Testing for COVID-19

RACGP CPD Activity 2020 22 2 points

Date Thursday 4 June 12.30pm

Presenters Mr Robert Skeen
Prof Dominic Dwyer
Ms Ruth Luppino

This activity has been developed in partnership with Aboriginal Health & Medical Research Council of NSW and NSW Health

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Acknowledgement of Country

We recognise the traditional custodians of the land and sea on which we live and work.

We pay our respects to Elders past and present.

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Learning Outcomes

By the end of this webinar, participants will:

- Understand the importance of testing for COVID-19
- Understand the role of different types of testing in the diagnosis and management of cases with COVID-19
- Understand how to access testing and support for test interpretation

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Presenters

Robert Skeen
CEO, AH&MRC

Professor Dominic Dwyer
Director of Public Health Pathology, New South Wales Health Pathology

Ruth Luppino
Practice Manager at Coonamble Aboriginal Health Service

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Robert Skeen

WELCOME & UPDATE

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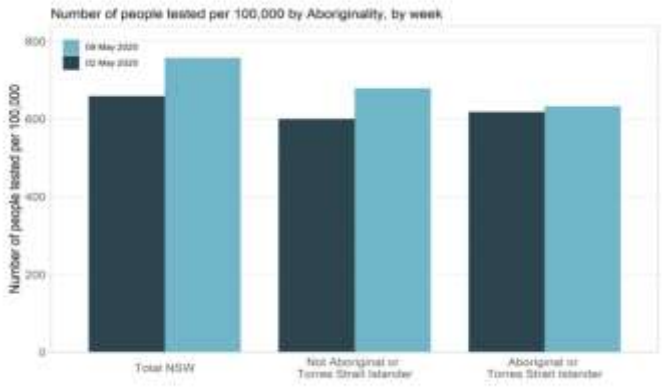
Current Situation in NSW

- 30 cases = 1% of all cases in NSW
- No deaths
- Comparable rates of testing



*Total rates include people with unknown Aboriginality status

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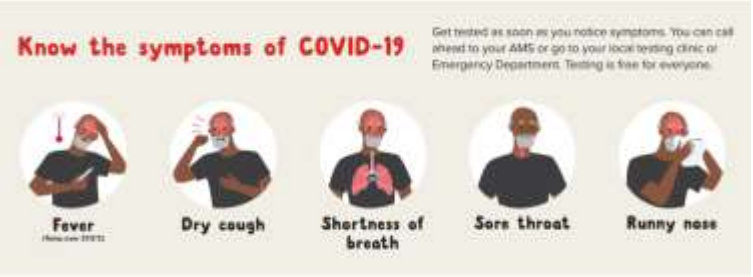
Testing criteria is now symptom based

Test everyone with:

- Respiratory symptoms OR
- Unexplained fever



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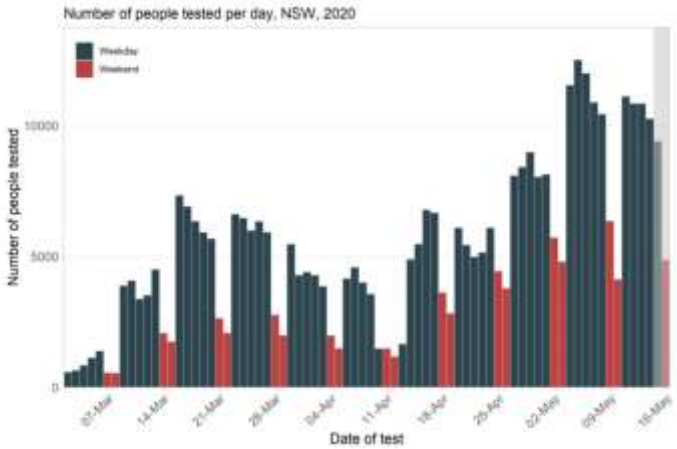
High testing rates in NSW are needed as restrictions ease



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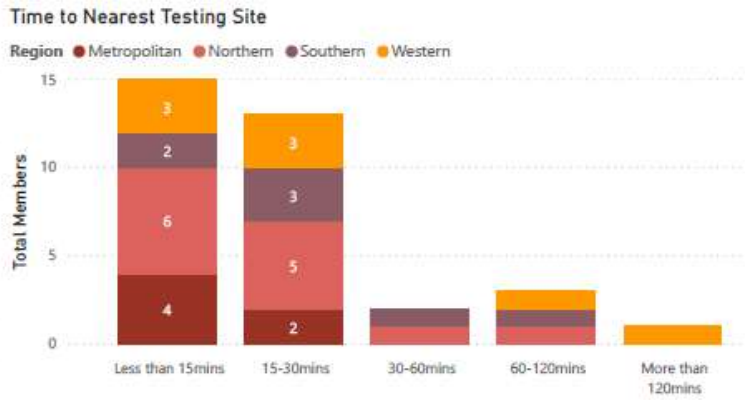
Supporting Community Testing

Barriers include:

- Access to transport
- Limited hours at GP Respiratory clinics
- Long distances for regional members



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Dominic Dwyer

TESTING FOR COVID-19

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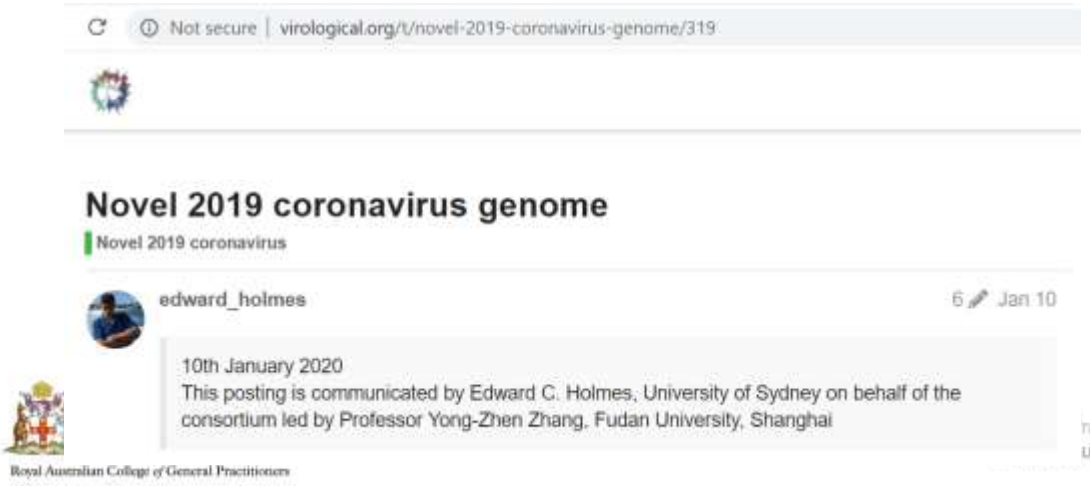
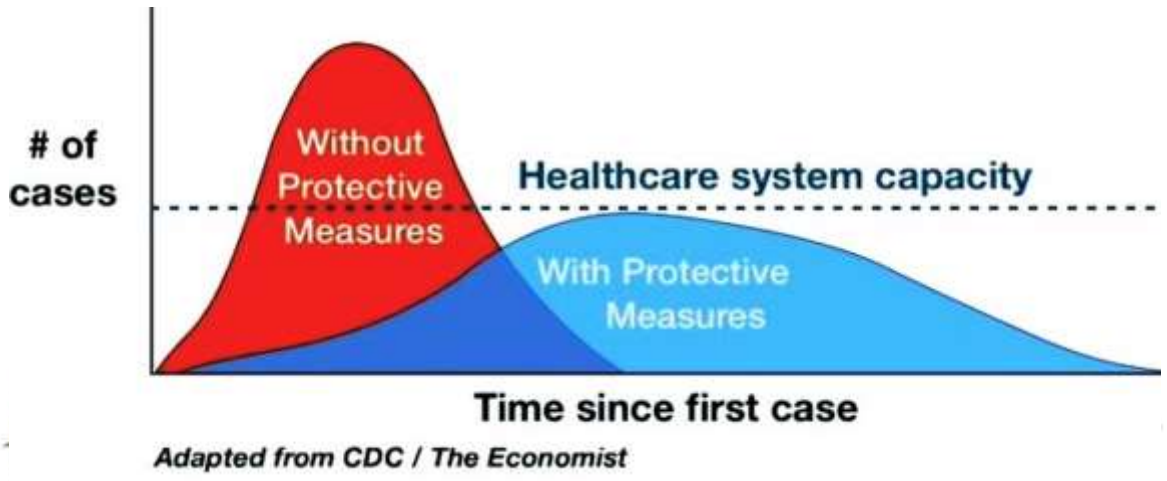
A new coronavirus (*SARS-CoV-2) causing a new illness (COVID-19)*



Interventions to slow disease spread



Adapted from CDC / The Economist

Laboratory tests for COVID-19 disease

- Nucleic acid testing
- Serology
- Virus isolation (or virus culture)
- Whole genome sequencing (WGS)
- Tests for disease management

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Developing SARS-CoV-2 nucleic acid detection tests

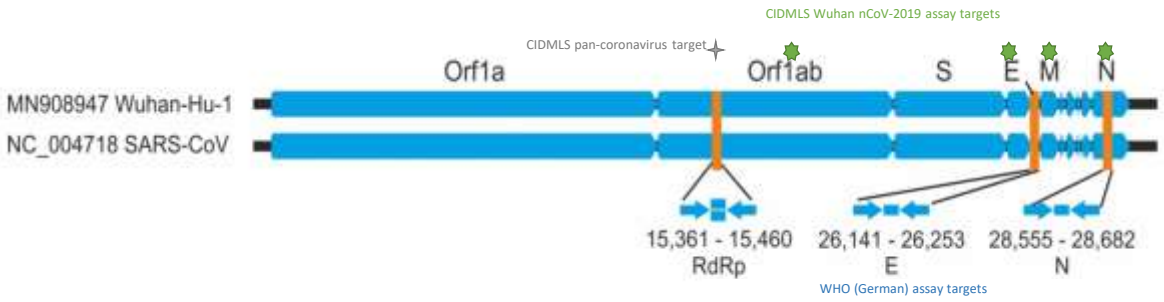

Figure 1 relative positions of amplicon targets on SARS-CoV ad Wuhan-CoV genome. N: nucleocapsid; ORF: open reading frame; RdRp: RNA-dependent RNA polymerase. Numbers below amplicon are genome positions according to SARS-CoV, NC_004718.

Nucleic acid testing for COVID-19 disease

- 'NAT' or 'PCR' or 'molecular tests'
- Multiple high throughput platforms
- Turnaround times vary and depend on the definition
  - Clinical TATs ~12-40 hours
  - In-laboratory TATs ~6 hours
- Rapid individual PCR tests eg Genexpert
  - <1 hour in-lab

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Nucleic acid testing for COVID-19 disease

- Issues around sensitivity and specificity
- Variation between platforms
- Sample collection
  - Methods of swabbing the upper respiratory tract
  - Swab types
  - Transport media
- Reagent shortages
- Clinical indications for testing

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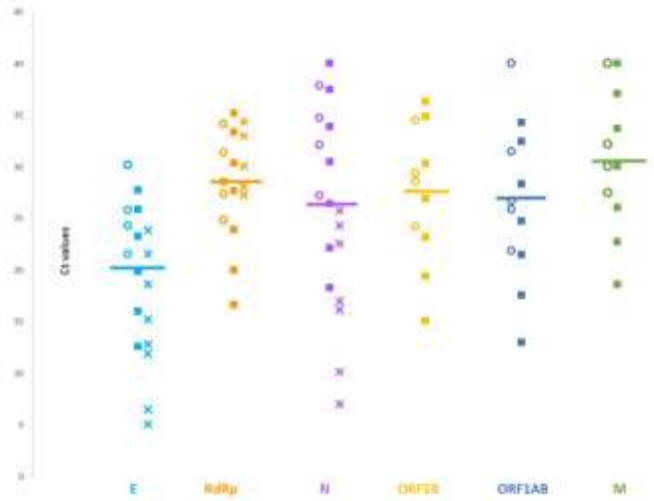
40,000 tests in NSW Health Pathology later..

Figure 1 Cycle threshold values of clinical samples (○), cell culture supernatant (■) and synthetic positive controls (X) for nucleic acid test assays targeting different regions of the SARS-CoV-2 genome



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Virus isolation or culture

- Risk group 3 pathogen
  - Cultures performed in PC3/4 laboratory
- Use cell lines - Vero-E6 cells
- Observe for cytopathic effect (CPE) and confirm by PCR
- Studies in persistently NAT positive patients, including in healthcare workers

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Courtesy of Ken McPhie, ICPMR

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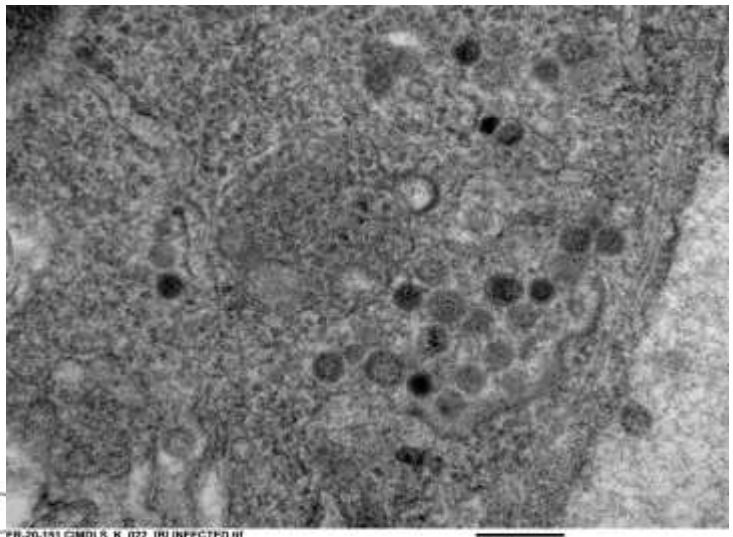
Electron microscopy of SARS-CoV-2



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PCR positivity vs culture positivity

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Indications for serology (SARS-CoV-2 antibodies)

- Making a **retrospective diagnosis** in individuals who have recovered from infection prior to testing
- Identifying cases where **false negative nucleic acid testing** has occurred, either because of sampling issues or mutations at primer/probe binding sites
- Confirmation of **unexpected positive nucleic acid tests**: especially important in settings of low incidence
- Identifying **asymptomatic infection**, especially in close contacts of cases or healthcare workers
- Determining the extent of infection in a population through **serosurveys**

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SARS-CoV-2 serology at NSWHP–ICPMR Westmead

- First results 20th February using immunofluorescence (IFA)
- SARS-CoV-2-specific IgG, IgM and IgA
- IgG is a marker of past infection; IgM and IgA are markers of more recent infection
- Virus neutralisation is available as another specific test for SARS-CoV-2-specific antibody

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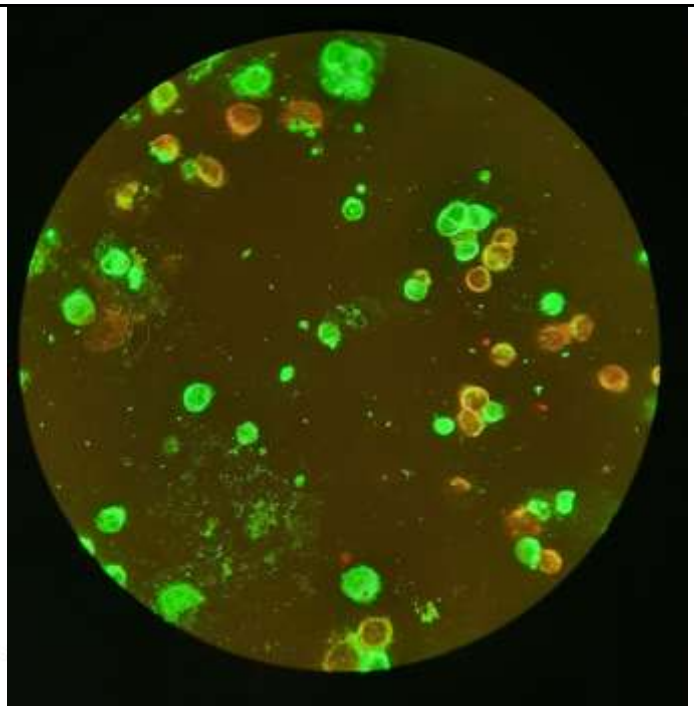

SARS-CoV-2 infected cells showing cytoplasmic immunofluorescent staining

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Courtesy of Linda Hueston, ICPMR

SARS-CoV-2 serology at NSWHP–ICPMR, Westmead

- >6500 samples tested
  - Routine diagnosis
  - Outbreak investigations (schools, ACFs, Ruby Princess crew)
  - Population serosurveys
- Evaluations of commercial platforms
  - Point-of-care antibody tests
  - Euroimmun ELISA, Abbott Architect CMIA….
- In-house EIA in development

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Kinetics of the SARS-CoV-2 antibody response

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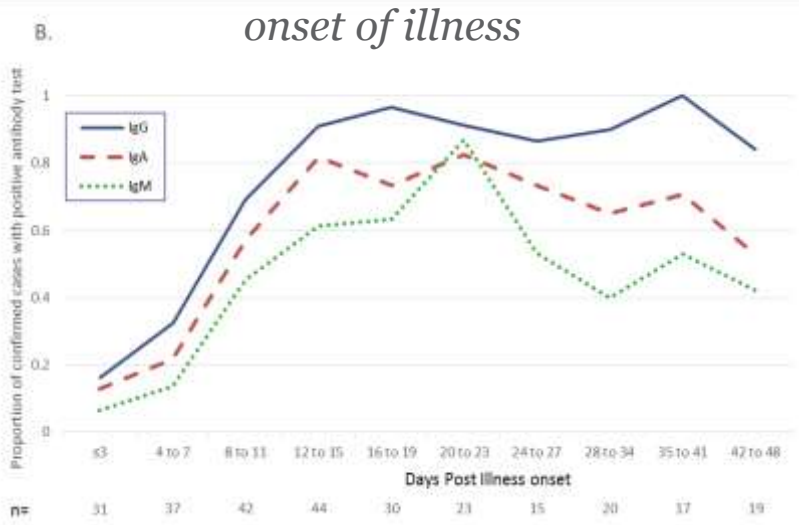
Detection of SARS-CoV-2 antibodies at different times after onset of illness



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RAPID COMMUNICATION

Estimating the asymptomatic proportion of coronavirus disease 2019 (COVID-19) cases on board the Diamond Princess cruise ship, Yokohama, Japan, 2020

Kenji Mizumoto[1,2,3], Katsushi Kagaya[2,4], Alexander Zarebski[5], Gerardo Chowell[3]

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2. Hakubi Center for Advanced Research, Kyoto University, Yoshidahonmachi, Sakyo-ku, Kyoto, Japan
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4. Seto Marine Biological Laboratory, Field Science, Education and Reseach Center, Kyoto University, Shirahama-cho, Nishimuro-gun, Wakayama, Japan
5. Department of Zoology, University of Oxford, Oxford, United Kingdom

Correspondence: Kenji Mizumoto (mizumoto.kenji.5a@kyoto-u.ac.jp)

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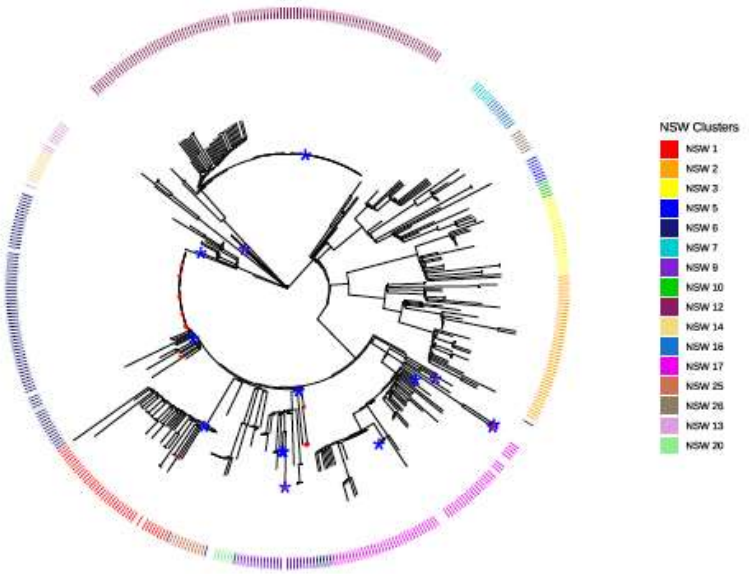
cases on board the Diamond Prin
ES.2020.25.10.2000180

ase 2019 (COVID-19)
807/1560-7917.

/ published on 12 Mar 2020

The estimated asymptomatic proportion was
17.9%
95% credible interval:15.5–20.2%

Whole Genome Sequencing – infection clusters in NSW



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Sintchenko V et al. WGS SitRep 29/05/20

Communicable Diseases network AUSTRALIA

Coronavirus Disease 2019 (COVID-19)
CDNA National Guidelines for Public Health Units

https://www1.health.gov.au/internet/main/publishing.nsf/Content/cdna-song-novel-coronavirus.htm

Confirmed case

A person who:

i. tests positive to a validated specific SARS-CoV-2 nucleic acid test;

OR

ii. has the virus isolated in cell culture, with PCR confirmation using a validated method;

OR

iii. undergoes a seroconversion to or has a significant rise in SARS-CoV-2 neutralising or IgG antibody level (e.g. four-fold or greater rise in titre).[1]

Probable case

A person who:

i. has not been tested, with fever (≥38°C)[2] or history of fever (e.g. night sweats, chills) **OR** acute respiratory infection (e.g. cough, shortness of breath, sore throat) **AND** is a household contact (refer to Contact definition below) of a confirmed or probable[3] case of COVID-19;

OR

ii. has detection of SARS-CoV-2 neutralising or IgG antibody[1] **AND** has had a compatible clinical illness **AND** is a close contact (refer to Contact definition below) of a confirmed or probable[3] case of COVID-19.

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COONAMBLE'S EXPERIENCE

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Useful resources

- NSW Health Website – Testing Advice for General Practitioners https://www.health.nsw.gov.au/Infectious/covid-19/Pages/case-definition.aspx
- NSW Health Website – Advice for ACCHSs https://www.health.nsw.gov.au/Infectious/covid-19/Pages/aboriginal-services.aspx
- AH&MRC Website https://www.ahmrc.org.au/coronavirus/

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Any questions….

Thank you

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