



Special Commission of Inquiry into the Ruby Princess

EXHIBIT 58

Second Statement of Dr Jeremy McAnulty dated 15 June 2020

SPECIAL COMMISSION OF INQUIRY INTO THE RUBY PRINCESS

Second Statement of Jeremy McNulty, 15 June 2020

- 1 My full name is Jeremy McNulty.
- 2 Attached to this statement is a report titled "Public Health Response Report"
(**Report**).
- 3 The Report has been prepared by me, with the assistance of my staff and other
officers at NSW Health, based on documents available to NSW Health.
- 4 I believe that the matters set out in the Report are true and correct.

Signed:



Name: Jeremy McNulty

Date: 15 June 2020

SPECIAL COMMISSION OF INQUIRY INTO THE RUBY PRINCESS

PUBLIC HEALTH RESPONSE REPORT

A. Introduction

1. This report details NSW Health's public health response and the contact tracing processes in place during the COVID-19 pandemic. It sets out the actions taken by NSW Health in relation to responding the outbreak of COVID-19 on board the Ruby Princess cruise ship that docked in Sydney on 19 March 2020.

B. Background to contact tracing systems in NSW

2. The statement of Jeremy McAnulty contains information about, among other matters:
 - i) routine health protection work and the processes for managing communicable diseases in NSW;
 - ii) the roles of the Australian Health Protection Principal Committee and the Communicable Diseases Network Australia (CDNA); and
 - iii) the work of the Public Health Emergency Operations Centre (PHEOC).

Series of National Guidelines (SoNG)

3. The CDNA has developed SoNGs for the surveillance and response to many of the nationally notifiable diseases. These SoNGs provide guidance to state and territory public health authorities on how to manage notifications of the relevant disease. They are generally endorsed by the Australian Health Protection Principal Committee prior to publication. The Australian Government Department of Health coordinates the development and publication of the SoNGs.
4. The first interim SoNG developed specifically for COVID-19 was released on 23 January 2020 and has been subsequently updated 32 times through to 4 June

2020. Each iteration of the SoNG includes current information about infection, definition of a COVID-19 case (for surveillance purposes), testing, public health management of cases, definition of contacts, public health management of contacts and the management of outbreak situations.

Diagnosing and reporting COVID-19

5. A diagnosis of current COVID-19 infection is made by detecting a positive PCR (polymerase chain reaction) test in a swab taken from a patient. This is a method used by laboratories to detect genetic material from the virus that causes COVID-19. This is a reliable, validated test.
6. Serological tests are used in some patients to help determine whether the patient has evidence of prior infection. The serology test measures different antibodies (IgG, IgM and IgA) that a patient's immune system has produced in response to infection with the virus. A laboratory may measure the presence or absence of these antibodies, or numerically quantify the amount of antibody present. While the presence of these antibodies may indicate previous infection with the virus that causes COVID-19, scientists are still working to understand the significance of these tests, including how soon after infection antibodies develop and how long they last.
7. The *Notifiable Conditions Incident Management System* (NCIMS) is a dynamic data management and workflow system used by public health staff across NSW for the surveillance of and response to notifiable diseases. NCIMS is a web based platform that enables Public Health Units to share information collected for cases of notifiable diseases.

Contact tracing process

8. Public Health Units respond to notifiable diseases according to NSW Health procedures for Public Health Units known as "control guidelines"¹. The procedures are either in the form of a SoNG that has been adapted to suit the

¹ <https://www.health.nsw.gov.au/Infectious/controlguideline/Pages/default.aspx>

structure of NSW's healthcare system, or, where a SoNG does not exist, a guideline developed by NSW Health.

9. Part of the public health response to a notifiable condition is a case investigation. This is typically performed by a Public Health Unit staff member (a nurse or surveillance officer). The officer will speak to the laboratory and/or doctor and the patient or their carer to gather information about how the patient acquired the condition, to identify who else might be at risk, and then take action to reduce the risk of transmission to other people. Depending on the disease, this could be achieved by educating the patient or carer about isolating from other people, treating them to cure the infection, and asking them or their carer who else may have been exposed to the patient while they were infectious. For some notifiable diseases that have very poor consequences, NSW Health may issue a Public Health Order to require the person to go into isolation or submit to other management.
10. Other people who might have been exposed to the disease from the patient while infectious are called "contacts". A "close contact" refers to someone who is at higher risk for the condition, generally because they spent more time with the patient with the infectious disease. A "casual contact" refers to someone who is at low risk, generally because they spent less time with the patient while infectious.
11. Contact management varies depending on the condition to which the contact may have been exposed. For some conditions, it may involve explaining to the individual that they are at risk of infection, and actions to take to manage that risk. Such actions may include taking antibiotics (e.g. meningococcal disease or tuberculosis), checking immunisation status (e.g. hepatitis B), getting vaccinated (e.g. measles), getting tested for infection (e.g. HIV or tuberculosis), or going into quarantine (e.g. SARS or COVID-19). For some notifiable diseases that have very poor consequences, NSW Health may issue a Contact Order to require the person to go into quarantine.
12. The Public Health Unit is responsible for conducting the case interview for cases residing within the catchment area of their Local Health District and may

assist in arranging ongoing clinical and welfare support using Hospital in the Home or equivalent, or through their GP, until the patient's release from isolation. The information gathered during the case interview using a case questionnaire, which includes information such as date of symptom onset and likely place and source of infection, is entered into NCIMS by the Public Health Unit at or after the time of interview. Additional information from the questionnaire may be entered by the Ministry of Health at a later date, at the request of the Public Health Unit.

13. During a case interview, the Public Health Unit is also responsible for identifying the close contacts of the confirmed case and obtaining contact details for each person. The Public Health Unit then either calls the close contacts or provides their details to the NSW Ministry of Health Close Contact Tracing Team. The Close Contact Tracing Team then manages each close contact as per the Contact Tracing Team workflow (see below for more information).
14. During the initial phone call to a close contact, the interviewer will inform the contact of the requirements and duration of the isolation period and advise them to be tested if they develop symptoms. In addition, a welfare assessment and referral if necessary is conducted to ensure that people have accommodation, food, medicines and other essentials to enable them to meet the requirements of isolation. During or immediately after this initial phone call, the interviewer will enter the details of the close contact into NCIMS, including personal details, date of last exposure, any symptoms experienced and referral to testing. In the NCIMS database, close contacts can be linked to the case they were exposed to when the case has been notified in NSW.
15. The Close Contact Tracing Team provides follow-up for all referred close contacts during the isolation period. They endeavour to follow up contacts who are categorised in NCIMS as high risk every two days, whilst all other close contacts are followed up every three days. Summaries of each follow-up call to a close contact are recorded in NCIMS. Initially, close contacts were surveyed daily by an automatic survey generated from NCIMS via email or SMS. On 28 March 2020 the large volume of close contacts exceeded the technical capacity

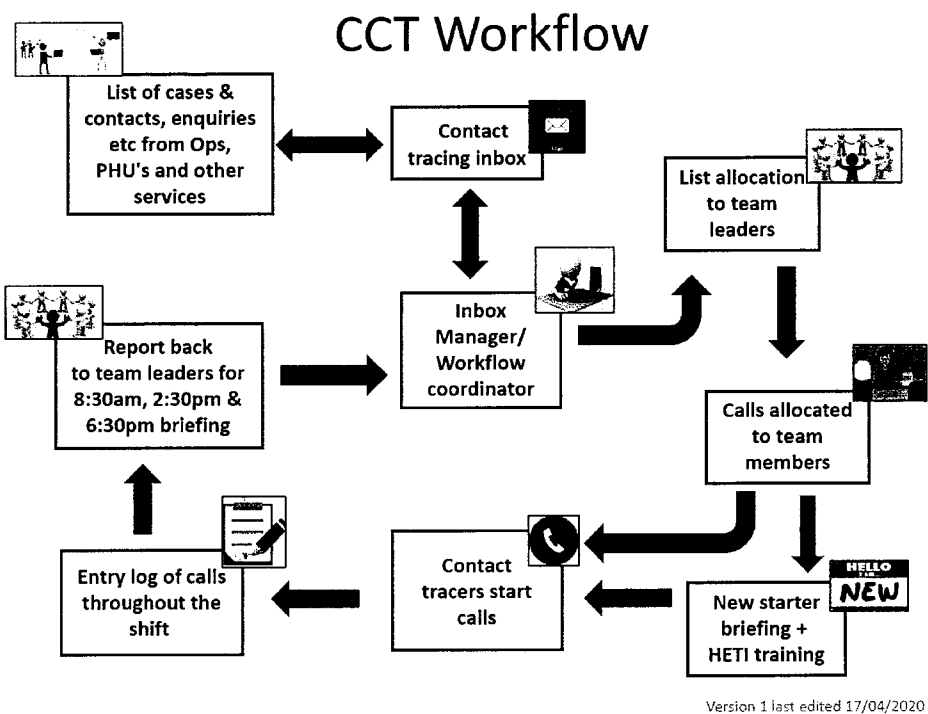
of the automatic survey when the final batch of surveys were sent with a number of hyperlink failures. From this point on the Close Contact Tracing Team has manually surveyed close contacts. This involves phone calls to each close contact to ask whether they are experiencing symptoms (and refer to testing if symptomatic), to check if they are successfully isolating and to find out if welfare assistance is required to complete isolation.

16. Close contact follow-up continues until release from isolation 14 days following the last exposure to a confirmed case, providing the close contact is asymptomatic and COVID-19 testing results have been entered in NCIMS and are negative. The service following up a confirmed case is responsible for releasing the individual from isolation in accordance with the SoNG, noting that criteria for release from isolation differs depending on whether the case is symptomatic and whether the case required hospitalisation for COVID-19.

Contact Tracing Team workflow

17. Public Health Unit staff or the PHEOC Operations team email lists of contacts to the Close Contact Tracing Team inbox. The nominated inbox manager reviews the contact list to ensure the list contains all necessary information. If the list is complete, it is emailed to a team leader within the Close Contact Tracing Team. The team leader then loads the list into a spreadsheet and allocates the contact list among team members to contact as per the Close Contact Tracing Team contact protocol. All contacts are entered into NCIMS regardless of whether or not they were contacted on the first attempt. Any contacts who are unable to be contacted are entered into a re-contact spreadsheet for contacting on the next shift and a note about attempted contact is entered into the corresponding NCIMS record. The team leader then advises the inbox manager of the status of the job at the end of the shift so that any outstanding work is handed over. The inbox manager includes any outstanding actions in a handover to the next shift.
18. The Close Contact Tracing Team has a surge plan with a resource forecasting tool, triggers for activating and additional staffing.

19. Diagram 1: Close contact tracing workflow



C. Contact tracing actions taken for passengers and crew from the Ruby Princess

20. On 20 March, the PHEOC Operations Team, the Ministry of Health Close Contact Tracing Team and Service NSW began contacting passengers of the Ruby Princess. Service NSW is a NSW government agency with a contact centre staffed by non-clinical team members. The PHEOC engaged Service NSW to expedite contacting all passengers. The following tables outline the actions taken by each team.

PHEOC – Actions taken on 20 March

Time	Action
08:56	Tracing was activated after SES Public Health Unit emailed the PHEOC to notify that there had been two confirmed cases associated with the Ruby Princess (Annexure 1).
09:30	Staff from the PHEOC and SES Public Health Unit participated in a teleconference to discuss the approach to managing the positive cases, including the plan to communicate with passengers and to treat every passenger as a close contact.
10:02	SES Public Health Unit emailed the PHEOC with the guest contact list provided by the Ruby Princess (Annexure 2).
10:46	The PHEOC emailed passengers via the Prodocom ² system notifying them of confirmed COVID-19 cases on the ship, and that every passenger was considered a close contact and required to self-isolate up to and including 2 April 2020 (Annexure 3).

² Prodocom is a mass communication system that can send bulk email, fax, SMS or voice messages. It allows for customised contact lists for communication and has the ability to generate reports for the campaign.

NSW Health has a Prodocom account which can be used during a public health response in order to effectively distribute information via the above methods. It has been used to manage other public health outbreaks including communications to GPs for measles outbreaks and other public health issues.

Time	Action
	<p>The email addresses were obtained from the guest contact list provided by the Ruby Princess. Of the 2626 emails sent to these email addresses, 2535 (96.5%) were successful according to Prodocom data (Annexure 4).</p>
11:00	<p>Staff from the PHEOC, SES Public Health Unit and Carnival Australia participated in a teleconference to discuss the approach to managing the positive cases, including how to manage the crew still on the ship. During the teleconference, participants agreed to provide the guest contact list provided by the Ruby Princess to the Commonwealth Department of Health's National Incident Room to notify them about passengers who were overseas residents. Carnival Australian said that 98 crew from the Ruby Princess had disembarked the ship on 19 March and travelled onward to their home countries.</p>
11:43	<p>The PHEOC sent the first SMS to passengers between 11:43am and 12:12pm via the Prodocom system to notify them of confirmed COVID-19 cases on the ship, and that every passenger was considered a close contact and required to self-isolate up to and including 2 April 2020 (Annexure 5).</p> <p>The mobile numbers were obtained from the guest contact list provided by the Ruby Princess. Of the 2586 SMS sent, 950 (37%) were successful according to Prodocom data. (Annexure 6).</p> <p>The PHEOC contacted Prodocom for assistance to convert the guest contact list provided by the Ruby Princess to a CSV format to ensure that the mobile numbers were in a format needed to use the Prodocom system.</p> <p>The Prodocom system was not able to send messages to international mobile numbers.</p>

Time	Action
12:00	The NSW representative on the CDNA, Dr Christine Selvey, informed members in a meeting about the confirmed cases on the Ruby Princess and outlined how the outbreak was being managed.
12:02	The PHEOC emailed the guest contact list provided by the Ruby Princess to the National Incident Room with a request to distribute it to states, territories and to National Focal Points in other countries (Annexure 7).
13:30	The NSW Minister for Health and the Chief Health Officer held a press conference to inform the public about the confirmed cases on the Ruby Princess, and to reinforce the need for passengers to self-isolate and to get tested if they developed symptoms.
14:00	At a meeting of the Australian Health Protection Principal Committee (AHPPC), Dr Kerry Chant, Chief Health Officer informed members of the two cases of COVID-19 on the Ruby Princess.
15:38	<p>The PHEOC sent the second SMS to passengers between 15:38 and 16:05 via the Prodocom system to notify them of confirmed COVID-19 cases on the ship, and that every passenger was considered a close contact and required to self-isolate up to and including 2 April 2020.</p> <p>Of the 2586 SMS sent, 957 (37%) were successful.</p> <p>This second text message was sent in an attempt to reach more passengers. This time, PHEOC staff reviewed the phone numbers in the guest contact list provided by the Ruby Princess to identify and correct any obvious errors. The guest contact list was received in Microsoft excel format from the Ruby Princess, and there were instances where a zero was missing from the front of the number.</p>
16:00	Staff from the PHEOC, SES Public Health Unit, Carnival Australia, NSW Police and the SHEOC participated in a teleconference to discuss

Time	Action
	the plan for managing the crew and the diagnosis of another passenger with COVID-19.
17:00	The NSW Health Protection Leadership Team, PHEOC staff and Directors of Local Health District Public Health Units across NSW participated in a teleconference to discuss the response to the positive cases from the Ruby Princess.
17:25	<p>The PHEOC emailed the ship's guest contact list provided by the Ruby Princess to Public Health Units in NSW with a request:</p> <ul style="list-style-type: none"> • to cross check any new cases with the guest contact list to identify whether they were passengers on the Ruby Princess; and • to inform the PHEOC and link to the outbreak in NCIMS (Annexure 8).
17:58	NSW Health distributed a media release to all NSW media outlets with the number of cases associated with Ruby Princess and reminding passengers about the need to self-isolate for 14 days, the symptoms of COVID-19 and how to get tested (Annexure 9).
18:25	<p>The NSW Health media release was loaded onto the NSW Health website.</p> <p>https://www.health.nsw.gov.au/news/Pages/20200320_03.aspx</p>
18:50	The media release was sent to other NSW government agencies including the Department of Premier and Cabinet, Transport NSW, the Department of Education, Service NSW, NSW Police, Surf Life Saving, Department of Planning, Industry and Environment, NSW Treasury, Multicultural NSW, and the NSW Department of Communities and Justice.

Close Contact Tracing Team and Service NSW – Actions taken on 20 March

Time	Action
Approx. 10.30	The Close Contact Tracing Team prepared to call Ruby Princess passengers and sourced additional staff from across the Ministry of Health to assist.
Approx 11:00	The PHEOC called Service NSW to request assistance with telephoning Ruby Princess passengers. Service NSW agreed to assist.
12:45	The PHEOC developed a script for calling passengers for use by both Service NSW and the Close Contact Tracing Team (Annexure 10). The final script used by Service NSW is provided at Annexure 11 .
13:45	The Manager briefed the team and all team members were provided with a close contact tracing script.
14:07	The contact details for international passengers, obtained from the guest contact list provided by the Ruby Princess, were provided to team leaders for allocation to team members.
15:38-20:56	The Close Contact Tracing Team identified international Ruby Princess passengers who intended to onward travel to their home countries despite being advised to self-isolate and not to travel. The PHEOC offered to arrange accommodation for these passengers until the end of the isolation period.
17:22	The Close Contact Tracing Team emailed Service NSW with the details of the 44 international passengers that the Close Contact Tracing Team successfully contacted out of 570 attempted (Annexure 12). Only 44 passengers were able to be contacted for a variety of reasons, some of which

Time	Action
	include that the passenger was on a flight at the time of contact, did not have an active voicemail, did not allow calls from a private number, or did not answer the call.

21. On 21 March, staff from the PHEOC, Service NSW and the Close Contact Tracing Team continued to contact passengers from the Ruby Princess. The following tables outline the actions taken by each team.

PHEOC – Actions taken on 21 March

Time	Action
15:25	The PHEOC sent the guest contact list provided by the Ruby Princess to all jurisdictional CDNA and AHPPC members to facilitate passenger follow-up and contact tracing (Annexure 13).

Service NSW – Actions taken by Service NSW on behalf of NSW Health on 21 March

Time	Action
08:04 – 14:44	38 Service NSW staff members called 1849 unique phone numbers. They attempted each number at least once and up to three times. They were successful in contacting 1195 of the 2647 passengers (45% of passengers). 539 phone numbers on the guest contact list provided by the Ruby Princess were invalid or incomplete (Annexure 14).

Close Contact Tracing Team – Actions taken on 21 March

Time	Action
13:27	On 21 March, Service NSW provided a list to the PHEOC with passengers who had reported symptoms.
16:17	The PHEOC emailed the Close Contact Tracing Team with a request to contact <i>all</i> symptomatic passengers ³ and provided a script for these calls (Annexure 15).
19:16	The Close Contact Tracing Team notified the PHEOC Operations team that two passengers reported that they had tested positive to COVID-19, bringing the total number of passengers diagnosed to four.
19:48	The Close Contact Tracing Team notified the PHEOC about another passenger who reported testing positive to COVID-19, bringing the total number of passengers diagnosed to five.
20:59	The Close Contact Tracing Team notified the PHEOC about another four passengers who had self-reported testing positive to COVID-19, bringing the total number of passengers diagnosed to nine.
21:37	The Close Contact Tracing Team attempted to call all passengers who had been identified by Service NSW as symptomatic. Of these, 88% were successfully contacted on the evening of 21 March. The remainder did not answer the call.

³ Passengers were considered symptomatic if they were experiencing, or had experienced, any of the following:

- Fever
- Cough
- Runny nose
- Sore throat
- Shortness of breath or difficulty breathing

22. By 22 March Service NSW, the Close Contact Tracing Team and the PHEOC Operations team had attempted to contact all passengers with valid phone numbers from the guest contact list provided by the Ruby Princess. Valid phone numbers were those that were listed, complete and belonged to the passenger for whom they were listed.
23. Between 25 – 28 March, passengers were surveyed daily to determine whether they had symptoms of COVID-19. Passengers who responded "yes" to experiencing symptoms were flagged in NCIMS. The Close Contact Tracing Team or Public Health Unit then telephoned these symptomatic passengers to discuss their symptoms and refer them to testing.
24. The survey was generated from NCIMS and delivered by text or email, depending on the contact details provided for each passenger in NCIMS. When the volume of responses exceeded the technical capacity of the automated survey, the system was disabled and the Close Contact Tracing Team instead telephoned passengers every second or third day. The frequency of follow-up was dependent upon whether individuals were classified as a high risk contact or not (age over 60 years).
25. On 21 March, staff from Carnival Australia and the PHEOC decided in a teleconference to email all passengers with a letter (**Annexure 16**) about being a close contact to ensure that passengers received the message.
26. On 22 March, the PHEOC sought assistance from the National Incident Room and Australian Border Force to prevent onward travel for Ruby Princess Passengers:
 - i) At 11:09 the PHEOC emailed the National Incident Room asking for assistance (**Annexure 17**);
 - ii) At 13:33 the PHEOC emailed the Australian Border Force to provide further information that passengers were advised not to onward travel (**Annexure 18**);

- iii) At 13:38 and 16:34 the PHEOC emailed the Australian Chief Medical Officer with an update about the efforts to prevent onward travel (**Annexure 19 & Annexure 20**); and
 - iv) At 20:11 the Australian Border Force emailed the PHEOC to advise that all Ruby Princess passengers were being placed on a 'do not board' list (**Annexure 21**).
27. On 25 March, Carnival Australia provided the PHEOC with the contact details of the 158 passengers for whom there was no evidence they had opened the Carnival Australia email with the NSW Health letter.
28. On 25 March, the PHEOC reviewed this list and cross referenced with the list of individuals that Service NSW had contacted, the responses NSW Health had received from the email on 20 March, and the contact made by the Close Contact Tracing Team. This process indicated that 21 passengers were unlikely to have been contacted. On 26 March, the Close Contact Tracing Team followed up the remaining passengers.

A summary of the approaches used to communicate with passengers

29. In summary, the PHEOC used a range of communication strategies to inform passengers that they were considered a close contact and to reinforce the requirement they had already received at disembarkation from the Australian Department of Agriculture, Water and the Environment staff to self-isolate for 14 days:
- i) An email (with a link to a fact sheet on NSW Health's website (**Annexure 22**)) sent on 20 March;
 - ii) Two short message services (SMS) sent on 20 March (**Annexure 5**);
 - iii) A media release, also published on NSW Health's website on 20 March (**Annexure 9**);

- iv) A letter from NSW Health dated 21 March emailed by Carnival Australia (with a link to an updated fact sheet on NSW Health's website (**Annexure 23**)); and
 - v) Telephone calls.
30. The advice provided to passengers was consistent with the advice from the Commonwealth Department of Health that applied at 19 March 2020 in that passengers were required to isolate for 14 days from the day of disembarking, up to and including 2 April 2020. The updated NSW Health fact sheet of 21 March (**Annexure 23**) also stipulated that passengers:
- “cannot continue with onward flights, trains or buses. You can travel directly to your home or hotel by private car, taxi or ride-share (provided you are wearing a surgical mask and sit in the back seat) to begin your period of home isolation”.*

Contacting passengers who tested positive

31. The process of contact tracing the confirmed cases started on 20 March as the first cases among known passengers were notified.
32. To determine whether a confirmed case had been a passenger on the Ruby Princess, Public Health Units asked about travel history as part of the case interview, or cross checked against the guest contact list provided by the Ruby Princess and provided to Public Health Units by the PHEOC on 20 March.
33. The local Public Health Unit staff interviewed each passenger who tested positive to identify their close contacts. If the Public Health Unit required assistance to make the initial approach with the people identified as close contacts then they emailed the PHEOC and Close Contact Tracing Team.
34. After an individual was notified of their positive test result, they were interviewed using a questionnaire (**Annexure 24**), including:
- i) Demographic information (name, date of birth, country of birth, indigenous status)

- ii) Place of usual residence
 - iii) Travel history in the previous 14 days
 - iv) Any contact with a confirmed case
 - v) Current symptoms and onset
 - vi) Any contact with the health system in the previous 14 days (primary care, hospital admissions)
 - vii) Pre-existing medical conditions
 - viii) Risk factors (alcohol, smoking, pregnancy)
 - ix) Occupation
 - x) Locations where the person has been during their infectious period
 - xi) People they have had contact with during the infectious period.
35. The close contacts identified in the questionnaire were captured in NCIMS.
36. If the Public Health Unit made the initial approach with the close contacts of the passenger then they would provide their personal details to the Close Contact Tracing Team for ongoing follow-up during their period of isolation. Records of communication with close contacts were then documented in NCIMS. In addition to administering the questionnaire, the interviewer provided information relating to isolation requirements, welfare and the process for follow-up and release from isolation. A welfare referral may have followed depending on the individual's circumstances.
37. Throughout March, the infectious period was considered to be 24 hours before the onset of symptoms as per the SoNG. On 17 April, this was revised in version 2.6 of the SoNG to be 48 hours prior to the onset of symptoms (**Annexure 25**).
38. When close contacts of a positive case were called, they were informed about where and when they may have been exposed to the confirmed case. During

the call, the Close Contact Tracing Team also explained how they needed to self-isolate and when the period of isolation ended. They were also told about the symptoms of COVID-19 and how to get tested if they became symptomatic. Depending on the contact's preference, they were either directed to the NSW Health website for further information or sent an email or SMS with a link to relevant information.

Tracking the number of COVID-19 cases among passengers

39. The number of confirmed cases of COVID-19 has been sourced from the NCIMS.
40. The management of cases associated with Ruby Princess was regularly discussed at:
 - i) The NSW Health Protection Leadership Team;
 - ii) The Australian Health Protection Principal Committee (AHPPC); and
 - iii) The Communicable Diseases Network of Australia.
41. One responsibility of the PHEOC Operations team is to provide support to Public Health Units to manage active clusters. As part of this, the Operations team is a communication point between Public Health Units, other PHEOC teams and other government agencies in relation to clusters. The Operations team assists the Public Health Unit to work with relevant stakeholders to identify cases and close contacts derived from a cluster, put measures in place to prevent further transmission of COVID-19 and escalate issues to other agencies where required.
42. At the end of each shift, Operations team members compile handovers comprising an update and details of outstanding actions for the following shift members' information and action.
43. A Public Health physician, usually accompanied by an Operations team member, attended daily teleconferences held with other government agencies and Carnival Australia to manage the Ruby Princess COVID-19 cluster. This

enabled frequent information sharing to manage the cluster collaboratively and ensure timely communication between stakeholders.

44. On 24 March at 10:41am, the Secretary of NSW Health emailed all Local Health District and Specialty Health Network Chief Executives and Public Health Units requesting that cruise ship passengers be given high priority for COVID 19 testing (**Annexure 26**).
45. There were more than 200 emails exchanged between NSW Health and other state and territory Public Health Emergency Operation Centres as new cases among passengers of the Ruby Princess were identified.

Contact tracing secondary and tertiary cases

46. *Primary transmission* refers to the process where a contact is directly infected from a patient with COVID-19 (in a single generation of infection). *Secondary transmission* occurs where another person is infected from the contact (a second generation of infection). *Tertiary transmission* refers to a third generation of infection.
47. *Community transmission* typically refers to transmission occurring within the community (as opposed to a closed setting such as a residential aged care facility or a cruise ship, or where the case has acquired infection overseas).
48. Contact tracing for the 19 probable secondary and three probable tertiary cases associated with the Ruby Princess in NSW occurred using the same process as outlined earlier in this report.

D. Results of contact tracing procedures performed in respect of Ruby Princess passengers, and probable secondary and tertiary cases

Summary data

49. As of 13 June 2020

- i) There were 371 passengers from the Ruby Princess who were residents of NSW or have been in the care of NSW Health facilities identified as confirmed cases in NCIMS. This information was obtained through a process of linking the guest contact list provided by the Ruby Princess with the records held for COVID-19 in NCIMS.
- ii) In NSW, there have been 19 probable secondary cases and three probable tertiary cases of COVID-19 diagnosed that have been linked epidemiologically (see below).
- iii) There have been nine deaths reported in passengers who were residents of NSW or have been in the care of NSW Health facilities.

50. Of the 19 probable secondary cases, 14 had exposures to others while they should have been in home isolation, including: household or family contacts (11), health care (1) and friends (2). The remaining five had exposures that most likely occurred while travelling, including bus drivers (2), other bus contact (1), flight contact (1) [REDACTED]. Of the three probable tertiary cases, two had household contacts and one had a workplace contact with a secondary case.

51. As of 13 June 2020, 1242 cases of COVID-19 have been found to be locally acquired in NSW. Transmission from Ruby Princess passengers account for 22 of these, or 1.8%.

Data linkage

52. In order to accurately identify passengers from the Ruby Princess who had subsequently tested positive for COVID-19, the guest contact list provided by the Ruby Princess was linked to the NCIMS.
53. The Centre for Health Record Linkage (CHeReL) performed the linkage on behalf of the PHEOC. The linkages used demographic data (such as name, date of birth, address) from the guest contact list provided by the Ruby Princess and demographic data from NCIMS and linked data from the Admitted Patient Data Collection, Emergency Department Data Collection and Deaths Registration. The Admitted Patient Data Collection, Emergency Department Data Collection and Deaths Registrations were used to enhance demographic linkage by creating a larger set of demographic information and demographic variants for each person who was a confirmed COVID-19 case. The linkage process made use of exact linkage methods and probabilistic methods. Probabilistic methods use techniques from computer science and statistics are used to identify highly approximate but not exact matches. The PHEOC then reviewed all matches to confirm the accuracy of the linkage.
54. The linkage occurred ten times between 1 April 2020 and 9 April 2020 using the most up to date NCIMS data.
55. This method reduced the chance of missing that a case was associated with the Ruby Princess due to the large volume of confirmed cases of COVID-19 being reported at the time.