REPORT TO THE MINISTRY OF HEALTH ON THE

AUCKLAND TYPHOID OUTBREAK: MARCH/APRIL 2017

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Executive summary

This report, prepared at the request of the Ministry of Health, considers how well the Auckland Regional Public Health Service (ARPHS) handled a recent outbreak of typhoid in Auckland and what learnings may be able to be usefully applied to improve its future performance and potentially be of interest and value to other sector colleagues.

Typhoid outbreaks occur from time to time in New Zealand from a combination of local and overseas acquired sources. Most cases occur in Auckland, primarily affecting members of Auckland's Asian and Pasifika communities. ARPHS has well-established systems and protocols in place for dealing with such events.

This outbreak was brought under control relatively quickly. On this occasion, however, there were some shortcomings in how the outbreak was managed, especially in relation to communication and engagement issues.

This report notes a number of learnings for the future, including:

- keeping protocols up to date;
- providing cultural support in any incidence of unexpected death of a Pasifika patient;
- considering the need for a media statement to accompany a Health Professional Advisory (HPA);
- providing increased support for community advisors, including working proactively with community groups; and
- developing protocols for escalating work issues within ARPHS.

Appropriate action is also being taken in respect of certain staff members.

The outbreak also demonstrated weaknesses in relation to ARPHS's culture, management capability and structure.

Steps were already being taken before the outbreak to change and improve ARPHS's culture and strengthen its management capability. There is scope to further strengthen these efforts and also to speed them up by enlisting outside assistance.

There is also scope to strengthen the support ARPHS receives from Auckland District Health Board (ADHB) in respect of communications and human resource practice, along with improved reporting lines between ARPHS and ADHB.

Report methodology

This report was prepared by the Office of the Chairman of Auckland, Counties Manukau and Waitemata DHBs on the basis of written inputs provided by key clinical and professional leads across ARPHS and the metro Auckland DHBs. These were requested by the Chief Executive of Waitemata District Health Board (WDHB) in his metro Auckland DHB coordinating role for public health. In preparing some of these inputs, the key leads interviewed or consulted a number of other clinicians and interested persons.

Short background information on the above leads is provided in Appendix 1.

The report was also prepared on the basis on interviews conducted by the Chairman's office with ARPHS's senior management team: General Manager, Jane McEntee; Clinical Director, Dr Julia Peters; and Director Health Outcomes, Simon Bowen (who works across both ADHB and WDHB), to whom the General Manager reports.

Context and purpose of this report

On 21 March 2017, a case of typhoid was notified to ARPHS. Over the following 7-8 weeks, a further 22 cases were notified. In all cases except one, those affected in the Pasifika community made a full recovery. Sadly, one person who had contracted typhoid died after a short period of time in hospital. The person concerned had multiple co-morbidities but it was not known that they also had typhoid until the time of their death.

There were some shortcomings in how the outbreak was managed. While these did not affect the clinical outcome – the outbreak was contained quickly – they served to create undue concern among some members of the public and an impression of an organisation under pressure and struggling to cope.

For serious events such as an outbreak of typhoid fever, it is necessary for health authorities not only to be managing risks to public health expeditiously and effectively but being seen to do so.

As the person with overall responsibility for public health in New Zealand, the Minister of Health also has an expectation that they will be well-briefed on important and emerging public health issues.

This report, which has been requested by the Ministry of Health, is aimed at taking an objective view of ARPHS's performance on this occasion so that the public can continue to have confidence that risks to public health in Auckland are being managed effectively and that ARPHS and possibly other public health units in New Zealand can use this experience to learn about how to improve their performance.

This report is therefore forward looking. Its purpose is neither to establish rights and wrongs, nor to consider the performance of any particular individual. Rather, the focus is on what learnings from this experience may be able to be usefully applied going forward. This is no different from the self-review and continuous improvement processes any high-performing organisation would be expected to undertake.

Background information

Auckland Regional Public Health Service

ARPHS is a public health organisation serving Tamaki Makaurau's diverse population through health protection, disease prevention and health promotion. It provides public health services to all three metro Auckland DHBs - ADHB, Counties Manukau District Health Board (CMDHB) and WDHB - and the populations they serve.

Its work includes management of typhoid fever, tuberculosis and other notifiable infectious diseases, air/water quality, advice on environmental hazards, border health protection, refugee health, public health policy advice and health promotion, including alcohol and tobacco compliance. ARPHS is active in workplaces and works with a wide range of organisations, including central government agencies, early childhood centres and council and non-governmental organisations.

ARPHS is funded directly by the Ministry of Health through a public health services contract with ADHB and has a current full-time staffing complement of some 157 people.

Typhoid fever

Typhoid fever, also known simply as typhoid, is a common worldwide bacterial disease transmitted by the ingestion of food or water contaminated with the urine or faeces of an infected person which contain the bacterium *Salmonella typhi*. In New Zealand, most cases acquire the infection while travelling overseas or through contact with visitors from abroad.

The incidence rate for the Auckland region in 2016 was 1.7 per 100,000 population, over five times the incidence rate for the rest of NZ (0.3/100,000 population). 72 per cent of the typhoid cases nationally have been in the Auckland region over the last five years.

There were 28 typhoid cases reported in Auckland throughout 2016, with sustained numbers from mid-summer to early autumn. Approximately 86 per cent of cases required hospitalisation.

Nearly all cases were of Asian and Pacific ethnicity. The highest incidence rate occurs among Pasifika. There were six locally acquired cases (an incidence rate 0.37 per 100,000 population). All locally acquired cases were from Samoan or Tongan ethnic groups, with the majority of overseas acquired cases of Indian ethnicity.

Further information on the incidence of typhoid fever in New Zealand is provided at Appendix 2.

Public health management of typhoid cases

ARPHS has well-established systems and protocols for managing infectious diseases such as typhoid fever. It has an assessment and management team which receives all notifications (in accordance with requirements under the Health Act 1956). These are first triaged and then assigned throughout the service for follow up and management. ARPHS receives around 6,000 notifications annually, a high proportion of which require investigation and follow up.

The usual management of enteric (also known as gastrointestinal) diseases and typhoid specifically is set out in the Enteric Disease Protocol.

The process for managing outbreaks is set out in the Acute Gastrointestinal Outbreak Investigation Protocol. Dedicated outbreak strategies and operational plans are prepared in the case of complex outbreaks.

Enteric diseases such as typhoid are managed within the environmental health team because of the need both to ensure appropriate case and contact management and to investigate potential environmental sources for the disease.

Timeline summary of typhoid outbreak in Auckland over March/April 2017

Over the period to 21 March to 20 April 2017, a total of 22 people were confirmed as having typhoid fever (all but two in Auckland).

21-27 March

The initial typhoid case (the 'index case') was notified to ARPHS on 21 March [Day 0]. Two more cases were notified over subsequent days, assessed as household contacts. An ARPHS outbreak case manager and a Medical Officer of Health were assigned to the investigation.

On 26 March [Day 5], a fourth case was notified and a connection to a church group was identified.

On 27 March [Day 6], a fifth notification was received.

28 March

At an enteric disease meeting on 28 March [Day 7], the above cases were confirmed as a cluster linked to the operation of the church group. The Medical Officer of Health was not present at this meeting as he was in Wellington.

On the same day (28 March), at approximately 1510 hours, ARPHS was notified by Auckland City Hospital that a person with a positive *Salmonella typhi* blood culture had died. The person concerned had multiple co-morbidities and septic shock. The fact that they also had typhoid fever had only become apparent shortly before their death. The family was notified of the typhoid diagnosis by medical staff from Auckland City Hospital.

ARPHS attempted to contact the family of the deceased but this proved not to be possible as the family was at Auckland City Hospital dealing with the patient's death.

LabPLUS subsequently confirmed the notification of typhoid at 1558 hours.

29 March

On 29 March [Day 8], the General Manager of ARPHS emailed the Chief Executives of the Auckland metro DHBs with an update on the four outbreaks it was managing (mumps, measles, malaria and typhoid). The fact that a death had occurred the previous day was noted in the email.

ARPHS staff visited a family member of the person who had died, conducted an interview and that evening arranged for three children at the house to be admitted to Starship. ARPHS staff also visited the church Minister's house and requested a list of congregation members (to facilitate comprehensive contact tracing).

31 March

On 31 March [Day 10], ARPHS's Communications Manager was informed of the outbreak and prepared an HPA for all health professionals across the Auckland region for distribution.

At 1400 hours, ARPHS distributed the HPA to health professionals across the region and a media statement was released at 1700 hours. A Medical Officer of Health remained until 1900 hours to answer media calls.

In view of the media interest this statement generated, the Director of Public Health at the Ministry of Health contacted the Clinical Director and the on-call Medical Officer of Health in the evening of 31 March and on 1 April to receive further information.

ARPHS staff visited the church Minister on 31 March but he was not at home. He later responded to the message he had been left (at 2100 hours).

1-3 April

In response to the church Minister's call the night before, ARPHS's Pacific advisor went to the church Minister's home early on 1 April [Day 11]. The church Minister advised that he was conducting the funeral on 2 April and that a burial service would take place in the morning of 3 April. He indicated that he would be happy to assist with encouraging members of his congregation to engage fully with the outbreak investigation, including the provision of faecal specimens, once the services had concluded.

There were further media communications in the afternoon of 1 April which were referred to the Clinical Director and General Manager.

3 April

On 3 April [Day 13], a decision was made to initiate an ARPHS incident management structure using CIMS (coordinated incident management system) roles.

Additional support was provided to ARPHS including senior communications staff, public health consultants and a registrar, health protection officers and cultural support from the ADHB/WDHB Pacific Health team.

Requests were also made to the Ministry of Health and to other public health units. Two medical officers of health were provided for short periods, although neither the Ministry nor most public health units were able to release staff due to work pressures of their own.

As at 23 May 2017, two new cases associated with the Auckland typhoid outbreak had been identified (in Palmerston North), bringing the number of confirmed cases to 24.

Issues concerning the management of the outbreak

Overview

A number of issues need to be reflected on to consider what improvements, if any, should be made to the way such outbreaks are managed in future.

These comprise:

1. Issues relating to clinical management. Did ARPHS achieve the outcome it was seeking in managing the outbreak? Do the relevant protocols (the Enteric Disease Protocol and the Acute Gastrointestinal Outbreak Investigation Protocol) remain fit for purpose? How well did Auckland City Hospital care for the person who sadly died?

2. Issues relating to ARPHS's management response. How effectively did ARPHS manage its response to the outbreak?

3. Issues relating to communication and engagement. How well did ARPHS communicate with health professionals? How well did it communicate with the general public via the media and other channels? How well did it communicate with key stakeholders, principally the Ministry of Health? How well did ARPHS communicate and engage with individuals and communities affected by the outbreak?

Each of these issues is considered in turn below.

Clinical management

ARPHS's role includes protecting the Auckland public from communicable diseases.

At the time of the typhoid outbreak, ARPHS was managing four other outbreaks (mumps, measles, malaria and legionella). Its medical team had recently been depleted by resignations of key public health specialists and staff absences due to leave or sickness.

From a clinical perspective, the outbreak was, nevertheless, managed successfully. As Table 1 below shows, the epidemiological curve of the outbreak conforms to what is desired in any outbreak, i.e. a short period in which notifications rise, peak and fall. In other words, the outbreak was brought under control in a short period of time.

The two cases that were subsequently reported in Palmerston North were linked to the same families and church group as the other cases associated with the outbreak and reinforce the importance of continued vigilance and follow up. They have been successfully managed.

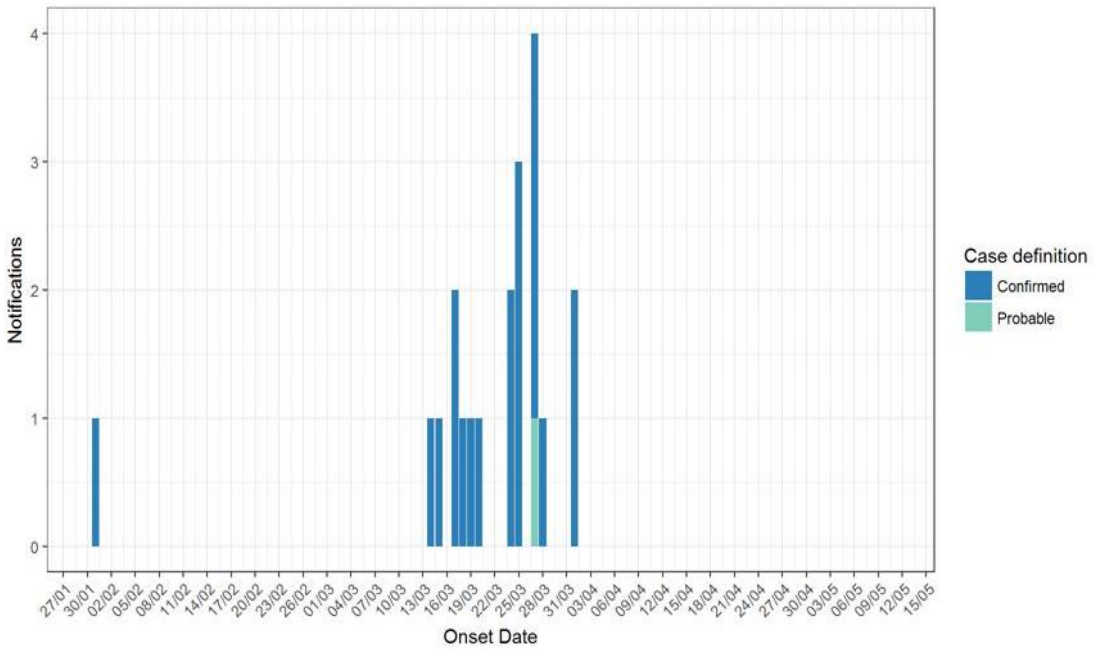
The two protocols which guided the clinical response to the outbreak (the Enteric Disease Protocol and the Acute Gastrointestinal Outbreak Investigation Protocol) were followed. It is usual practice to check that protocols remain fit for purpose after an outbreak and this should be done in this instance.

In managing an effective response to the outbreak, ARPHS developed an outbreak strategy and an operational practice which augmented and customised the above protocols to the particular needs of the situation, e.g. in supporting GP visits and providing vouchers for those affected in the Pasifika community.

ARPHS's work is becoming increasingly reliant on such protocols and it will be important that all of the protocols it uses are kept up to date.

The clinical management of the person who sadly died was appropriate, as were the frequency and quality of conversations with the family. There is an opportunity, however, for DHBs to consider providing Pasifika support in any instance of unexpected death of a Pasifika patient, especially if there are likely to be ongoing procedures such as screening following death. In such circumstances, early communication between DHB Pasifika support staff and ARPHS would greatly assist the family.

Table 1: Epidemiological curve of the outbreak (note: excluding two subsequent cases reported in Palmerston North)



Management response

When the typhoid outbreak occurred, strategic and operational leads were assigned to lead ARPHS's response. These positions were filled by two respected medical professionals working within ARPHS, supported by an operations team including a Pasifika advisor.

In the early stage of the outbreak, it was assumed that the outbreak was confined to certain members of a particular family. For this reason, the strategic lead (a Medical Officer of Health) did not see a need to cancel plans to attend a training course in Wellington. When circumstances changed, fog in Wellington delayed his return to Auckland.

The General Manager and Clinical Director are normally able to arrange their absences from the office so that one of them is always present. This was the case in the early stages of the outbreak. Later on, however, both the General Manager and the Clinical Director were absent. It would be desirable for clear guidelines to be developed to ensure that a certain number of senior staff are always on hand to deal with any outbreaks that may occur.

It quickly became apparent that the outbreak was actually larger in scale than first thought, potentially affecting members of a local church group as opposed to a single family. Nevertheless, there was a delay in escalating management of the outbreak within ARPHS and notifying senior management of the ADHB that a death had occurred in the context of an outbreak of a communicable disease.

As noted above, the delay in escalating matters did not appear to affect the clinical management of the outbreak adversely but it arguably made a complex situation more challenging than it needed to be, especially with respect to communication and engagement matters.

It is not entirely clear why this delay occurred but it appears to be related to a combination of circumstance and judgement. Nevertheless, senior managers not only have a responsibility for establishing clearly defined roles but ensuring that staff understand and follow what is expected of them, including the parameters within which they are expected to operate. With the benefit of hindsight, closer senior management attention from the outset would have been desirable.

Communication and engagement

There are a number of strands to how well ARPHS communicated and engaged throughout the outbreak. The strands are:

- communication with health professionals
- communication with the general public via media

- communication with key stakeholders, principally the Ministry of Health
- communication and engagement with those affected by the outbreak in the Pasifika community.

Communication with health professionals and the general public via the media

As noted above, ARPHS became aware that a patient with typhoid had died at Auckland City Hospital on 28 March. It was not until 31 March, however, that ARPHS's communications team was brought into discussions with ARPHS medical staff about the need to issue a formal HPA.

The objective of the HPA was to ask medical personnel across the metro Auckland region to be vigilant for potential cases of typhoid. This was issued to the three metro Auckland DHB communications directors on 31 March at 1400 hours (a Friday). The advisory was issued to a large external recipient list shortly afterwards. A media release about the outbreak was issued on 31 March around 1700 hours.

The relatively late involvement of the communications team and the decision to release a media statement late on a Friday afternoon with no apparent plan for how media enquiries would be handled over the weekend point to the inexperience of those concerned and, more fundamentally, issues of culture and management practice.

It should be noted that it is not usual practice to issue a media statement on the back of an HPA. This reflects a view held by senior officials in ARPHS that information about outbreaks does not necessarily need to come to the attention of the wider public and that it is generally best to be reactive rather than proactive in making information available. This view would not appear to be consistent with how open government is generally being interpreted in the wider State sector and should be reconsidered.

Communication with the Ministry of Health

Although a member of ARPHS's medical staff had been in contact with the Ministry of Health about the outbreak early in the day on 31 March, it appears that a clear sense of the developing situation was not conveyed to the Ministry, the consequence of which was that the Minister of Health was not informed of the matter when news reports in response to the media statement started to surface. In addition, ARPHS neglected to copy the media statement to the Ministry of Health.

The handling of this aspect points to the inexperience of those concerned but again it raises issues about managerial oversight and supervision.

Over the weekend, ARPHS staff responded to enquiries from the Ministry of Health and the Minister of Health's office. A media update was emailed to various media organisations and placed on ARPHS's website. Unfortunately, however, ARPHS's communications lead could not be contacted, which led to an inappropriate delay in responding to media enquiries.

Communication and engagement with those affected by the outbreak in the Pasifika community

As noted in the timeline above, various attempts were made to contact the Minister of the church group in an effort to ensure that members of the group could be contacted, tested and, where necessary, treated. With the benefit of hindsight, it would have been better to work directly with senior members of the church group rather than the Minister who was busy attending to the various services for the person who had died.

When contact was made, it proved difficult to arrange samples so that members of the group could be tested for possible infection. Communication was in Samoan, which further complicated matters.

There is sometimes a difficult but important balance to be struck between respecting cultural values and sensitivities of particular groups in the community and safeguarding the health of the wider public. Being able to strike an appropriate balance and, more importantly, gain the support of the community concerned is something that requires considerable skill and personal credibility.

The Pasifika community is an extremely broad grouping, involving more than 30 languages. It is unrealistic to rely on a single individual to be able to work effectively across all these groups. An issue for ARPHS to consider, therefore, is how to increase support for its community advisors in particular situations. Options include reaching out to DHB-based Pacific Health teams or co-opting senior community leaders to assist, as required. In addition, there would be merit in ARPHS working proactively with community groups, for example by attending meetings of the Healthy Village Action Zone (HVAZ) funded by the ADHB/WDHB Pacific Health team.

Having such support is particularly important where there is an unexpected death as ongoing procedures such as screening are likely to be required, which will need to be explained to the family and others involved, such as the funeral director.

While every effort needs to be made to work with the community and gain its trust and support, there will be occasions where progress cannot be made or cannot be made quickly enough to protect the wider public. In such circumstances, ARPHS should be prepared to use its regulatory powers. Clear criteria need to be established for using such powers, assuming they have not been already.

Other issues

ARPHS's operating model

ARPHS's operating model is how the organisation delivers on its purpose and business strategy. It covers such issues as ARPHS's culture, management capability, structure and level of support from other parts of the metro Auckland DHB system.

As previously noted, ARPHS is funded by the Ministry of Health through a public health services contract with ADHB. ADHB employs ARPHS staff and provides day-to-day support for its operations.

ARPHS is headed by a General Manager and a Clinical Director who report to the Director Health Outcomes who works across both ADHB and WDHB. The Director reports to the Chief Executive of WDHB who has a coordinating role for public health for the metro Auckland DHBs.

Reporting to the General Manager are several managers with portfolio responsibilities and specialist advisors responsible for liaising with Maori and Pasifika communities.

The General Manager is currently in the process of strengthening parts of ARPHS's operating model. This is being driven in part by necessity since a number of experienced public health professionals have recently resigned from ARPHS and ARPHS is carrying some vacancies. But the process is also being driven to improve management capability within ARPHS and to change and improve ARPHS's culture which tends to be inward-looking.

There is a general shortage of people who can work effectively in public health and recruiting to vacant or new positions is challenging. Like many organisations, ARPHS also faces the challenge of finding managers who are effective both as managers of people and managers of the particular business of the organisation.

As a ring-fenced organisation within the wider Auckland health system, ARPHS is also vulnerable both to being and feeling isolated. In discussions about the outbreak, a culture of 'we can manage' was detected (when in fact people were struggling). The failure to escalate issues relating to the typhoid outbreak noted above is a reflection of this mind-set.

Bringing ARPHS more closely under the wing of ADHB for operational support would go a long way to reducing this sense of isolation and improving ARPHS's capability in the areas discussed in this report.

There are two particular opportunities for doing this: support with respect to communications and human resource practice.

Conclusions

Management of the outbreak

The typhoid outbreak was a dynamic, evolving situation involving groups that were not easily reached.

From a clinical management perspective, ARPHS performed well. The outbreak was brought under control relatively quickly.

From a wider management perspective, however, there were shortcomings in ARPHS's performance, especially with respect to communication and engagement issues which should have been escalated earlier.

This report notes a number of learnings for the future, including:

- keeping protocols up to date;
- providing cultural support in any incidence of unexpected death of a Pasifika patient;
- considering the need for a media statement to accompany an HPA;
- providing increased support for community advisors, including working proactively with community groups, for example by attending meetings of HVAZ funded by the ADHB/WDHB Pacific Health team; and
- developing protocols for escalating work issues within ARPHS.

Appropriate action is also being taken in respect of certain staff members.

Other issues

ARPHS's operating model

The outbreak also demonstrated weaknesses in relation to ARPHS's culture, management capability and structure.

Steps were already being taken before the outbreak to change ARPHS's culture and strengthen its management capability. There is scope to further strengthen these efforts and speed them up by enlisting outside assistance.

One option for addressing these issues in a timely and comprehensive manner would be to enlist outside help in diagnosing particular changes needed to ARPHS's operating model. In this respect, it would be useful to tap into the experience of other public health bodies and non-health agencies managing risks, for example MPI's experience in managing biosecurity incursions.

Given the nature of its day-to-day work, consideration should be given to changing ARPHS's reporting line from the Director Health Outcomes in ADHB's funder arm to a chief of operations in its provider arm.

There is also a need to ensure that ARPHS has greater communications and human resource support.

To address the communication issues discussed above, ARPHS requires access to high quality communication services 7 days a week, 52 weeks a year. Options are to merge ARPHS's communications team into the communications team in ADHB or retain a separate team but with better support from ADHB, for example, through fostering a closer community of practice.

The best option would be for ARPHS's communications team to be merged with the communications team in ADHB. Taking advantage of the high quality services provided by ADHB in this way would also address the shortcomings noted in this report relating to communication with the Ministry of Health.

With respect to human resource practice, it makes little sense for ARPHS to maintain its own capability in such a complex and fast changing field. While this has already been recognised to some extent, there is scope to do more. For example, ADHB has well-established programmes in relation to matters such as health and safety and personal conduct and these should be extended to include ARPHS.

Recommendations

It is recommended that the Ministry of Health:

1. **Note** that Auckland Regional Public Health Service (ARPHS) is taking steps to:
   a. Review the currency of its Enteric Disease and Acute Gastrointestinal Outbreak Investigation Protocols in the light of the experience of the recent typhoid outbreak
   b. Ensure that a process is in place to regularly review its other protocols so that they always kept up to date
   c. Ensure that, where relevant, cultural support is provided to the family of a person who unexpectedly dies during the course of an outbreak
   d. Consider the need for a media statement to be made when a Health Professional Advisory (HPA) is issued
   e. Provide increased support for its community advisors, including working proactively with community groups, for example by attending meetings of the Healthy Village Action Zone (HVAZ) funded by the ADHB/WDHB Pacific Health team
   f. Develop protocols for escalating work issues within ARPHS
2. **Note** that to ensure ARPHS has a robust operating model:
   a. The current process of effecting cultural change within ARPHS is being strengthened and speeded-up through the engagement of a management consultant experienced in advising public sector agencies on such matters
   b. ARPHS's communications team will be merged with that in Auckland District Health Board (ADHB)
   c. Consideration will be given to changing ARPHS's reporting line from the Director Health Outcomes in ADHB's funder arm to a chief of operations in its provider arm
   d. The Director Health Outcomes will be developing clear guidelines within a month to ensure that a certain number of senior staff are always on hand to deal with any outbreaks that may occur
   e. ADHB will be providing greater support to ARPHS on human resource issues, including matters such as health and safety and personal conduct.

Dr Lester Levy
Chairman
Auckland, Counties Manukau and Waitemata District Health Boards

BACKGROUND INFORMATION ON KEY CLINICAL AND PROFESSIONAL LEADS WHO CONTRIBUTED TO THIS REPORT

Simon Bowen

Simon Bowen is Director Health Outcomes for ADHB and WDHB. He trained as a public health specialist in New Zealand and the United Kingdom and is a Fellow of the UK Faculty of Public Health

Bruce Levi

Bruce Levi is General Manager of Pacific Health for both ADHB and WDHB

Jane McEntee

Jane McEntee is ARPHS's General Manager. She was previously General Manager of the National Screening Unit.

Dr Jocelyn Peach

Dr Jocelyn Peach is Director of Nursing and Midwifery for WDHB where she has worked for over 18 years. She is also an Emergency Systems Planner for WDHB

Dr Julia Peters

Dr Julia Peters is ARPHS's Clinical Director. She is a public health physician and has chaired the New Zealand College of Public Health Medicine.

Matthew Rogers

Matthew Rogers is Communications Director for WDHB. He has 25 years' experience in the news media and public relations in Australia, the United Kingdom and New Zealand

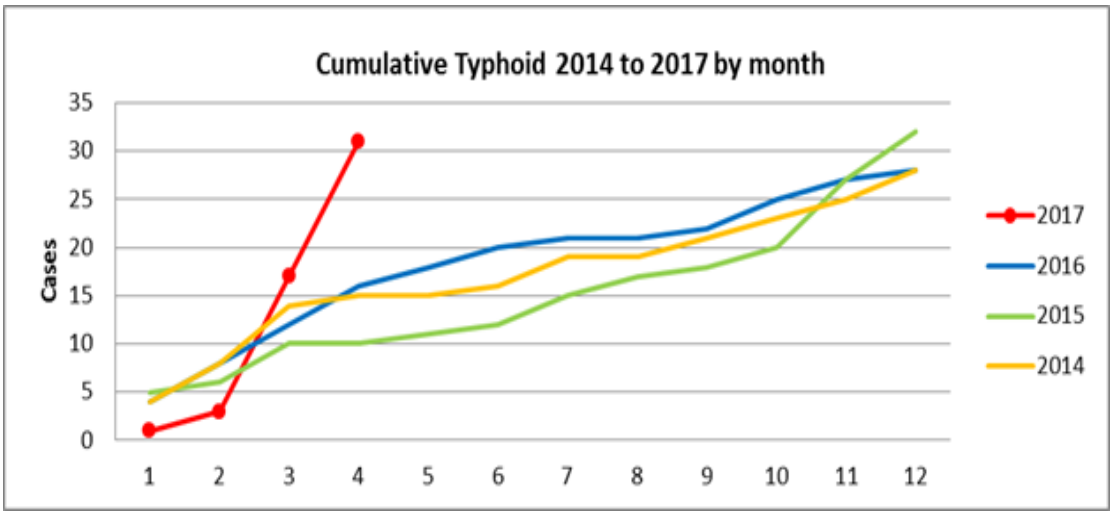
Dr Margaret Wilsher

Dr Margaret Wilsher is Chief Medical Office for ADHB. She holds a number of health leadership responsibilities outside of the DHB, including membership of the Capital Investment Committee

Incidence of typhoid fever in New Zealand

Typhoid fever cases in Auckland and NZ, 2006-2016

Year	Auckland	NZ	% of NZ cases that were in Auckland
2006	28	42	67%
2007	37	47	79%
2008	21	29	72%
2009	26	34	76%
2010	20	31	65%
2011	36	45	80%
2012	30	44	68%
2013	39	50	78%
2014	28	43	65%
2015	32	43	74%
2016	28	38	74%



Ethnic-group distribution and ethnic-specific incidence rates of typhoid cases in the Auckland region, 2016

Ethnic-group	Female	Male	Total	Incidence-rate per 100,000 population*
Asian	6	7	13	3.2
Other	0	1	1	0.1
Pacific Peoples	7	7	14	6.6
Total	16	16	32	2.0

*Rates are based on 2016 projected mid-year population, ethnicity is MPAO prioritised (Source: Statistics New Zealand)

Ethnic-group distribution, and where typhoid was acquired, Auckland region, 2016

Ethnicities	Locally acquired	Overseas acquired	Total
Indian		13	13
Samoan	5	7	12
Tongan	1	1	2
Middle Eastern		1	1
Total	6	22	28

Country of origin for imported typhoid fever, 2016

Source country	Cases
India	12
Samoa	6
Pakistan	2
Fiji	1
Tonga	1
Total	22