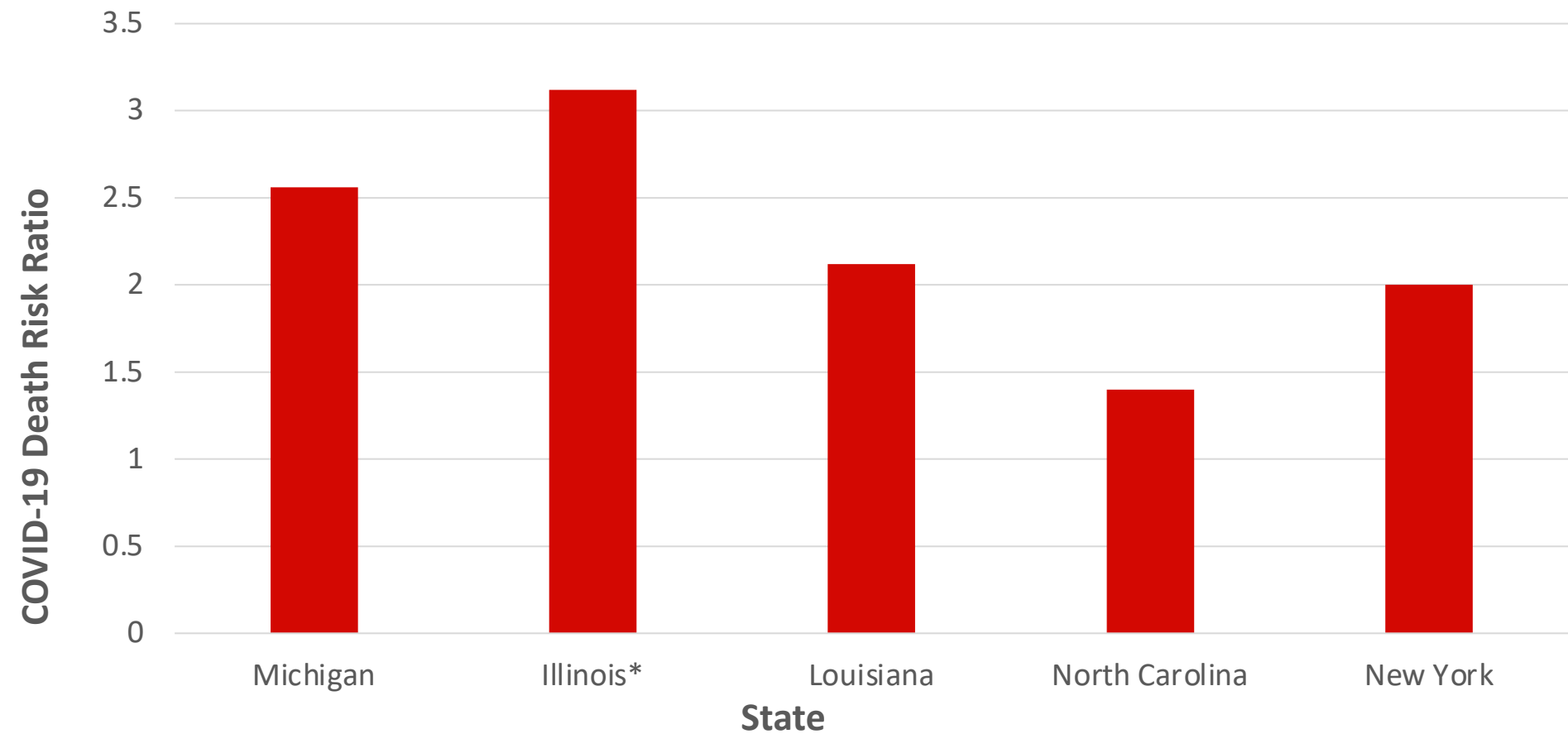
Medical and Social Context

- Weak Healthcare system:
 - The pandemic had greatly affected the “best” healthcare systems in Europe and USA
 - Haiti’s health system had been severely weakened over many decades (only 4% of national budget for health)
- Impact of prevention measures:
 - Almost all donors left the country
 - Difficult to meet in person with the local deciders
 - Limiting in person training opportunities
 - Zoom: reduce number of trainees
 - Need for internet electricity
- Population “blissfully” unaware of the danger:
 - On going crowding in markets, in public transportation
 - On going cultural festivals with large crowds

COVID-19 Early Modelling: Attack Rate, Hospitalizations, and Deaths

No Intervention	Mitigation: Isolation of symptomatic person and quarantine of contacts
86% of the population infected	35% of the population infected
426,000 people need hospitalization between April and August 2020	313,000 people need hospitalization between April and August 2020
9,000 hospital beds needed at the peak of pandemic in end May/1 st week June 2020	7,500 hospital beds needed at the peak of pandemic in June 2020
17,000 deaths ** if no COVID-19 care centers available death toll could increase X 5-10 times	5,700 deaths * New York with a population of 10 M already have >6,000 deaths

Risk of COVID-19 Deaths Among Black Individuals in the United States

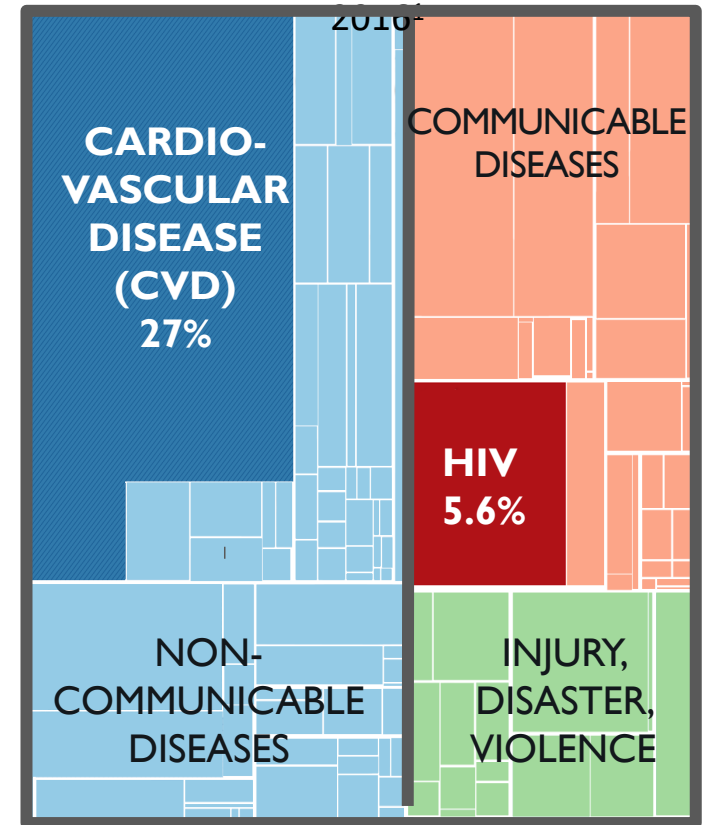


*In Chicago, Illinois, 81% of black individuals who died of COVID-19 had hypertension, diabetes or both.

CVD Epidemic >> HIV Epidemic

- CVD : most common cause of adult mortality, surpassing HIV
- Hypertension is the most common CVD risk factor
- Highest stroke mortality rate in the Caribbean and Americas²
- Median age for stroke is 52 years → ~10 years lower than 2010 ages in developing countries³

CAUSES OF DEATH ALL AGES IN HAITI, 2010



CVD Risk Factors Among Adults Living in a Slum in Port au Prince (2016)

CVD Risk Factor	TOTAL	18 – 30 years	31 – 44 years	>= 45 years
*Hypertension	21%	12%	24%	40%
** Obesity	11%	8%	14%	16%
Smoking	7%	7%	6%	10%
Diabetes	1%	<1%	3%	3%

Haitians have 4 times more hypertension than Black Americans

Tymejczyk O, McNairy ML, Petion JS, Rivera VR, Dorelien A, Peck M, Seo G, Walsh KF, Fitzgerald DW, Peck RN, Joshi A, Pape JW, Nash D. Hypertension prevalence and risk factors among residents of four slum communities: population-representative findings from Port-au-Prince, Haiti. **Journal of Hypertension 218,36: 2018**

COVID-19 Pandemic: Haiti's Initial Response

March 19, 2020 : first 2 cases of COVID-19 confirmed in Haiti

Immediate lockdown and response measures:

- Closing of airports, border with the Dominican Republic
- Closing schools
- Closing exports factories
- Prohibit gathering of ≥ 10 people
- Mandatory curfew at 8:00 PM-5:00 AM
- Promotion of barrier methods: hand washing, face masks (April 10)
- Scientific Committee named (March 26)
- National COVID Response Presidential Commission established (April 4th)

National Response Strategy

- 1) Prepare dedicated COVID-19 treatment centers:
 - Increase # hospital beds providing oxygen, IV fluids, medications for comorbidities
- 2) Train Staff:
 - Hospital and home care guides produced by GHESKIO, improved and approved by the scientific committee
- 3) Secure Equipment and Supplies
 - PPEs
 - Medications, IV fluids, Meds for TB, hypertension, diabetes
 - Oxygen generators >>> Ventilators:
 - ✓ Bad outcomes of patients on ventilators in Europe and USA : 70-80% dead!
 - ✓ Few staff in Haiti with expertise in intubation and ventilation
 - ✓ Only 2 oxygen providers in Haiti, both in PAP – capacity building!

Repurposing the Cholera Treatment Center into a 50-bed COVID-19 Unit



Establishing Testing Capacity



Warren D Johnson Jr Medical Center



Rodolphe Mérieux Laboratory



MDRTB Ludwig Pavilion



BSL-3 lab



COVID-19 care Units


Promoting the Use of Face Masks







Challenges

- Social distancing – Not realistic in densely crowded slums
 - Poverty - hand washing and mask wearing are a luxury (no running water in more than 65% of homes)
 - Gang violence and insecurity in large slums prohibit access to local teams and interventions – leaving large populations “untouched”
 - Face masks recommended, but no means to enforce implementation in markets, public transportation
 - Stigma
 - Fear and rejection of COVID-19 care centers in neighborhoods
 - Some COVID-19 centers never opened despite being ready
 - Official list of all COVID centers never publicized but word of mouth
- 

Mistrust of

- "COVID-19"
- "Hospital deaths so

Fear and M

- Hospitals
- COVID ca
- Decrease
 - "In my r
home th
vaccine"
- Late patie
lives



of COVID-19

rather die at
th a deadly

to save their

Advice for Low-Income Countries on Managing Covid-19

You are on your own. Pool resources and expertise from public and private institutions.

Work with your Ministry of Health so that successful interventions can be shared and scaled up.

Prevention messages must consider socioeconomic context.

Grassroots community engagement is essential to gain public trust and fight stigma.

Screening, testing, and care guidelines must be developed early and adapted rapidly as the pandemic evolves.

Guidelines and training videos can be put online and rapidly distributed on social media.

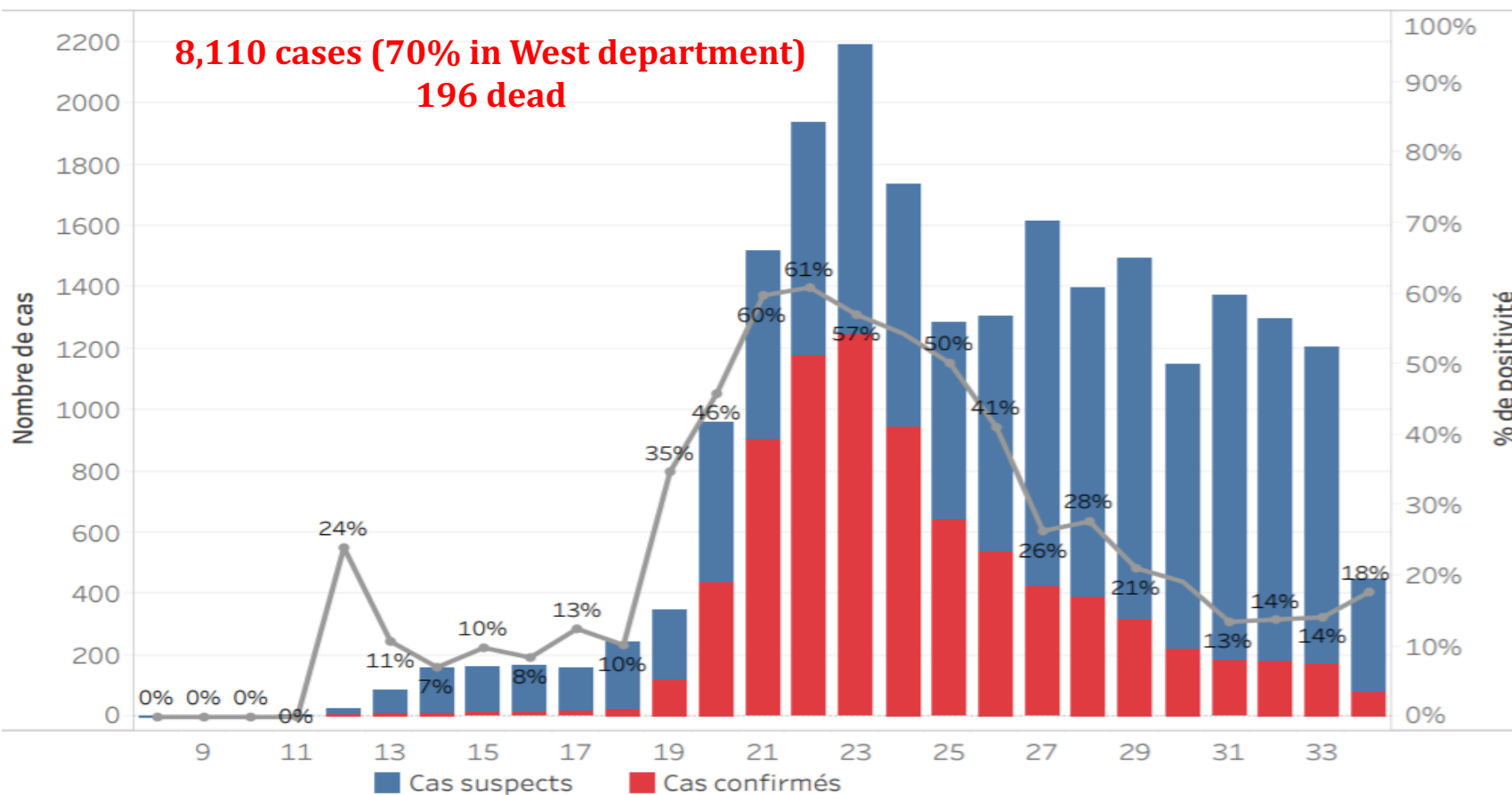
Suspect tuberculosis and Covid-19 coinfection in patients with chronic cough and sudden deterioration.



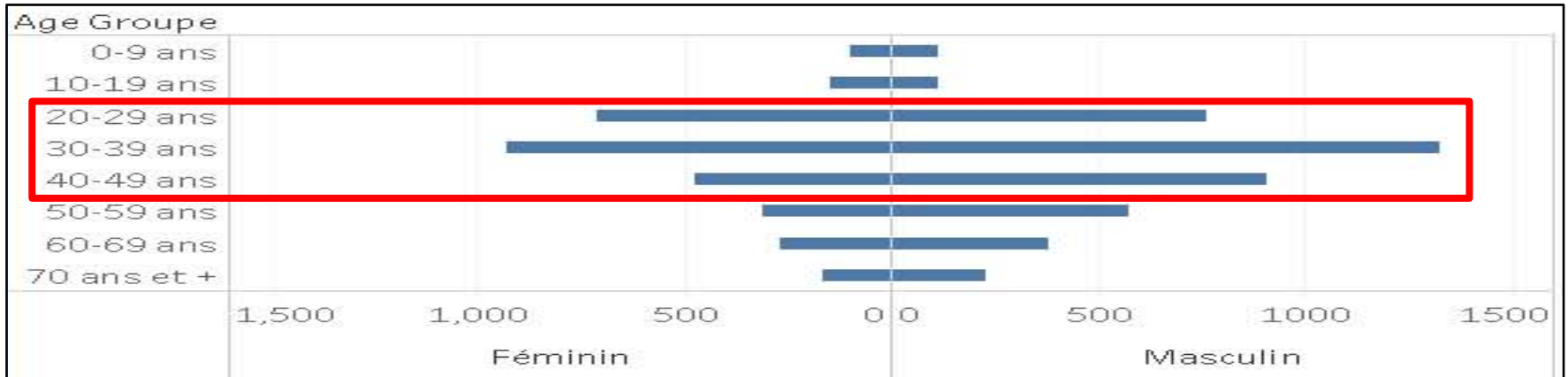
The NEW ENGLAND
JOURNAL of MEDICINE

COVID-19 Cases in Haiti: March 19-August 22, 2020

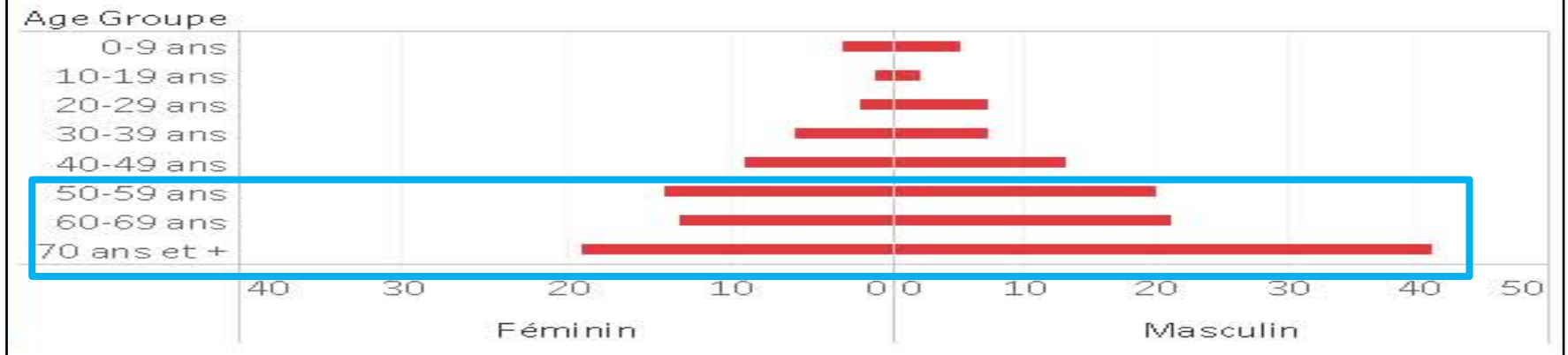
**8,110 cases (70% in West department)
196 dead**



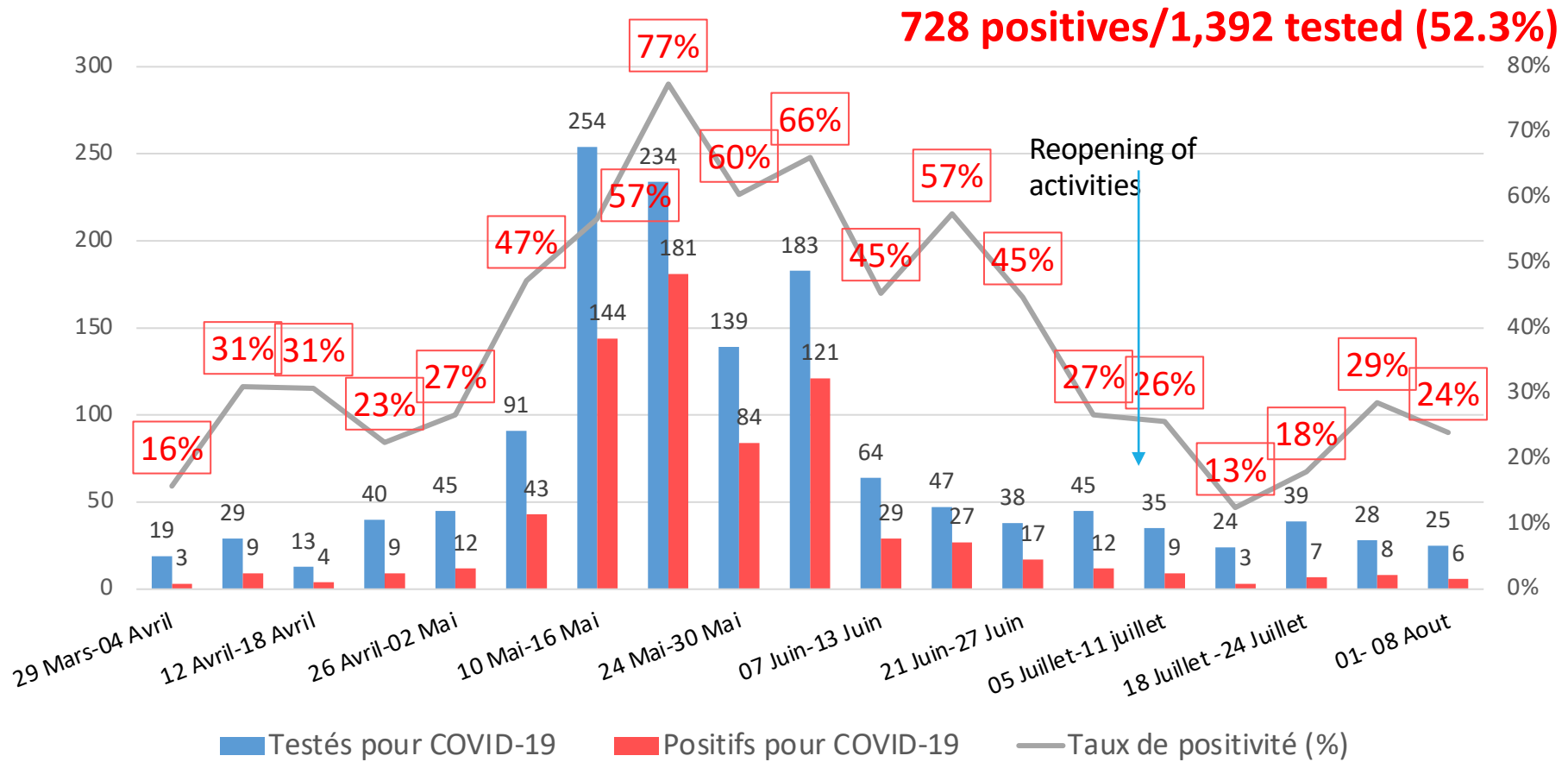
Age Distribution of Cases and Deaths



Graphique 3: Distribution des décès par groupe d'age et sexe au 9 aout 2020, Haiti

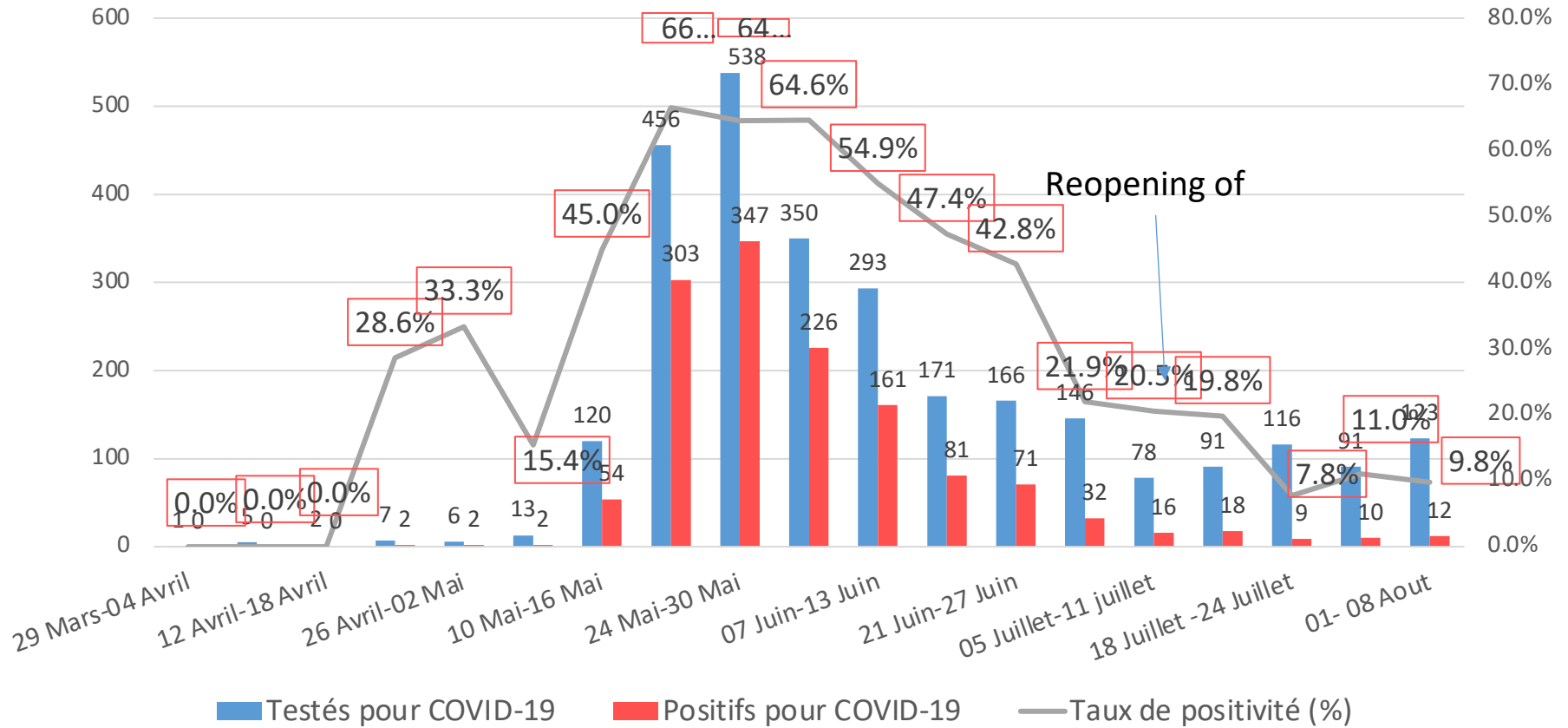


GHESKIO Patients Tested for COVID-19

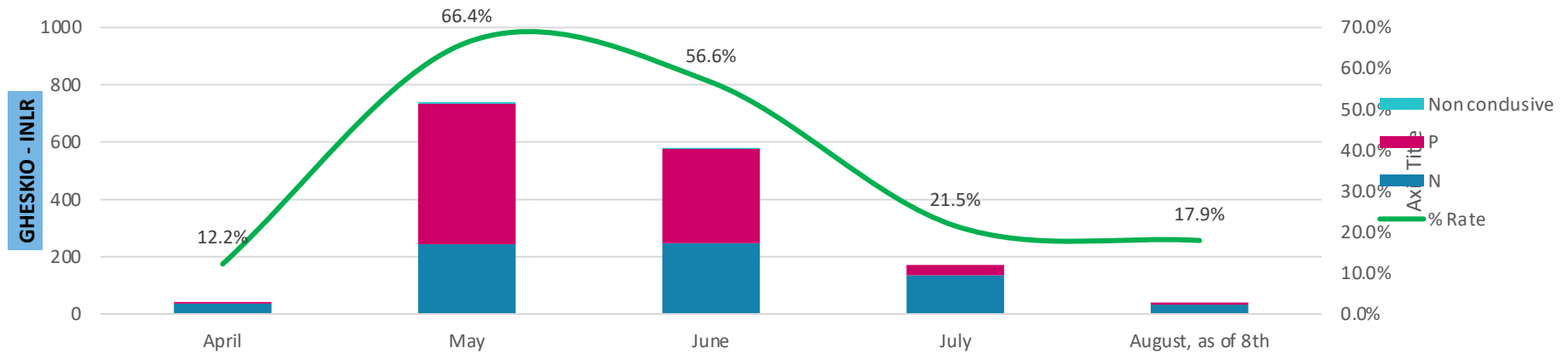
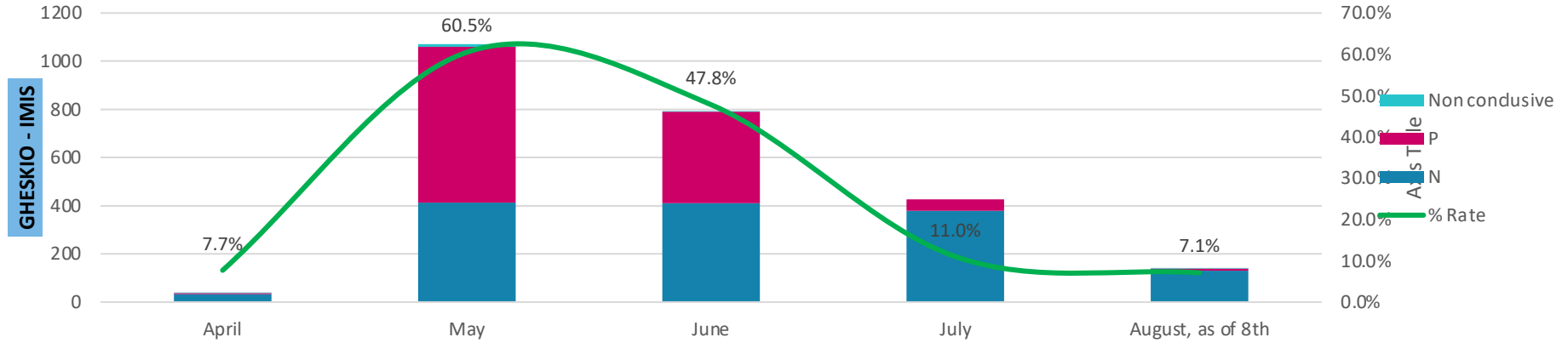


Referred Patients Tested at GHESKIO for COVID-19

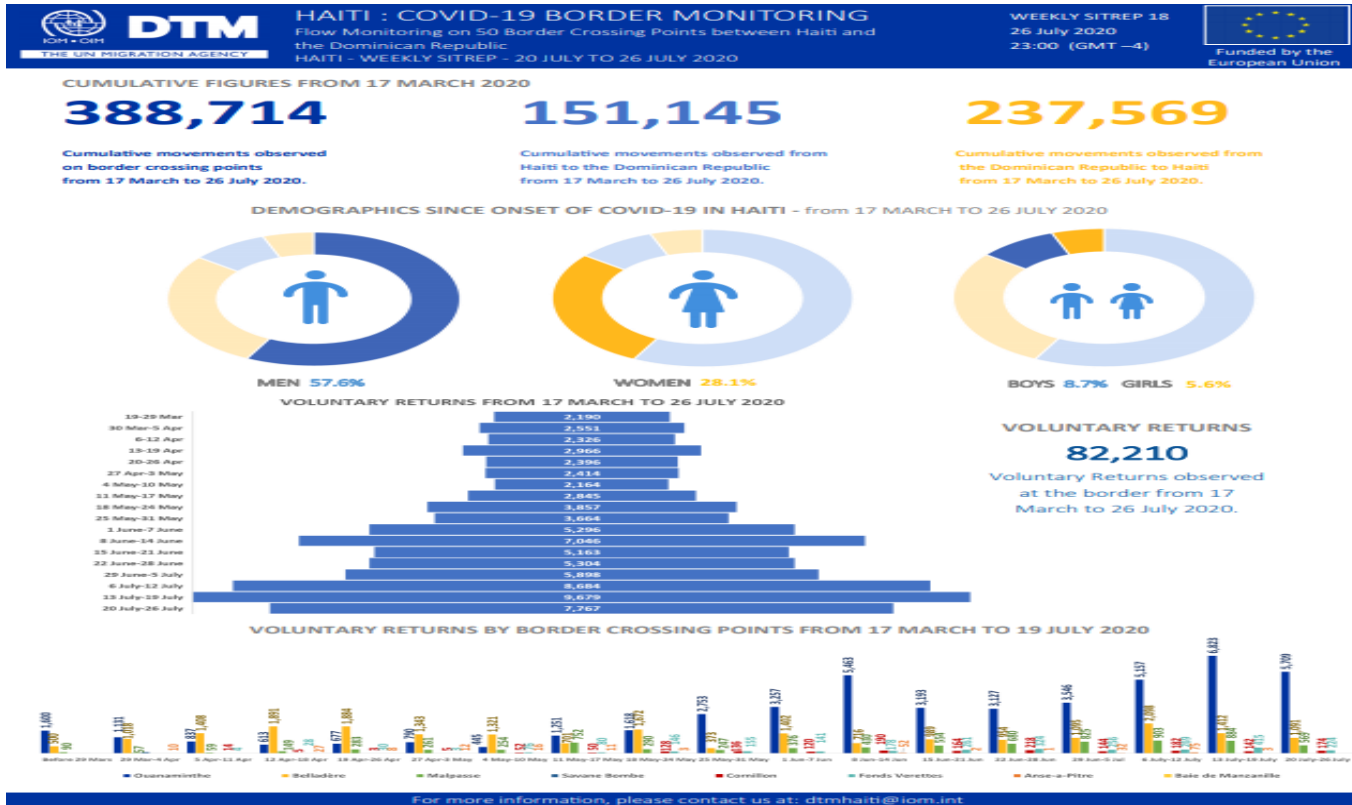
1,346 positive / 2,773 tested (48.5%)



Rate of positive PCR tests of COVID-19 at the 2 GHESKIOs (IMIS/INLR) April to August 8th, 2020

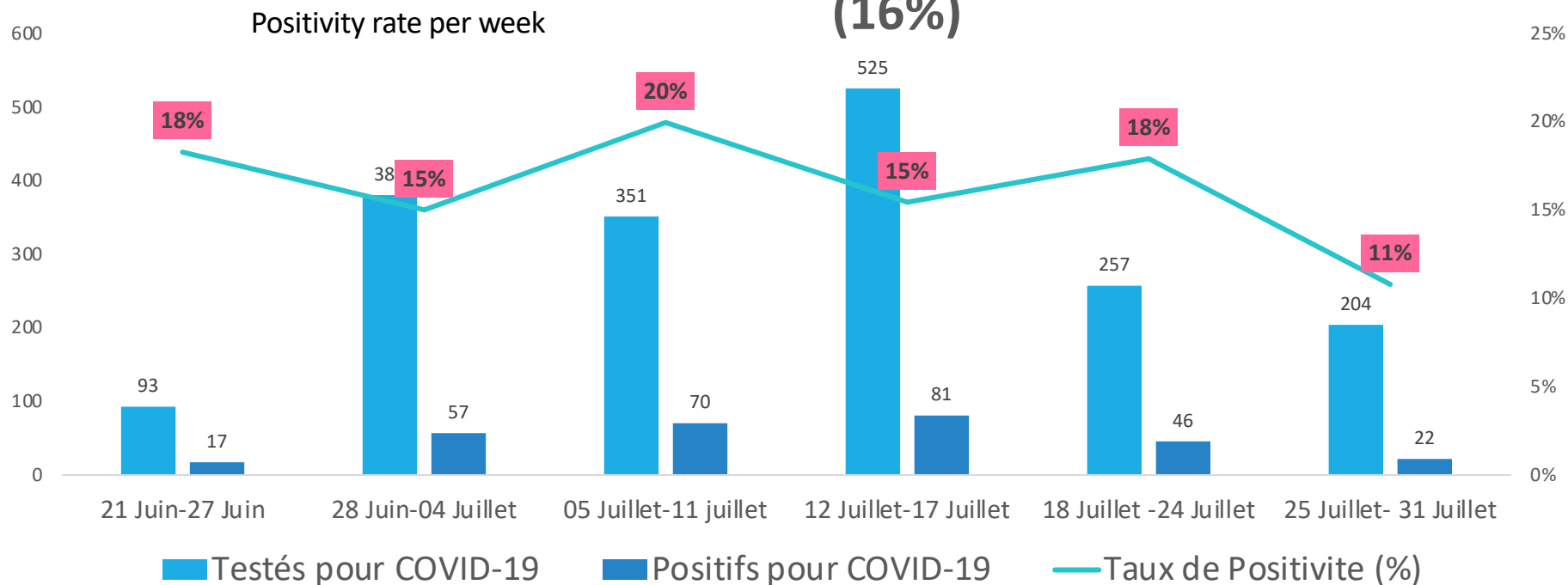


Continued Exposure: Important Migration from the DR




COVID-19 Positivity Rate of Migrants from the Dominican Republic to Haiti tested at border points

Malpasse & Ouanaminthe: 293 positive/1810 tested (16%)

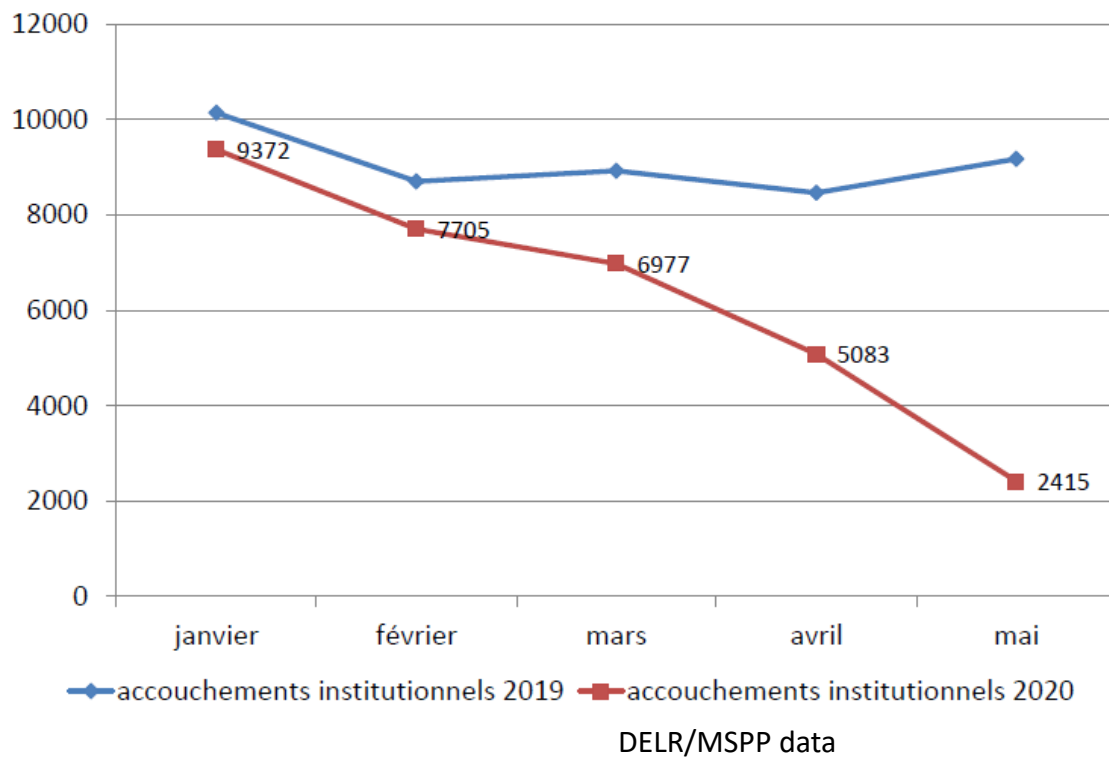


Negative Impact of COVID-19 Measures

- Maternal mortality
 - Malaria
 - Diphtheria
 - Immunizations
 - HIV/AIDS
 - TB
 - Malnutrition
- 

Decreased Access to Maternal Health Services

Nombre d'accouchements institutionnels mensuels déclarés les 5 premiers mois de 2019 et 2020 pour Haïti



La variation du nombre d'accouchements institutionnels mensuels en 2020 par rapport à 2019 est la suivante :

Janvier : -8%

Février : -11%

Mars : -22%

Avril : -40%

Mai : -74%

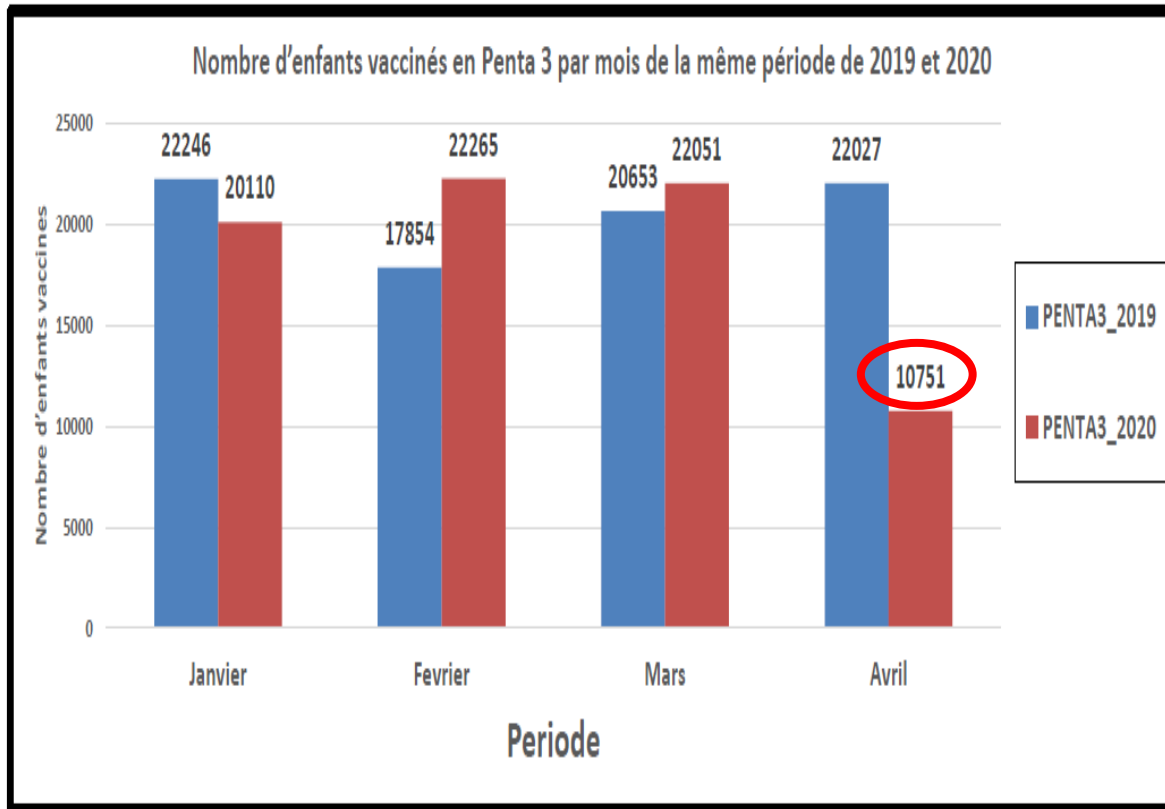
Increased Maternal Mortality

6/16/2020

Distribution des Décès Maternels par Département de la 1ère à la 22ème Semaine Epidémiologique (2018 - 2020)

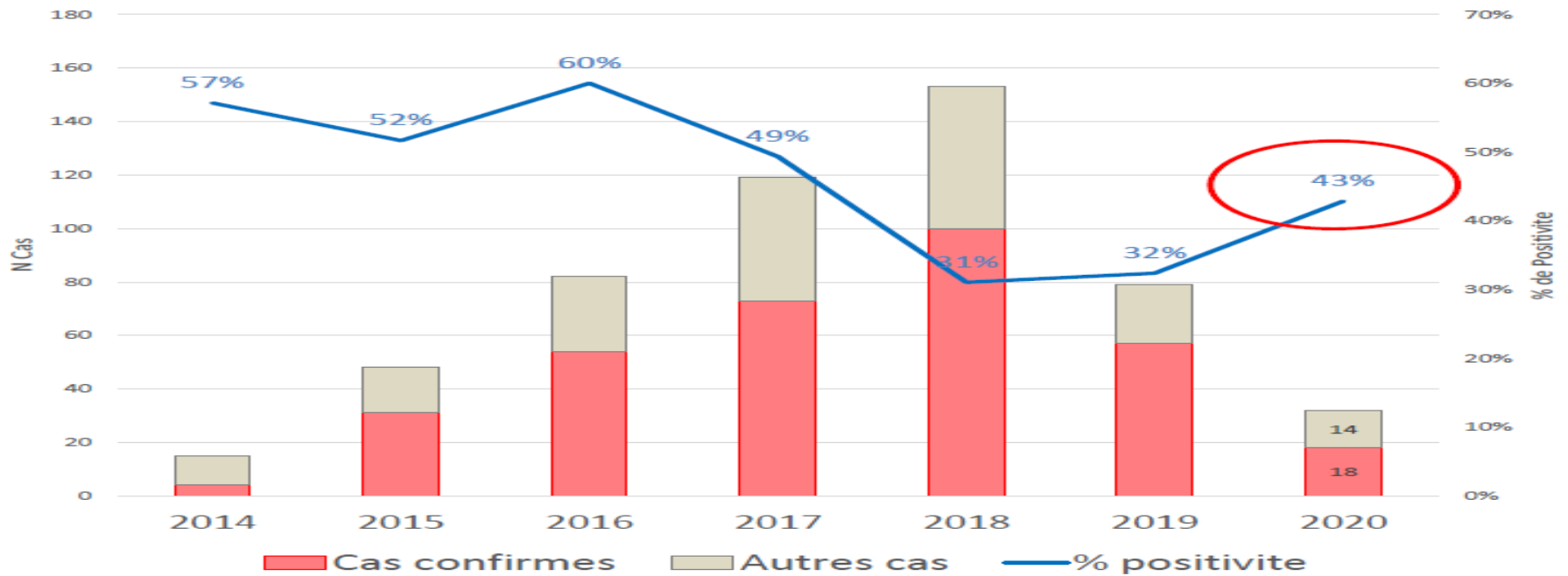
Département	Annee		
	2018	2019	2020
ARTIBONITE	6	3	9
CENTRE	12	15	15
GRANDE ANSE	2	4	2
NIPPES	1	0	5
NORD	18	10	12
NORD EST	1	2	1
NORD OUEST	0	1	9
OUEST	5	13	7
SUD	11	20	17
SUD EST	3	7	3
Grand Total	59	75	80

Decreased Childhood Immunizations



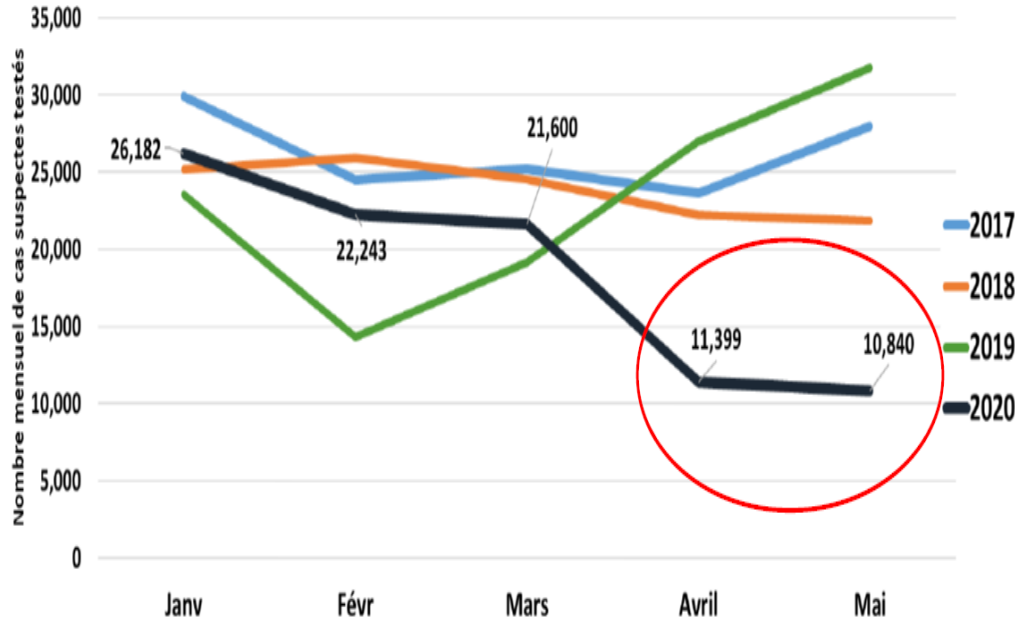
Increase in Diphteria Cases

Diphthérie: Nombre de cas et % de positivité par année 2014-2020, Haiti



Malaria: Decreased Testing but More Cases

Nombre mensuel de cas suspects de malaria testés en Haiti, 2017 - 2020



MSP/DEL

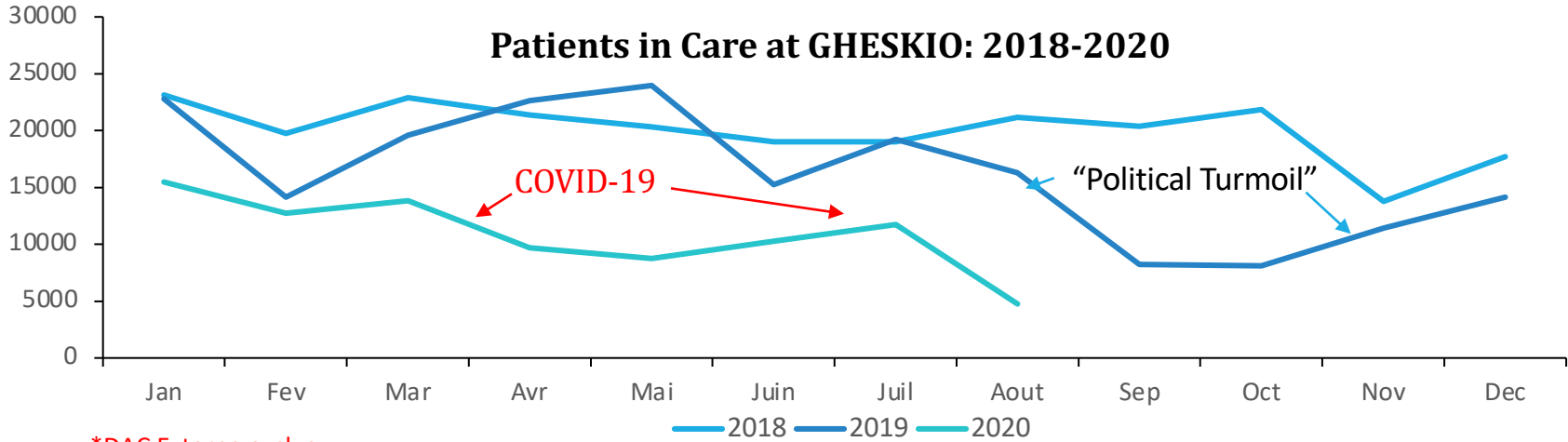
Nombre de Cas confirmés

Mois	2017	2018	2019	2020	2020/2019
Janvier	3,025	1,510	785	3,460	441%
Février	1,649	1,045	345	1,623	470%
Mars	1,604	682	329	1,516	461%
Avril	847	452	395	647	164%
Mai	1,351	548	556	764	137%
Grand Total	8,476	4,237	2,410	8,010	332%

Dans l'ensemble, par rapport à la même période en 2019, le nombre de cas suspects testés a baissé en 2020 (80%) alors que le nombre de cas confirmés a augmenté (332%)

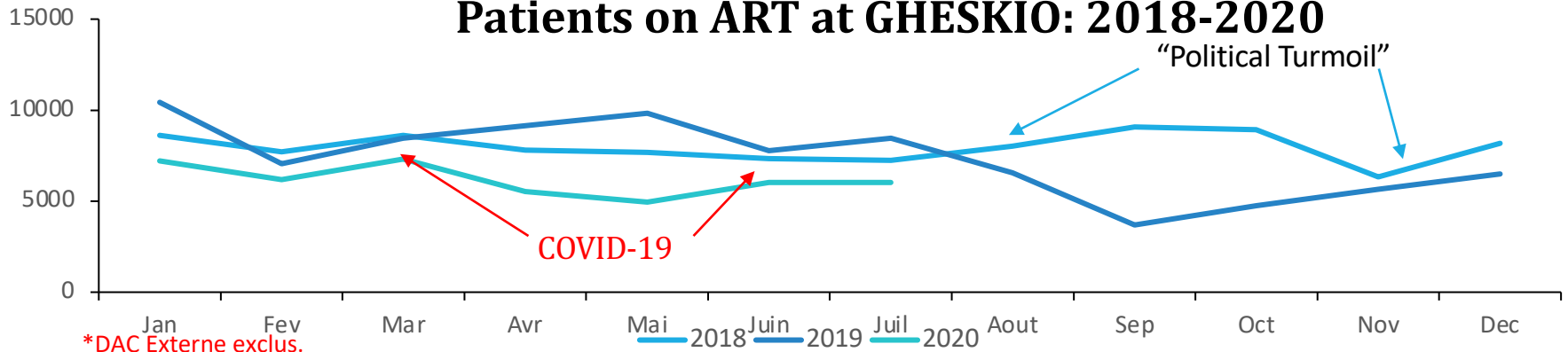
Decreased Access to HIV Care and Treatment

Patients in Care at GHESKIO: 2018-2020



*DAC Externe exclus.
 * Data for November 11 until 2020

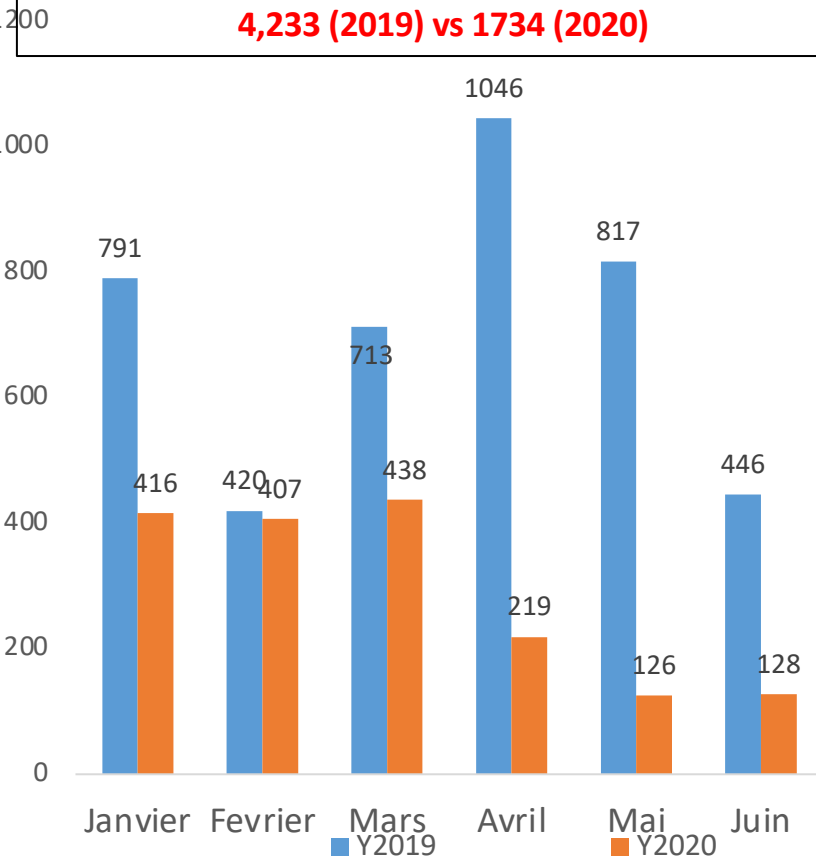
Patients on ART at GHESKIO: 2018-2020



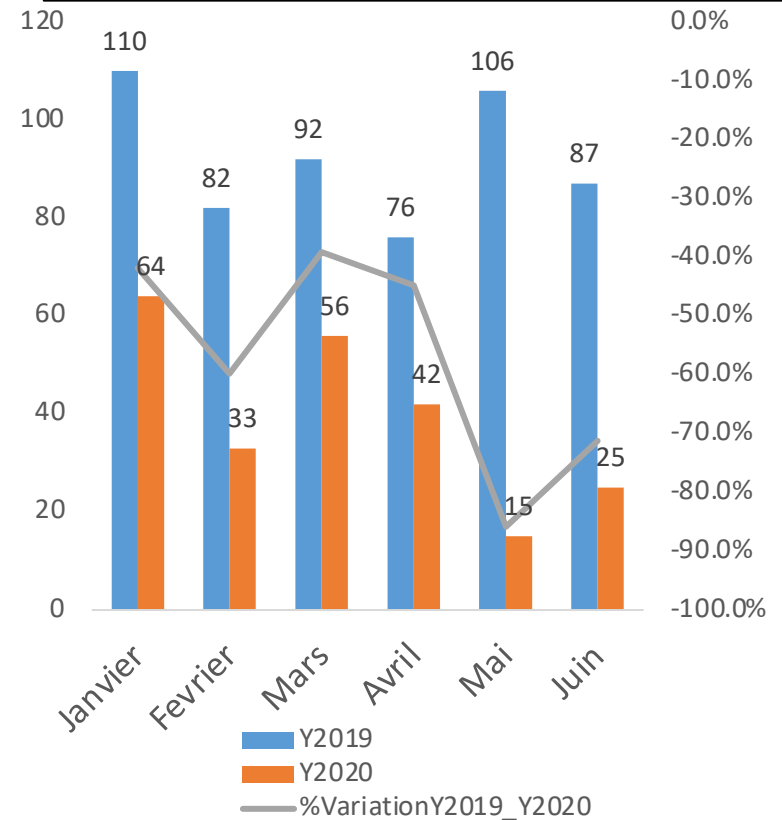
*DAC Externe exclus.

Decreased TB Testing and Treatment

**59% fewer patients screened for TB in 2020:
4,233 (2019) vs 1734 (2020)**




**57.5% Fewer Patients Treated for TB in 2020:
553 (2019) vs 235 (2020)**



Challenges and Perspectives

- Public health systems need to be flexible/reformed to be responsive to outbreaks (too many approvals required even during an emergency)
- Unprecedented collaboration between public and private sector (National Commission, Scientific Committee, government ministries)
- Medical equipment purchased “greatest investment in health in Haiti” will serve the country post COVID-19 (oxygen generators, ventilators) provided:
 - Maintenance plan for at least 3 years in place
 - Training in the use of ventilators and other critical care equipment's (University of Miami, AMHE)
- Major negative impact on other health parameters (far more damaging than COVID). Need to balance risks of COVID-19 deaths vs greater risk of closing economy

Challenges and Perspectives

- Despite information and sensitization campaigns, expected behavioral change did not occur! Lessons?
 - Need to maintain vigilance, surveillance, prevention - It's not over!
 - With Haiti's coronavirus lockdown lifted (July), challenge now is ensuring people understand the danger has not gone away, and imperative need to continue to respect prevention measures
 - Migration from the DR where the epidemic remains uncontrolled
 - Why was Haiti relatively spared?
 - Country's young age structure
 - Other factors? Cross-immunity with other infectious agents?
 - Herd Immunity?
- 

THANK YOU!

