

# THE NEW ZEALAND MEDICAL JOURNAL

Journal of the New Zealand Medical Association



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## **This Issue in the Journal**

### **Better be prepared than sorry: what should the New Zealand healthcare system learn from the 2009 Pacific Tsunami?**

Sultan Al-Shaqsi

On the early hours of the 29 September 2009, an earthquake in the Pacific generated a massive tsunami that caused significant destruction and claimed many lives across several Pacific nations. The disaster initiated an international relief operation from New Zealand (NZ), Australia, and the United States. The NZ healthcare response was adequate given the multiple challenges encountered. This article reviews the challenges faced by NZ healthcare responders to the Pacific Tsunami. Furthermore, it presents the lessons learnt from this operation in order to enhance the NZ healthcare system preparedness to respond to future disasters and mass emergencies nationally and internationally.

### **Communicable and non-communicable diseases in the Solomon Islands villages during recovery from a massive earthquake in April 2007**

Takuro Furusawa, Hana Furusawa, Ricky Eddie, Makiva Tuni, Freda Pitakaka, Shankar Aswani

In April 2007, a massive earthquake and tsunami hit fishing-horticulture villages and Gizo town in the Solomon Islands. Two years later, a peri-urban community who was affected by the tsunami were at risk of both communicable and non-communicable diseases. A risk of non-communicable disease was also increasing in a rural community who had successfully received a lot of aid. These results suggested that controlling urbanisation as well as providing continuous support against infectious conditions during the recovery process would be beneficial.

### **Yaws in Polynesia's Wallis and Futuna Islands: a seroprevalence survey**

Gilles Guerrier, Sandrine Marcon, Laure Garnotel, Roger Deltour, Stéphane Schinas, Jean Pierre Mathelin, Chantal Chouvin, Olivier Metge, Jean Marc Daronat

Yaws is a tropical infection of the skin, bones and joints caused by the bacteria *Treponema pallidum* which also causes syphilis. We carried out a serological and clinical survey to determine the prevalence and clinical presentation of yaws on two twin islands in Polynesia: Wallis and Futuna (600km from Fiji). A total of 264 serum (from blood) samples were tested. Our results contrast with findings in neighbouring islands, such as Vanuatu, where yaws has been reported to resurge. This difference might be explained by better availability and accessibility of healthcare on Wallis and Futuna, thus allowing widespread use of antibiotics for bacterial disease.

## **Increased incidence of empyema in Polynesian children**

Naomi Wright, Philip Hammond, Philip Morreau, James Hamill

Empyema is a collection of pus/ infection within the pleural cavity, an area between the lung and chest wall. This study shows that there is a higher incidence of empyema within Polynesian children. We highlight that severity of empyema may be higher within this population requiring further investigation. We recommend a high level of suspicion for empyema and abscesses (collections of pus) within the lungs of Polynesian children with pneumonia to allow swift referral and institution of treatment in order to minimise complications and need for invasive surgery and optimise outcome.



## Higher rate of empyema disease in Māori and Pacific children

Brendon Bowkett

The paper by Wright et al<sup>1</sup> in this issue of the *NZMJ* should serve as another serious wake-up call for the serious and distressing health problems faced by New Zealand's children, especially Māori and Pacific. The study has clearly shown for the first time a much higher rate of empyema disease in Māori and Pacific children compared to other ethnic groups.

The high incidence of empyema, with long inpatient stays, places not only a severe and distressing burden on the child and its family but will often be associated with significant financial cost for the treating institution. The high incidence sits on an enormous background admission rate for pneumonia for New Zealand children.<sup>2</sup>

The entry of video-assisted thoroscopic techniques (VATS) for treating empyema in children is well established and provides a treatment modality with less postoperative pain or discomfort compared to open thoracotomy. The latter, as the authors point out, is required in only a few cases where it is felt that adequate removal of organised collections within the pleural cannot be achieved by VATS.

Safety and visibility of the operative fields in VATS has improved greatly in recent years with the introduction of high-definition digital technology. Another recent advance is the development of periscopic cameras that allow the surgeon to look well past an angle of 90 degrees. This will prove particularly useful in the thorax. Malleable instruments have also been developed to allow access to areas without the need of extra incisional ports.

Open thoracotomy can also be associated with late development of scoliosis which VATS alone can avoid.

Wright et al do not demonstrate the use of fibrinolytic infusion into the chest cavity (urokinase) but reference the point that some studies demonstrate excellent outcomes with this modality alone combined with a chest tube.

The placing of a chest tube in a child almost always requires a general anaesthetic and as these children are often very sick a skilled paediatric anaesthetist is required as well as intensive care backup. This means transfer to a paediatric surgical centre is important. It is true however that intensive care post surgery is seldom required.

Factors most associated with poor response are failure to use a sensitive antibiotic in the first instance with MRSA increasing in incidence and secondarily a missed intrapulmonary abscess. It is surprising that only two children in the study isolated MRSA strains for those with proven staphylococcal infection.

ESR NZ 2007 figures for DHB wide notifications showed a marked geographic variation for MRSA annualised incidence rates across New Zealand. In 2007, for example, the Counties Manukau region recorded 441.6 notifications per 100,000

persons by far the highest in the country at the time. The Auckland central region being close behind.<sup>3</sup>

In our own study of subcutaneous abscess admissions completed in 2001 at Wellington Children's Hospital we recorded an incidence of 7% isolates positive for methicillin resistance . Recent and mounting concerns of antibiotic resistance for many bacterial infections will no doubt place a serious block to treatment success in future.

Early and aggressive treatment of pneumonia is crucial to prevent empyema in children and access to free primary care 24 hours is essential to achieve this. There are still many areas in New Zealand where such access is limited, especially in the afterhours setting.

I believe high rates of incidence of empyema seen in Māori and Pacific children will not reduce until this problem is remedied . Parent education to present children for assessment early is also crucial.

**Competing interests:** None.

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## **Better be prepared than sorry: what should the New Zealand healthcare system learn from the 2009 Pacific Tsunami?**

Sultan Al-Shaqsi

### **Abstract**

On the early hours of the 29 September 2009, an earthquake in the Pacific generated a massive tsunami that caused significant destruction and claimed many lives across several Pacific nations. The disaster initiated an international relief operation from New Zealand (NZ), Australia, and the United States. The NZ healthcare response was adequate given the multiple challenges encountered. This article reviews the challenges faced by NZ healthcare responders to the Pacific Tsunami. Furthermore, it presents the lessons learnt from this operation in order to enhance the NZ healthcare system preparedness to respond to future disasters and mass emergencies nationally and internationally.

On 29 September 2009, at 06:48 am, the nations of the Pacific were awakened by a magnitude 8.1 earthquake on the Richter scale. Six minutes later, a tsunami hit the islands of Samoa, American Samoa and Tonga, causing significant destruction and loss of life.

In [Independent] Samoa, the tsunami damaged the South Coast of the main island of Upolu and the smaller island of Manono. The villages along the coastline in the South Western, South Eastern and the Southern part of Upolu were the most affected. This event was the most devastating disaster in the living memory of Samoa.

The Government of Samoa made a “Declaration of Disaster” which is the highest level of civil emergency Samoa recognises. The Samoan Ministry of Foreign Affairs initiated a formal request for assistance from the New Zealand and Australian Governments. New Zealand (NZ) immediately launched a governmental relief operation involving Ministry of Foreign Affairs and Trade, NZAid, Ministry of Health, Ministry of Civil Defence and Emergency Management, Ministry of Pacific Island Affairs, NZ Defence Force, NZ Police and NZ Customs.

This article presents the lessons learnt from the NZ health response to the 2009 Pacific Tsunami that can enhance the overall preparedness of NZ healthcare system. The main lessons revolve around the urgent need to establish NZ medical assistance teams, the importance of discreet and robust leadership and command during international emergency relief missions, and the need for preparedness in dealing with logistics and communication issues.

Finally, the article will draw on some recommendations that could greatly strengthen the level of NZ healthcare preparedness to respond to such events nationally and internationally.

## **Background**

The magnitude 8.1 earthquake created tsunami waves that caused significant damage and loss of life in Samoa, American Samoa and Tonga. The Pacific Tsunami Warning Centre (PTWC) issued a tsunami alert 16 minutes after the onset of the earthquake.<sup>1</sup> The PTWC recorded a 76 mm rise in water levels near the epicentre of the earthquake and NZ scientists later measured the tsunami waves to be 14 metres at their highest point next to the Samoan coast.<sup>2</sup>

The major destruction and loss of life occurred in Samoa where the tsunami struck the South Coast of the main island of Upolu and the smaller island of Manono. The villages located in the South Western, South Eastern and Southern parts of Upolu (1–2 hours drive from the capital Apia) were the most impacted. These areas are located 1-2 hours drive from the capital city of Apia. This event was the most devastating natural disaster in the living memory of Samoa.

In response to this event, the Government of Samoa declared a national disaster status and an international response from NZ and Australia was initiated.

### **Medical response to Pacific Tsunami 2009:**

The initial health response was provided by the Samoan Government, including the Ministry of Health and the National Health Service (NHS), Samoan Red Cross, and other agencies and organisations. Initially, personnel from Apia were immediately despatched to the devastated areas to provide first aid, conduct triage and assessment and to provide transportation. Severely injured victims were transferred to the Tupua Tamaesese Meaole (TTM) National Hospital and Medcen private clinic which are located in the less impacted capital city, Apia.

A retrospective study showed that the initial local first responders were not well prepared to deal with injuries resulting from the event due to lack of prior training(3). However, the reception of patients in Apia, prior to the arrival of overseas responders, was well managed with the set-up of a “Tsunami ward” with controlled access in the National hospital.

At the request of the Samoan Government for health assistance, the NZ Ministry of Health deployed an Emergency Management Advisor with the initial objective of identifying and assessing the immediate medical needs. He joined a team consisting of NZ Defence Forces environmental health officers, NZ Red Cross representatives and Ministry of Foreign Affairs and Trade representatives arriving on the morning of the 30<sup>th</sup> of September. Australian Medical Assistance Teams (Ausmat) arrived concurrently. They were followed the same day by 14 members of NZ Defence Force Light Medical Team.

Due to good cooperation and networks between the Ministry of Health in Wellington and the Department of Health and Aging in Canberra, Australia, in the aftermath of the Tsunami, Health coordination of the NZ and Australian response teams were immediately effective in collaborating with Samoan Ministry of Health and the National Health Service (NHS) personnel.

Combined teams from NZ, Australia and Samoa were deployed to conduct rapid assessment of worst-affected areas and mobile temporary clinics were established in

coastal and inland areas where victims had relocated. This collaborative initial approach proved to be invaluable to allow the local health authorities to assess its capabilities and reorganise its personnel.

The initial assessment deemed the existing capabilities of Samoan Health augmented by the Ausmats, NZ Health response team and foreign medical volunteers at that time to be adequate. However, medical issues were subsequently identified in areas such as:

- Trauma surgery.
- Wound nursing and care.
- Respiratory complications of near drowning.
- Logistics of medical evacuation of foreign patients.
- Extra need for environmental health expertise.
- Urgent support for primary and community-based health care services.
- Psychological and emotional support.

It was agreed with the Ausmat Leader, that the NZ response team would provide additional specialist health care during and after the progressive withdrawal of the Australian teams from Samoa ending on the 7 October 2009. The first group of NZ specialists arrived in Samoa on 2 October followed by a successive rotation of health care personnel.

The NZ specialists' rotations in Samoa continued until Sunday the 25 October 2009, when the medical assistance responsibility was transferred back to existing NZAid and Counties Manukau District Health Board which have well-established programmes and relationships with health services in Samoa.

Overall, 53 MoH, DHBs and Public Health Units personnel were deployed to Samoa as a part of the NZ government health response, with a peak of 33 staff on the ground between 8 and 10 of October 2009.

The NZ Government health response teams included the following specialities:

- Emergency planners
- Anaesthetists
- Plastic surgeons
- Postoperative nurses
- Emergency doctors
- Theatre nurses
- General nurses
- Public health officers
- Psychologists
- A Psychiatrist
- Health coordinators
- Orthopaedic surgeons
- General surgeons
- High dependency unit nurses
- Emergency nurses
- Wound care nurses
- General practitioners
- Outpatient physicians
- Infectious disease specialist
- Health Protection Officers

On 3 October, the Government of Samoa downgraded the state of emergency from "Declaration of Disaster" to a "Proclamation of Emergency". This was followed 2 days later by the shift in response from "relief and rescue" to "recovery and restore" phase.

On the afternoon of 7 October, two earthquakes struck the area again leading to tsunami warnings. However, these warnings were withdrawn 2 hours later.

According to figures from the United Nations, the Tsunami killed 150 people including 14 members from a single family. The Samoan Ministry of Health estimated that the event directly affected at least 5300 people, which is 43% of the total population in the affected areas. Furthermore, the financial cost is speculated to be around \$NZ 193 million equating to around 15% of the Gross Domestic Product (GDP) of Samoa.<sup>3</sup>

The impact and loss of life may have been higher if it was not for some education programmes and drills on how to respond in tsunami situations among school children.<sup>4</sup>

## **Lessons learnt**

**The need for NZ Medical Assistance Teams**—An important lesson learnt during the response is that NZ requires a Medical Assistance Team ready to be deployed at a short notice to such events. The Ministry of Health defines the NZ Medical Assistance Team (NZMAT) as a ‘multidisciplinary team of health practitioners and other health and supporting personnel with the necessary skills, qualifications and training to collaborate in a health emergency response in an affected area in NZ or overseas’.<sup>5</sup>

By definition, the team should be self sufficient and have the ability to deploy at short notice when a major incident or emergency occurs. Depending on the nature of the emergency, the team may include experts from a wide range of health areas such as public health, pre-hospital trauma, trauma, surgical, medical, environmental health, and mental health. The team should also incorporate administrative, logistics and communications support.<sup>5</sup>

Currently, NZ does not have such teams that could be deployed at a short notice to disaster stricken areas nationally or internationally. For the response to Samoa the lack of established medical response teams led the Ministry of Health to send a regional emergency advisor who was experienced in international relief operations, to identify the needs and medical assistance required in the initial stages of the Samoan response. This was appropriate given the lack of ready-to-go medical assessment and response teams in NZ.

Disasters are increasing in frequency and severity worldwide and it is inevitable that the NZ health care system will be called upon to respond to similar events in the pacific region or even nationally.<sup>6</sup>

The core objective of medical assistance teams is to provide prompt and life-saving medical care to victims of disasters by self-sufficient group(s) of medical personnel. The ideal medical assistance teams require members of the team to train and prepare together before being deployed. It is unrealistic to expect members of a team to work efficiently and effectively together if they have not done this. Moreover, it is counter-productive to formulate a medical response team on the day of the event with members from different disciplines meeting for the first time at the pre-deployment briefing session.

Therefore, it is essential to build the essence of teamwork and team approach ahead of events. This cannot be achieved without investment in medical assistance teams' preparedness and training during peace and non-disaster times.

NZ base their MATs on those of countries such as Israel, the United States, Japan, and in particular Australia, who all have a well-established medical assistance teams that have been proven to be useful in saving lives during international and national disasters. For example, the Israeli medical response teams were deployed and fully functional in Haiti 24 hours after the 2010, January earthquake.<sup>7</sup>

These teams have provided remarkable medical assistance services in many international disasters and serves as an example of a well-established and self-sufficient medical assistance teams that save lives.<sup>8,9</sup>

Internationally, there are two main general frameworks used to establish medical assistance teams.<sup>10-12</sup> The first approach is advocated by the International Federation of Red Cross and is based on utilising two teams; one is for rapid assessment followed by the second which is a needs-tailored team.

The role of the first team is to conduct an initial needs assessment and evaluate the requirements for the full deployment of a specialised medical team. Obviously, in this approach there are different specialised pre-established teams such as Medical and Surgical Emergency Response Team, Environmental Health Team, Infectious Control Team, Health Logistics Team, Search and Rescue Team. This approach allows the response to be tailored to the needs of the event and prevents unwarranted and unwanted assistance responses. However, there is a possible time delay between the assessment of needs and the actual delivery of assistance. Furthermore, the needs may change in this time period which is another drawback of this approach.<sup>12</sup>

This philosophy of assistance teams is widely adopted by most non-governmental organisations such as the International Federation of the Red Cross and Doctors Without Borders.

The second approach is to have a full comprehensive team that carry out both tasks of needs assessment and provision of urgent medical care. The team is composed of medical personnel (doctors, nurses, paramedics) and non-medicals (logisticians, fire-fighters, search and rescue). The Australian Medical Assistance Team is an example of this approach. The advantage of this strategy is that all the needs recognised during the initial assessment are addressed by the same team immediately. However, there is always the risk of duplication in services provided by the team and that some specialized assistance might not be required immediately or at all.

At present, there is no such team available in NZ. (The NZ Defence Force has a Light Medical Assistance Team that consists mainly of army medics, usually augmented by civilian doctors and surgeons.) The first step in establishing a NZ Medical Assistance Team would be to create a database of potential health care personnel who have the skills, experience, and attributes to be members of an assistance team.

A process of selecting, identifying, training and equipping health care personnel to form teams ready to be deployed with short notice for incidents in NZ and internationally are a pressing need. Research has shown that at least 32% of doctors, nurses, and paramedics in NZ have some experience in dealing with mass

emergencies which is a desirable attribute in formulating Medical Assistance Teams.<sup>13</sup> Establishing a database of health care providers will not be an easy task because of the high rates of turnover among the NZ medical workforce.<sup>14</sup>

In short, there is a pressing need to establish a scheme where a NZ Medical Assistance Team can be trained and funded to effectively respond to emergencies and mass casualty incidents in NZ and overseas.

**Leadership and co-ordination**—Leadership and coordination are key elements for the success of any MAT response. Experiences from international disasters have shown that disorganisation of response efforts is probably the single most hampering factor.<sup>15–18</sup>

Leadership and coordination is the single most important factor to establish order after a chaotic emergency. Emergencies by definition are chaotic situations and multiple agencies are usually involved in dealing with these chaotic events. Therefore, unless the efforts from all different agencies are coordinated, it is very likely that the overall response will be fragmented and ineffective. The most accepted approach to establish leadership and coordination is to follow the principles of a Incident Command Structure<sup>19,20</sup> which in NZ is called Coordinated Incident Management System (CIMS).<sup>21</sup>

During the NZ health response to the 2009 Pacific Tsunami, it was clear that the majority of NZ health care team, NZAid and MFAT members were not familiar with the incident command principles. A study has shown that 60% of NZ doctors, nurses, and paramedics are not aware of the existence of the Coordinated Incident Management System that is the fundamental to leadership and coordination of multi-agency response to an emergency.<sup>13</sup> This finding highlighted a training issue that is wider than just MAT preparedness.

Team leadership has to be robust and well-respected among all members of the team. The members cannot act outside the terms and objectives of the overall mission and must consult with the team leader before embarking on any task. During the Samoan response there was confusion when individual members of the health response teams, requested resources directly from NZ. Such spontaneous actions highlight the lack of prior training as mentioned above.

Members of the team cannot function individually and outside the established coordination structure. This ensures smooth coordination of different agencies aiming to achieve the same goals and objectives. It would also provide a line of responsibility and liability as a team rather than individual members. Therefore, it is imperative that all members must be trained in principles of command and control for an effective overall emergency response.

It is also critically important to have leadership, coordination and cooperation around the time of transitioning and ending the relief mission. This step is usually left until the end and is not well established in many international relief missions.<sup>22</sup> The coordination of the health care provision when the Ausmat teams left Samoa and handed over to the NZ team was smooth.

It is important to recognise the local health care system capacity before transition in discussion with local health services in order to be realistic about the level of care

capable of being delivered during the transition and following the exit phases of a mission. This is an integral aspect as it helps to obviate unsustainable expectations of the local population.

## **Personnel**

There was a high turnover rate of deployed personnel during the response period. Taking into account that such response missions can be exhaustive and demanding, longer deployment times would facilitate continuity in long-term planning, proper allocation of roles, cost reduction, and discourage “humanitarian and disaster tourism”.<sup>23</sup>

It was also obvious that many more health professionals from NZ and elsewhere appeared in the field as “self-volunteers”. This created confusion among responders and team leaders alike as to who was a volunteer and who was sent by the MOH or a DHB in NZ. The officially deployed personnel should not be labelled as volunteers and their equipment should distinguish them from self-volunteers who were managed and deployed under the umbrella of the Samoan MOH and NHS. The issue of self-volunteering in international emergencies is long debated and it is very detrimental to the overall response.<sup>24</sup>

## **Coordination, logistics and communication hurdles**

Planning and preparedness for emergencies is centralised around proper and flexible logistics. Like other international emergencies of similar magnitude, the early hours of the 2009 Pacific Tsunami were chaotic and led to uncoordinated outpouring of personnel and resources. For instance, ordering of supplies and equipment proved to be a daunting task as confusion occurred about what is available and what is needed urgently.

Prioritisation of the most urgent supplies needed was extremely difficult due to the lack of coordination in the initial stages of the response. This confusion led to individual responding agencies prioritising the need for urgent supplies differently and they went ahead with ordering the supplies directly from their contacts in NZ without prior consultation with the overall response leaders. Furthermore, the initial packed supplies were not well documented and detailed descriptions of contents of received packages were missing. This further delayed the custom clearance and caused difficulty in tracing orders.

The absence of logistic procedures complicated the despatch of items to appropriate field teams (i.e. surgical teams and mobile clinics). Although logistics in any emergency will be challenging and complex, pre-planned communication, documentation mechanisms and a single point of contact will mitigate some of the logistical hurdles encountered during the 2009 Pacific Tsunami response.

Coordination of response efforts requires the recognition by government officials of the special circumstances under which responding personnel operate. Hence, facilitate the processing of official requests faster for things which are time-sensitive such as evacuating victims and injured patients to other hospitals.

The decision-making process has to take into consideration the overall situation and the exceptional circumstances of such events. For example, among the victims of the

2009 tsunami were two individuals who were neither Australian nor NZ residents for whom their evacuation out of Samoa was delayed for a long time, as they required specific approval. Despite the fact that they eventually were evacuated with the other patients, the decision-making process was complex and based on political rather than humanitarian grounds.

Communication during the response to the 2009 Pacific Tsunami in Samoa was a struggle. International roaming service was not set up ahead of the deployment. Therefore, the initial reporting between the response leader in Samoa and the Ministry of Health National Health Coordination Centre (NHCC) in NZ was erratic and irregular and made through the satellite phone (SatPhone) until international roaming services were activated for the Team Leader.

In Samoa, key personnel deployed in the field were provided with local mobile phones with pre-paid cards provided by the NZ High Commission. However, there were issues with payment of pre-paid cards and tracing of mobile phones was difficult due to high turnover of team leaders and staff.

Internet access was problematic and non-existent other than in the capital city of Apia. The limited Internet and international phone line access highlighted the importance of having a self-sufficient responding team to avoid overloading the already stressed local structures while a disaster occurs. As for other pieces of equipment, it is particularly relevant to have a communication technology that adaptable and specifically designed for such deployments.

Another issue to discuss is that resources of funding for such international response missions are unclear. During the initial stages of the 2009 response, expenses were covered by personal credit cards as there was no other alternative provided. Later a source of “Temporary” funding for the response expenses was found. Accordingly, it is vital to have pre-planned and well-established funds ready to be utilised in such incidents.

### **Recommendations:**

- Creating a NZ Medical Assistance Team, selected, trained, equipped and self-sufficient to be deployed at a short notice to respond to national and international incidents.
- Personnel from all agencies with the potential to be called on to respond to an emergency must have regular training for command, leadership and coordination during emergency relief missions.
- Preparedness for logistics, communication and financial issues must take place ahead of any deployment and must be a regular objective to enhance emergency health preparedness in NZ.

### **Conclusion**

The overall NZ health response to the 2009 Pacific Tsunami achieved the objectives outlined in the action plans. The response was managed to an acceptable level taking into consideration that at the time of deployment there was neither pre-existing NZ Medical Assistance Team nor established robust procedures and policies in place to

outline the details of such emergency missions. This outcome can be attributed to a positive assistance response within the NZ Health sector, as well as improvisation, adaptation and commitment of individuals and organisations involved in Samoa.

**Competing interests:** None.

**Disclaimer:** The views and recommendations presented in this article are solely those of the author and do not necessarily represent the view of the Ministry of Health team members deployed to Samoa or Samoan health officials.

**Note:** The article was written before the devastating Canterbury, NZ Earthquakes (Sept 2010 and Feb 2011) and North-East Japan Earthquake and Tsunami (March 2011).

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**Acknowledgments:** This article is in remembrance of the wonderful souls whose lives were cut short by the power of nature. My thanks to all people (medical and non-medical) who devoted their time and efforts to help those in need during the event.

I also thank Gerard Clerc (NZ Health Response Leader, Samoa 2009) and Graeme McColl (NZ National Health Coordination Centre Response Manager during 2009 Pacific Tsunami) for sharing the lessons learnt from the 2009 Pacific Tsunami Response.

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## Communicable and non-communicable diseases in the Solomon Islands villages during recovery from a massive earthquake in April 2007

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### Abstract

**Aim** The major causes of mortality and morbidity have changed from infectious diseases and malnutrition conditions to non-communicable diseases (NCDs) in Melanesian societies. However, a massive earthquake and its related changes might have disturbed the patterns. This study aimed to explore which health problems were likely to be prevalent during the recovery process from the 2 April 2007 earthquake in the Solomon Islands.

**Methods** Participants were recruited in Titiana, a severely damaged village located near a town; Tapurai, a severely damaged remote village; Mondo, a severely damaged, medium urban village; and Olive, a control village. Health indicators measured were classified into communicable and nutritional conditions (malaria, malnutrition, infection status and child growth) and NCDs (overweight/obesity, hypertension and diabetes).

**Results** Titiana residents were more at risk of infectious conditions (C-reactive protein  $\geq 1$  mg/dL) and obesity (BMI  $\geq 30$  kg/m<sup>2</sup>). Tapurai and Mondo residents were at risks of infectious conditions and becoming overweight (BMI  $\geq 25$  kg/m<sup>2</sup>), respectively. Titiana and Mondo residents complained about insufficient subsistence production.

**Conclusion** The urban communities were found to be at risks of both communicable and NCDs. Controlling the urbanisation as well as providing continuous support against infectious conditions during the recovery process would be beneficial.

In the Solomon Islands, there was little clinical evidence of non-communicable diseases (NCDs) until the 1960s,<sup>1</sup> but research conducted in the 1980s revealed that a substantial portion of adults were classified as suffering from obesity, diabetes or hypertension.<sup>2</sup> On the other hand, mortality and morbidity by malaria, respiratory infections, diarrhoea and other infectious diseases, which had once been the main causes of deaths, have decreased due to improved hygienic conditions and health services.<sup>3,4</sup>

In 2002, deaths due to communicable, maternal, perinatal and nutritional conditions were 254.8 per 100,000 population, while those due to NCDs were 363.9.<sup>5</sup> Thus, although people are still under the double burden of both types of etiological diseases, the epidemiological transition has already been shifted toward higher prevalence of NCDs.

On 2 April 2007, at 7:40 local time, a massive earthquake (Richter magnitude 8.1), the epicentre of which was 10 km deep and 45 km south-southeast of Gizo (the provincial capital of the Western Province), struck the country (Figure 1).<sup>6,7</sup>

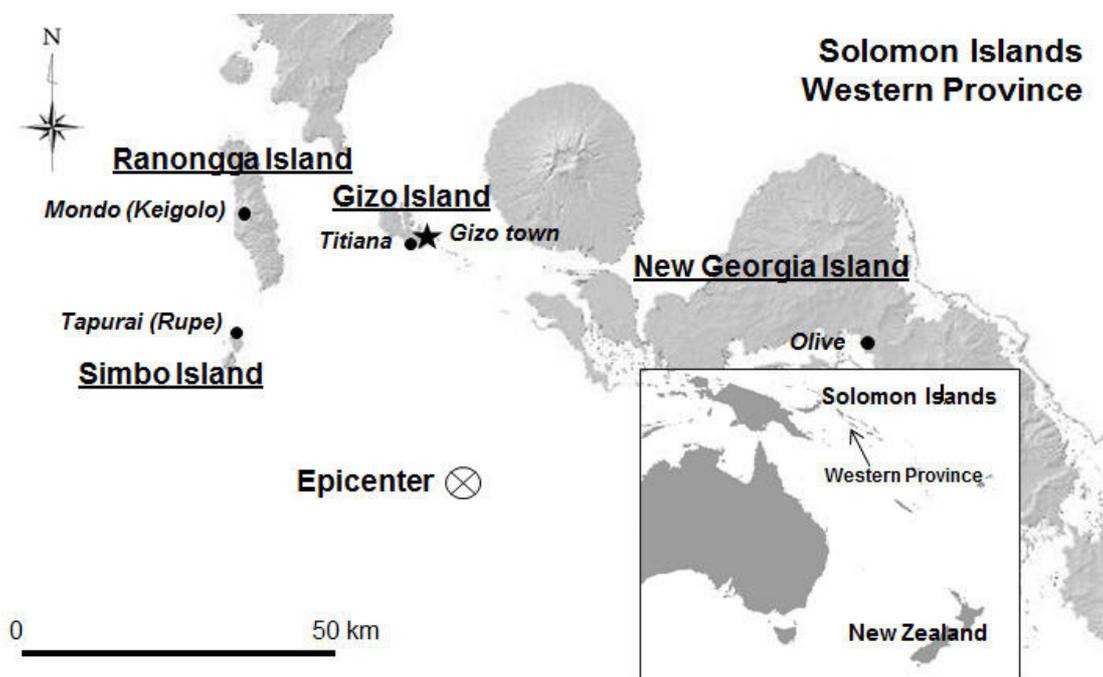
This earthquake and the related tsunami and landslides killed 52 people, wrecked 3150 houses and left behind an affected population of 24,059 in the Western and Choiseul Provinces.<sup>8</sup> The greatest damage was inflicted upon the residents of the town and neighbouring semi-urban villages in Gizo Island, followed by coastal fishermen and horticulturalists on several small islands.

In the devastated areas, people took refuge on mountain ridges, since houses and infrastructure, including water supply, hygiene and subsistence tools (e.g. fishing canoes and agricultural tools) were severely affected.<sup>9</sup>

National, international and non-governmental efforts delivered relief goods and sufficient food, and tried to control disease incidences.<sup>8,10-12</sup> While these efforts were successful in avoiding severe outbreaks of infectious diseases and shortage of food and drinking water, disease risks and dietary shortage remained an issue at the local level.

In addition, during this time, the population experienced a lifestyle change; some of the residents became increasingly dependent on imported foods and cash economy because subsistence economy and local food production were interrupted. Therefore, this disaster could potentially be related to risks of communicable and nutritional conditions as well as NCDs.

**Figure 1. Locations of epicentre and study villages in the Western Province, Solomon Islands**



This study aimed to explore the type of health and nutritional problems that were likely to be prevalent during the recovery process from the 2007 earthquake in the Solomon Islands. Special attention was paid upon the effects of levels of damages, recovery and urbanisation.

The research was conducted 2 years after the disaster. This time period was ideal to assess medium-term influences, since the adverse effects of the initial phase are usually treated by emergency relief operations. The effects remaining after withdrawal of intensive operations were little studied. A greater understanding of these effects is necessary for implementing or assessing long-term recovery action plans at the grass-root level.

## Methods

**Study area**—Out of 53 deaths caused by the disaster, 33, including at least 29 Micronesians, occurred on Gizo Island, followed by 11 on Simbo.

This study was conducted in August 2009 in the following four villages (Figure 1; Table 1) in the Western Province. Titiana village, where almost all houses were lost in the tsunami and all residents had evacuated to the top of a hill and built a camp; both original settlement and the camp were located at walking distances from the centre of the Gizo town (approximately 45 minutes on foot).

During the study period, a portion of households had returned to the original settlement, but the majority was still living in the camp. Tapurai village, in the remote Simbo Island, had also been totally destroyed by the tsunami. All residents, except only for a couple of households, were living in a new settlement in Rupe, where subsistence gardens were located before the disaster. Mondo village in Ranongga Island had lost about half of the settlement due to landslides.

The majority of the residents moved into an inner mountainous area and built a new settlement called Keigolo. Although this village was geographically remote from the town, the lifestyle was manifestly more modern than Tapurai, since it had been one of the biggest villages in the island before the disaster, and even after the disaster, it had received overseas aids for setting-up a clinic and rebuilding hygienic infrastructure.

Olive village in New Georgia Island was affected by the quake but the sea level increased only slightly and did not change the settlement.

**Table 1 Characteristics of the study villages**

Village	Titiana	Tapurai (Rupe)	Mondo (Keigolo)	Olive
Island	Gizo	Simbo	Ranongga	New Georgia
Major effects	Tsunami	Tsunami	Land slides	Sea level rise
Damage	Severe	Severe	Severe	Minimum
Population	366 <sup>†</sup>	234 <sup>†</sup>	341 <sup>†</sup>	365 <sup>a</sup>
No. of deaths (% population)	13 (3.6%) <sup>†</sup>	7 (3.0%) <sup>†</sup>	2 (0.6%) <sup>†</sup>	0 (0%) <sup>a</sup>
Recovery stage	Majority still live in campsite on a hill near the Gizo town*	Building a new settlement without new infrastructure*	Building a new settlement with new hygiene equipments in inner mountain*	Same*
Distance to the nearest town	1 km	38 km	34 km	32 km
No. of participants (% Female)				
Infants (<5 years)	49 (44.9%)	21 (33.3%)	23 (39.1%)	27 (37.0%)
Children (5–17 years)	81 (51.9%)	34 (58.8%)	52 (57.7%)	60 (40.0%)
Adult (18–49 years)	63 (77.8%)	53 (52.8%)	36 (77.8%)	36 (66.7%)
Elders (≥50 years)	17 (52.9%)	15 (60.0%)	24 (33.3%)	23 (52.2%)
Total	210 (58.1%)	123 (52.0%)	135 (55.6%)	146 (48.0%)
No. of participating households	61	34	30	35

<sup>a</sup>Source: The authors' field observations; \*At August 2009.

We therefore assumed that Titiana represented a village severely damaged and located near the town, Tapurai represented a severely damaged remote village, Mondo represented a severely damaged, medium urban village and Olive represented a control village.

It should be noted that almost all residents in Titiana were Micronesians who had migrated from the Gilbert Islands in 1960s,<sup>2</sup> while those in the remaining three villages were indigenous Melanesians.

**Participants and interview survey**—In each village, all residents were invited to participate in the study; measurements were made for three days in Titiana and two days in Tapurai, Mondo and Olive. All participants who, based on their free will, agreed and provided informed consent were included in the study; the consent was obtained from a parent or a legal guardian in case of children less than 18 years of age.

This study has been conducted in full accordance with the ethical principles of the World Medical Association Declaration of Helsinki (as amended by the 59th General Assembly in Seoul, 2008) and was approved by the University of Tokyo Ethics Committee, Japan, and the Solomon Islands National Health Research Ethics Committee.

Every participant, or a parent or legal guardian in case of children, was asked to report the date of birth, settlement place and housing type; birth records were referred to in case of children to calculate their exact age in months. Every adult was asked to report on his/her lifestyle by replying yes or no in the questionnaire.

**Health check-ups**—Body height was measured to the nearest 1 mm using a field anthropometer (TTM, Japan) and weight was recorded to the nearest 0.1 kg using a portable digital scale (Tanita model HD-654, Japan) according to a standard protocol.<sup>13</sup>

Height was measured only for participants of 5 years of age or older. Blood pressure of participants aged 18 years or older was measured using a blood pressure monitor (HEM-7051-HP, Omron, Japan); readings were obtained twice for every participant and averaged.

For malaria active case detection, thick and thin blood films were collected by the finger prick method. All slides were taken to the Malaria Department of the National Gizo Hospital to be examined under a microscope; each slide was checked by at least two technicians. Malaria detection was also made with a rapid detection test using the ICT Malaria Combo Cassette Test (ICT Diagnostics, South Africa) on site.

The blood obtained from the finger prick method was also used to measure haemoglobin A1c (HbA1c) and C-reactive protein (CRP) using NycoCard HbA1c (Axis Shield, Norway) and NycoCard CRP tests, respectively, and read using a NycoCard Reader II on site. HbA1c is a glycated haemoglobin that reflects plasma glucose concentration over the past two to three months and is an indicator of diabetes mellitus.<sup>14-16</sup> CRP is a component of acute innate immunity that increases in concentration in response to a range of pathogenic agents and inflammation.<sup>17,18</sup>

**Statistical analyses**—The health indicators measured in this study were conceptually classified into (i) communicable and nutritional conditions and (ii) NCDs. Indicators for communicable and nutritional conditions included malaria infection (positive or negative), adult malnutrition (BMI < 18.5 kg/m<sup>2</sup>), adult and child infection status (CRP ≥ 1.0 mg/dL),<sup>18</sup> child stunting (height-for-age z-score (HAZ) < -2), child underweight (weight-for-age z-score (WAZ) < -2) and child malnutrition (BMI-for-age z-score (BMIZ) < -2). Those for NCDs included adult overweight (BMI ≥ 25 kg/m<sup>2</sup>), obesity (BMI ≥ 30 kg/m<sup>2</sup>),<sup>19</sup> hypertension (SBP ≥ 140 mmHg and/or DBP ≥ 90 mmHg) and diabetes (HbA1c ≥ 6.5%).<sup>16</sup>

Standardisation of measures (i.e. z-score calculation) for children was performed based on the CDC/WHO 1978 growth curves recommended by the WHO using Epi Info version 3.5 software (Centers for Disease Control and Prevention, Atlanta, USA). Associations between the villages and the health or life level indicators were tested using Fisher's exact test.

Multiple logistic regression analyses were performed to detect the effects of villages, individual-level settlement and housing styles, age and gender on the health indicators; settlement was treated as an environmental factor, while ownership and style of housing as factors of socioeconomic status. In this study, a *P* value of less than 0.05 was considered to be statistically significant. All statistical analyses were performed using SAS 9.2 (SAS Institute, Cary, USA).

## Results

Almost all participants from Tapurai and Mondo villages lived in settlements that were established after the disaster (Table 2); the majority of Titiana participants lived in a camp, but the remaining had returned to the old settlement. As opposed to 16.4% of participants from Titiana, only 6.7% and 2.9% of participants from Tapurai and Mondo, respectively, still lived in tents or temporary houses.

Regarding subsistence activities, almost all households were engaged in horticulture (making traditional gardens) in Tapurai, Mondo and Olive villages compared to only 75.4% of the peri-urban Titiana village households. The proportion of Mondo households engaged in fishing was as low as that of households in the urban Titiana. The proportion of households having a running business and employment or remittance for cash income was high in Titiana and Olive.

**Table 2. Socioeconomic status of the participant households**

Village	Titiana	Tapurai (Rupe)	Mondo (Keigolo)	Olive
<b>No. of participating households</b>	61 (100%)	34 (100%)	30 (100%)	35 (100%)
<b>Settlement style</b>				
Living in old settlement	21 (34.4%)	1 (2.9%)	2 (6.7%)	100 (100%)
Living in temporary camp site	40 (65.6%)	–	–	–
Living in new settlement	–	33 (97.1%)	28 (93.3%)	–
<b>House ownership</b>				
Living in own house	59 (96.7%)	29 (85.3%)	26 (86.7%)	34 (97.1%)
Living in a relative/friend's house	2 (3.3%)	5 (14.7%)	4 (13.3%)	1 (2.9%)
<b>Housing style</b>				
Tent/temporary house	10 (16.4%)	0 (0%)	2 (6.7%)	1 (2.9%)
Leaf house/Western house	51 (83.6%)	34 (100%)	28 (93.3%)	34 (97.1%)
<b>Economic activities</b>				
Horticulture	46 (75.4%)	33 (97.1%)	30 (100%)	35 (100%)
Fishing	38 (62.3%)	32 (94.1%)	19 (63.3%)	34 (97.1%)
Business (store)	13 (21.3%)	2 (5.9%)	0 (0%)	7 (20.0%)
With employment/remittance	36 (59.0%)	15 (44.1%)	14 (46.7%)	25 (71.4%)

Regarding health indicators, microscopy analyses of blood films found only one *Plasmodium vivax*-positive case (Table 3). Malaria rapid detection test also rarely found positive cases: two *P. falciparum* cases and six *P. vivax* cases. In addition, adult malnutrition was very rare (ranged 0–2.5%) (Table 3).

Infection or inflammation condition measured by CRP was found in higher proportion in Titiana and Tapurai than in Mondo and Olive (Fisher's exact test  $P = 0.0179$ ). The prevalence was high among participants younger than 18 years old; the prevalence was 14.6% and 9.5% in Tapurai and Titiana, respectively, and only 2.7% and 5.8% in Mondo and Olive, respectively (*N.S.*). The proportion of children with low height-for-age  $z$ -score was the highest in Tapurai, followed by Mondo, Olive and Titiana ( $P < 0.0001$ ). Children with low weight-for-age  $z$ -score were less frequent in Titiana than in the other three villages without significant inter-village differences. Regardless of the prevalence of low body height and/or weight, low BMI-for-age  $z$ -score was rare (0%–5.8%).

**Table 3. Prevalence of communicable and nutrition diseases and non-communicable diseases (the number of participants examined are in parentheses)**

Variables	Titiana	Tapurai (Rupe)	Mondo (Keigolo)	Olive
<b>Communicable and nutritional conditions</b>				
Malaria microscope (all age groups) <sup>a</sup>	1 Pv (207)	Nil (123)	Nil (135)	Nil (146)
Malaria ICT (all age groups) <sup>a</sup>	1 Pv (207)	1 Pf, 1 Pv (123)	1 Pf, 1 Pv (135)	3 Pv (146)
Adult malnutrition (BMI < 18.5 kg/m <sup>2</sup> ; ≥18 years)	2.5% (80)	0% (68)	1.7% (60)	1.7% (59)
CRP ≥ 1.0 mg/dL (all age groups)	9.2% (207)	8.1% (123)	2.2% (135)	3.4% (146)
Child CRP ≥ 1.0 mg/dL (0–17 years)	9.5% (127)	14.6% (55)	2.7% (75)	5.8% (87)
Child height-for-age z-score < -2 (5–17 years) <sup>***</sup>	17.3% (81)	61.8% (34)	48.1% (52)	33.3% (60)
Child weight-for-age z-score < -2 (0–17 years)	8.5% (130)	14.3% (56)	20.0% (75)	14.9% (87)
Child BMI-for-age z-score < -2 (5–17 years)	2.5% (81)	0% (34)	5.8% (52)	1.7% (60)
<b>Non-communicable diseases</b>				
Adult overweight (BMI ≥ 25 kg/m <sup>2</sup> ; ≥18 years) <sup>***</sup>	62.5% (80)	39.7% (68)	51.7% (60)	23.7% (59)
Adult obesity (BMI ≥ 30 kg/m <sup>2</sup> ; ≥18 years) <sup>***</sup>	32.5% (80)	10.3% (68)	10.0% (60)	3.4% (59)
Adult hypertension (SBP ≥ 140 mmHg and/or DBP ≥ 90 mmHg; ≥18 years) <sup>***</sup>	12.7% (79)	7.4% (68)	45.8% (59)	11.9% (59)
Adult diabetes (HbA1c ≥ 6.5%; ≥18 years) <sup>*</sup>	8.9% (79)	0% (68)	1.7% (60)	1.7% (59)

<sup>a</sup>Pv: *Plasmodium vivax*, Pf: *P. falciparum*

\*  $P < 0.05$  \*\*\*  $P < 0.0001$ .

Also, as shown in Table 3, the prevalence of overweight adults was high with a large inter-village variation; the prevalence was highest in Titiana (62.5%), followed by Mondo (51.7%), Tapurai (39.7%) and Olive (23.7%) ( $P < 0.0001$ ). Obesity with BMI ≥ 30 kg/m<sup>2</sup> was also most frequently found in Titiana ( $P < 0.0001$ ). Hypertension was most prevalent in Mondo, followed by Titiana, Olive and Tapurai ( $P < 0.0001$ ). Diabetes was found in 8.9% of Titiana population, but was seldom observed in other villages (0%–1.7%) ( $P = 0.0156$ ).

Multiple logistic regression analyses were performed to identify the effects of villages and life-related factors on these health indicators (Table 4). Infectious or inflammation conditions were more prevalent in Titiana and Tapurai, whereas they were referenced as minimum damage in Olive village; children in Tapurai were also referenced at risk. At the individual level, younger participants and children who lived in the old settlement were at risk.

Tapurai children were likely to have low height for a given age. Adults in Titiana and Mondo villages were at risk for being overweight, but obesity was found only in Titiana and not in Mondo. Hypertension was more prevalent among the older residents and female gender; Mondo village was not at risk when these risk factors were controlled. House ownership and housing style were not related with NCDs.

It should be noted that no significant model was found when adult malnutrition, child low body weight and adult diabetes were used as dependent variables due to small numbers of positive cases.

**Table 4 Effects of community difference and living conditions on communicable and non-communicable health indicators in the devastated Western Solomon Islands communities; odds ratios (*P* value in italics) by logistic regression analyses**

Health indicator	Village (Olive as reference)			Age (months)	Gender (Male = 1; Female = 0)	Settlement (old = 1; others = 0)	House ownership (Own = 1; others = 0)	Housing style (tent/temporary = 1; others = 0)	Model Wald statistics <i>model P value</i> (N)
	Titiana	Tapurai (Rupe)	Mondo (Keigolo)						
<b>Communicable and nutritional conditions</b>									
CRP ≥ 1.0 mg/dL (all age groups)	4.31 [1.42:3.07] <i>0.0100</i>	5.89 [1.46:23.80] <i>0.0129</i>	1.48 [0.29:7.64] <i>NS</i>	0.998 [0.996:1.000] <i>0.0262</i>	1.33 [0.67:2.66] <i>NS</i>	2.36 [0.97:5.72] <i>NS</i>	0.85 [0.24:3.03] <i>NS</i>	1.01 [0.32:3.23] <i>NS</i>	18.94 <i>0.0152</i> (611)
Child CRP ≥ 1.0 mg/dL (0–17 years old)	2.62 [0.77:8.94] <i>NS</i>	9.44 [1.72:51.78] <i>0.0097</i>	1.59 [0.21:12.14] <i>NS</i>	0.98 [0.97:0.99] <i>0.0007</i>	1.38 [0.58:3.27] <i>NS</i>	3.60 [1.05:12.35] <i>0.0416</i>	0.95 [0.19:4.85] <i>NS</i>	1.09 [0.26:4.56] <i>NS</i>	21.69 <i>0.0055</i> (344)
Child low height (HAZ < -2; 5–17 years old)	0.53 [0.20:1.44] <i>NS</i>	4.18 [1.14:15.34] <i>0.0310</i>	2.48 [0.73:8.41] <i>NS</i>	1.00 [0.99:1.01] <i>NS</i>	0.81 [0.45:1.46] <i>NS</i>	1.41 [0.52:3.83] <i>NS</i>	1.03 [0.36:2.98] <i>NS</i>	0.65 [0.22:1.95] <i>NS</i>	24.32 <i>0.0020</i> (227)
<b>Non-communicable diseases</b>									
Adult overweight (BMI ≥ 25 kg/m <sup>2</sup> ; ≥18 years old)	5.45 [2.00:14.81] <i>0.0009</i>	2.56 [0.81:8.27] <i>NS</i>	3.60 [1.24:10.45] <i>0.0187</i>	1.001 [0.999:1.002] <i>NS</i>	0.31 [0.18:0.55] <i>&lt;0.0001</i>	0.96 [0.42:2.19] <i>NS</i>	1.06 [0.40:2.83] <i>NS</i>	1.15 [0.37:3.55] <i>NS</i>	34.28 <i>&lt;0.0001</i> (267)
Adult obesity (BMI ≥ 30 kg/m <sup>2</sup> ; ≥18 years old)	15.88 [2.91:86.63] <i>0.0014</i>	4.13 [0.61:28.03] <i>NS</i>	3.04 [0.47:19.53] <i>NS</i>	1.002 [1.000:1.002] <i>NS</i>	0.50 [0.22:1.139] <i>NS</i>	0.92 [0.35:2.44] <i>NS</i>	1.32 [0.28:6.35] <i>NS</i>	0.87 [0.25:3.06] <i>NS</i>	26.18 <i>&lt;0.0001</i> (267)
Adult hypertension (SBP ≥ 140 mmHg and/or DBP ≥ 90 mmHg; ≥18 years old)	0.99 [0.17:5.77] <i>NS</i>	0.53 [0.07:3.79] <i>NS</i>	5.08 [0.92:28.23] <i>NS</i>	1.01 [1.01:1.01] <i>&lt;0.0001</i>	0.21 [0.08:0.55] <i>0.0014</i>	0.39 [0.09:1.61] <i>NS</i>	1.42 [0.29:7.02] <i>NS</i>	0.61 [0.10:3.58] <i>NS</i>	52.43 <i>&lt;0.0001</i> (265)

**Note:** Logistic regression models for adult malnutrition (BMI < 18.5 kg/m<sup>2</sup>; ≥18 years old), child low body weight (WAZ < -2.0; 0–17 years old), low child BMI (BMIZ < -2; 5–17 years old), and adult diabetes (HbA1c > 6.5%; ≥18 years old) are shown since no matching model were detected at the model *P* value < 0.05.

As shown in Table 5, a majority of residents (63.8%–78.7%) complained about their cash income. Compared to the Titiana and Mondo residents, the majority of Olive and Tapurai residents were satisfied with productions from horticulture (88.1% and 94.2%, respectively) and fishing (94.9% and 94.2%) ( $P < 0.0001$ ).

**Table 5. Adult participants' perceptions of their standard of living**

Questions	Answers	Percentage of the adult participants			
		Titiana	Tapurai (Rupe)	Mondo (Keigolo)	Olive
Do you have enough money to meet your needs?	Yes	32.1	31.9	21.3	36.2
	No	67.9	68.1	78.7	63.8
Do you have enough foods from gardens?***	Yes	50.0	94.2	77.1	88.1
	Unsure	0	1.5	0	0
	No	50.0	4.4	22.9	11.9
Do you have enough foods from fishing?***	Yes	44.6	94.2	45.9	94.9
	Unsure	1.2	1.5	0	0
	No	54.2	4.4	54.1	5.1

\*\*\*: Fisher's exact test  $P < 0.0001$

## Discussion

This study examined the prevalence and risks of communicable diseases and NCDs in Solomon Islands villages where fishermen and horticulturists as well as urban dwellers experienced environmental changes, i.e. a massive earthquake, and related socioeconomic changes. This is also one of the few studies which report NCD prevalence in rural Melanesian societies.

A limitation of this study was that our data were available only for cross sectional analysis, and thus, the direct effects of disaster and relevant effects of the recovery could not be distinguished from the progress of socioeconomic conditions. However, the inter-village differences found in this study are adequate to interpret ecological and socioeconomic effects related to the disaster and urbanisation.

Since previous studies from Melanesia have suggested that obesity, hypertension and diabetes were increasing in urban areas,<sup>2,20-22</sup> it is likely that the urbanised lifestyle in Titiana is related with the high prevalence of obesity and diabetes; although there was a potential confounding factor that Titiana people had a different ethnicity (Micronesian) from other three villages.

High prevalence of overweight people in Mondo was thought to reflect a progress of urbanisation in remote areas; Mondo was more affected by modernisation than Tapurai and Olive before the disaster and had received more aid. Another potential factor was that they were not frequently engaged in fishing since they were now settled in inner and mountainous area; this lifestyle might have decreased their physical activities and energy expenditure.

From the viewpoint of other life factors, Tapurai and Olive residents had sufficient local food production (garden crops and fishes), while Titiana and Mondo residents did not. It is interesting to note that NCD prevalence was low in the former two villages, suggesting that lifestyles with sufficient local production, subsistence and physical activities could have decreased NCD risks. This suggestion is partly supported by a previous finding that abundance and availability of natural resources, e.g. fishes, were directly related with health status in this area.<sup>23</sup>

From the longitudinal viewpoint, our previous study reported that obesity (BMI  $\geq$  30 kg/m<sup>2</sup>) prevalence was 2.4%, 18.6% and 30.1% in rural Melanesian, urban Melanesian and peri-urban Micronesian villages, respectively, in 2004 in the Western Province.<sup>24</sup> The obesity prevalence was 10.0% and 10.3% in Mondo and Tapurai, respectively, suggesting that the risk for rural residents might have gradually increased.

Child body weight is an indicator for short-term sufficiency of food, while child body height (e.g. stunting) reflects a chronic effect of nutrition and infectious conditions. Since body height of Tapurai children was lower than that of children from other villages, although body weight did not differ, it is possible that children in Tapurai might have experienced chronic malnutrition or infectious risks.

Since Tapurai residents, especially children, had high CRP values, while they admitted that they had sufficient subsistence production, it is reasonable to hypothesise that they were living under a risk of chronic infection by pathogens. Note that although a chronic ulceration secondary to diabetes is a possible confounding factor to the increased CRP value, diabetes prevalence was quite low in the study villages.

Health statistics have suggested that malaria prevalence in the Western Province had decreased from a peak of 506 patients per 1,000 population per year in 1994 to 58 patients in 2005; although a mass administrative survey was conducted soon after the disaster in 2007, only 78.5 patients per 1000 population were found to be positive for malaria (Malaria Department, National Gizo Hospital, personal communication). However, our results suggested that even if outbreaks of malaria and other major infectious diseases were avoided, minor infectious risks remained in some rural villages.

Interestingly, Titiana residents who bear the risks of NCDs also bear risk factors of infectious conditions. Epidemiological transition theory have usually assumed that NCDs increase as urbanisation progresses while replacing infectious diseases,<sup>25</sup> but our findings suggest that urban people experienced both kinds of diseases. In fact, a previous study reported that 12 out of 14 drinking water samples from Titiana were contaminated with *E. coli*.<sup>9</sup> Thus, public health concern should be focused on in urban areas as well.

The data demonstrating that children living in households in the new settlements had a lower risk of having a high CRP value is thought to reflect a delay in constructing improved hygienic living conditions in old settlements.

Previous public health research on the disaster have suggested that large natural disasters are usually followed by increased incidences of complex injuries and

outbreaks of infectious diseases in victims within a short-term period.<sup>26-28</sup> Therefore, priority has been given to the prevention of health disaster.<sup>29</sup>

In the case of the Western Solomon Islands, appropriate relief and aids were successful enough to interrupt the infectious outbreaks in the initial stage of the disaster. However, public health risks remained after two years.

On the other hand, NCDs have been reported to be increasing in the Pacific societies,<sup>30</sup> and were found at a high frequency in the devastated areas. Controlling the NCDs during recovery operations will efficiently improve the health status.

Since massive earthquakes continue to occur in the Pacific—e.g. 1998 Papua New Guinea Earthquake; 2009 Samoa Earthquake and Tsunami; January 2010 M7.2 and M6.9 Earthquakes in the Western Solomon Islands; 2010/2011 M7.1 and M6.3 Earthquakes in Canterbury, New Zealand; and March 2011 M9.0 Tōhoku Earthquake and Tsunami in Japan—the data reported in this study will be useful for implementing appropriate recovery actions.

Recommendations resulting from this study are

- Recovery of local subsistence;
- Minimising urbanisation of lifestyle and dietary habit; and
- Long-term follow-up of and support for hygienic and nutritional conditions in both urban and remote villages.

**Competing interests:** None.

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**Acknowledgements:** The Ministry of Education, Culture, Sports, Science and Technology (MEXT) of Japan (KAKENHI Grant-in-Aid) and United States National Science Foundation (NSF) financially supported this study. We are also grateful to the staff members of the Ministry of Health and Medical Services of the Solomon Islands, in particular Ms Josephine Watoto and Ms Connie Panisi. Lastly our sincere thanks to all the people of the villages studied.

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## Yaws in Polynesia's Wallis and Futuna Islands: a seroprevalence survey

Gilles Guerrier, Sandrine Marcon, Laure Garnotel, Roger Deltour, Stéphane Schinas, Jean Pierre Mathelin, Chantal Chouvin, Olivier Metge, Jean Marc Daronat

### Abstract

We carried out a serological and clinical survey to determine the prevalence and clinical presentation of yaws on two twin islands in Polynesia: Wallis and Futuna. A total of 264 serum samples were tested for specific *Treponema pallidum* haemagglutinations assay and non-specific rapid plasma reagin: 52 were positive for one or both tests; only one young adult had skin lesion consistent with yaws; and there were no observed cases of secondary or tertiary yaws.

Our results contrast with findings in neighbouring islands, such as Vanuatu, where yaws has been reported to resurge. This difference might be explained by better availability and accessibility of healthcare on Wallis and Futuna, thus allowing widespread use of antibiotics for other bacterial diseases.

Yaws is a non-venereal infection caused by the spirochaete *Treponema pallidum* subspecies *pertenue*. The disease affects populations living in warm and humid subtropical countries, especially children under 15 years, with a peak incidence in the 6 to 10-year-old age range. Direct skin-to-skin contact with exudative lesions is the main route of transmission, together with breaks in the skin caused by injuries, bites, or excoriations.<sup>1</sup>

Clinical manifestations occur in three distinct phases. The primary stage is characterised by a papular “raspberry-like” lesion, developed after 3 to 4 weeks of incubation at the *Treponema* inoculation site and ulcerates. This painless cutaneous ulcer may last 3 to 6 months before healing spontaneously. Secondary yaws are smaller skin lesions that teem with widespread disseminated treponemes. At the late stage, bone, cartilage, and soft tissue destruction may occur, leading to irreversible disabling or disfiguration.

Despite strong reduction in geographic extension due to past eradication campaigns targeting treponemal diseases organised by World Health Organization (WHO) during the 1950s, yaws has been reported to be re-emerging in Pacific islands, including Vanuatu<sup>2</sup> and Solomon Islands.<sup>3</sup>

To assess yaws prevalence on similar islands, a seroprevalence survey was carried out on Wallis and Futuna, one of France's three Pacific Island groups, located about 600 km North-East of Fiji.

### Methods

A clinical and serological survey was conducted from 1–30 August 2010 among patients attending four outpatient clinics and one hospital serving population on both islands.

Wallis has 9207 inhabitants scattered in three districts, each having an outpatients clinic while 4238 inhabitants live on Futuna served by a single clinic.<sup>4</sup> Included patients agreed with giving additional samples to perform treponemal serology in addition to regular blood analysis they required. Presence of cutaneous or osteo-articular lesions was recorded, as well as trips in endemic areas, such as Vanuatu or Solomon Islands.

All participants gave oral informed consent to participate in the study, after methods and objectives were extensively explained in local language by a native speaker health worker. Oral consent was notified in patient's notes. This procedure was approved by the institutional review board. For children, consent was obtained from a parent or a guardian. No incentives were offered to study participants and no names were recorded. The study protocol was approved by the Wallisian Ministry of Health.

## Results

A total of 264 serum samples were tested for specific *Treponema pallidum* Hemagglutinations Assay (TPHA; Biomérieux, Marcy l'Etoile, France) and non-specific Rapid Plasma Reagin (RPR; Fujirebio, Tokyo, Japan) according to the manufacturer's recommendations. Among 222 samples coming from Wallis and 42 from Futuna, 52 (20%) were positive for one or both tests. All positive patients but two were born before 1960 (Table 1).

**Table 1. Seroprevalence *Treponema pallidum* haemagglutinations assay (TPHA; specific) and rapid plasma reagin (RPR; non-specific) by age group**

Variables	≤15 years n=46 (%)	15–50 years n=83 (%)	≥50 years n=135 (%)
TPHA (+) VDRL(-)	1(2)	1(1)	18(13)
TPHA (+) VDRL (+)	0	0	27(20)
TPHA (-) VDRL (+)	0	0	5(4)
TPHA (-) VDRL (-)	45(98)	82(99)	85(63)

Among those aged 50 or under, one had consistent serology and compatible lesions with primary yaws without any relevant journeys in endemic areas. No case of tertiary yaws has been detected. Patients never travelled in other endemic areas with the exception of two job-seekers, who spent respectively 5 and 10 years in Vanuatu during their twenties.

## Discussion

Fifty-year-old plus people were positive for treponemal serology without any symptoms, compatible with serological scarring after healed infections. Past infections had been contracted on Wallis or Futuna, since most subjects did not move to areas with current yaws high endemicity.

The survey demonstrates that yaws was likely to have been a public health problem in the past. Indeed, this finding is consistent with seroprevalence surveys performed during eradication campaigns conducted in the Pacific area over the 1950s.<sup>5</sup> Since no data after intervention are available in Wallis and Futuna—where yaws is not a recorded condition in clinic statistics—our study provides interesting result on yaws prevalence.

A very low prevalence of non-venereal treponemal disease was found among young age groups. Our result contrasts with findings in Vanuatu, where difficult to diagnose clinically forms of attenuated yaws have resurged. This difference might be explained by the better availability and accessibility of healthcare on Wallis and Futuna, thus allowing widespread use of antibiotics for any infectious disease.

Serological tests cannot distinguish *Treponema pallidum* subspecies. Therefore, positive TPHA may reveal past syphilis infection, possibly lately treated in cases where VDRL is also positive. However, high prevalence of yaws in the region during the 1930s<sup>6</sup> indicates that serological profiles found in our survey are suggestive of non-venereal treponemal disease. Finally, rare cases of positive VDRL with negative TPHA may reflect false positive due to non-treponemal infections or systemic diseases.

This study was designed to assess the prevalence of present or past yaws on Wallis and Futuna. Due to time and financial constraints, study design focused on people presenting to clinics. This may explain why younger age groups are under-represented. Failure to randomise subjects is the major limitation of this survey.

Yaws was less likely in people able and willing to access health care. However, people live in close proximity to clinics and health facilities provide free care. In addition, included patients were roughly evenly distributed among different districts, limiting a potential selection bias. Nevertheless, a study concentrating on randomly selected 5 to 15-year-old children should be performed to definitely refute resurgence of yaws in Wallis and Futuna.

**Competing interests:** None.

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## Increased incidence of empyema in Polynesian children

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### Abstract

**Aim** The aim of this study was to review the epidemiology, treatment and outcome of surgically managed empyema in children.

**Method** A retrospective review was undertaken of all surgically managed empyema at Starship Children's Hospital (Auckland, New Zealand) from 1 July 2003 to 30 June 2008.

**Results** Of the 93 children diagnosed with empyema, 62 were managed surgically (55 VATS, 7 thoracotomy) and 31 with tube thoracostomy alone. 71% were of Māori or Pacific ethnicity despite making up just 30% of the New Zealand paediatric population ( $p < 0.0001$ ). Median duration of chest drainage following VATS was 3 days and postoperative hospital stay 14 days. There was a 5% conversion of VATS to thoracotomy. The VATS complication rate was 16%: one intraoperative cardiorespiratory arrest following rupture of an intrapulmonary abscess into the bronchial tree, two contralateral empyema, one recurrent empyema, four air leaks and a wound infection.

**Conclusion** For the first time increased incidence of empyema in the Polynesian population has been documented. Severity of empyema may be higher within the Polynesian population affecting treatment outcome.

Empyema in childhood causes significant morbidity and may be increasing in frequency.<sup>1,2</sup> Empyema is classified into three stages:

- (1) An early exudative stage,
- (2) An intermediate fibrinopurulent stage, and
- (3) A late organising stage.

The majority of cases present in the exudative stage and can be effectively managed with tube thoracostomy. Stage 3 empyema often requires open debridement of infective loculations to prevent lung restriction.

The optimal management of fibrinopurulent empyema remains under debate. Two recent randomised controlled trials comparing fibrinolysis with video-assisted thoracoscopic surgery (VATS) in children have shown no significant difference in clinical outcome or length of postoperative hospital stay, but reduced treatment costs with fibrinolysis.<sup>3,4</sup> Several series demonstrate that surgery can be safely avoided in approximately 80–90% of paediatric empyema patients with the use of fibrinolytics.<sup>1,3</sup>

The British Thoracic Society recommends fibrinolysis as first line therapy for empyema.<sup>1</sup> However, Bishay et al recently suggested that the failure rates for VATS can be considerably lower than for fibrinolysis if undertaken at a centre with high levels of thoracoscopic surgical experience.<sup>5</sup>

VATS is minimally invasive and can be undertaken whilst the child is under general anaesthesia for the chest drain, thus allowing early and effective drainage.<sup>6-8</sup>

Starship Children's Hospital (SSH) in Auckland, New Zealand, is a tertiary-referral centre for paediatric surgery. VATS was introduced in 2003 for the primary treatment of fibrinopurulent empyema. The aim of this study is to review the epidemiology, treatment and outcome of surgically-managed empyema in our first 5 years of VATS.

## Methods

**Study design**—A retrospective case-note review was undertaken of all surgically-managed empyemas at SSH over the 5 year period between 1 July 2003 and 30 June 2008. All children (<15 years) who had a diagnosis of empyema on hospital discharge coding data and had undergone surgical management were included in the study.

Surgical intervention (VATS or thoracotomy) was determined from examination of the medical records. Patient demographics, mode of presentation, investigations, timing of illness onset to presentation, surgical intervention, and discharge, duration of chest drainage and complications were recorded. No cases were excluded.

**Statistical analysis**—Differences between the ethnic distribution in our study and the New Zealand paediatric population were assessed using a goodness of fit test. Differences in surgical timing and chest drainage between those treated by VATS and thoracotomy were assessed using a Wilcoxon 2 sample test.

**Surgical technique**—Surgery was undertaken by three surgeons at SSH. The precise technique for VATS varied according to surgeon preference. Single lung ventilation with a bronchial blocker or double lumen tube was employed in a minority of cases but with increasing frequency later in the series.

With the patient in the lateral position and the affected hemithorax uppermost, two or three 5 mm ports are placed and carbon dioxide pneumothorax established at 3–5 mmHg. Loculations are lysed, fibrinous peel removed and the thoracic cavity irrigated. One or two chest tubes are left *in situ* and removed on the ward when drainage minimal.

## Results

Of 93 children with empyema 62, comprising the study population, were managed surgically (55 VATS, 7 thoracotomy) and 31 with tube thoracostomy alone. No children were managed with fibrinolysis. Of those treated by VATS, 45 (82%) underwent primary VATS and 10 (18%) underwent VATS following prior chest drain insertion. Demographics are listed in Table 1.

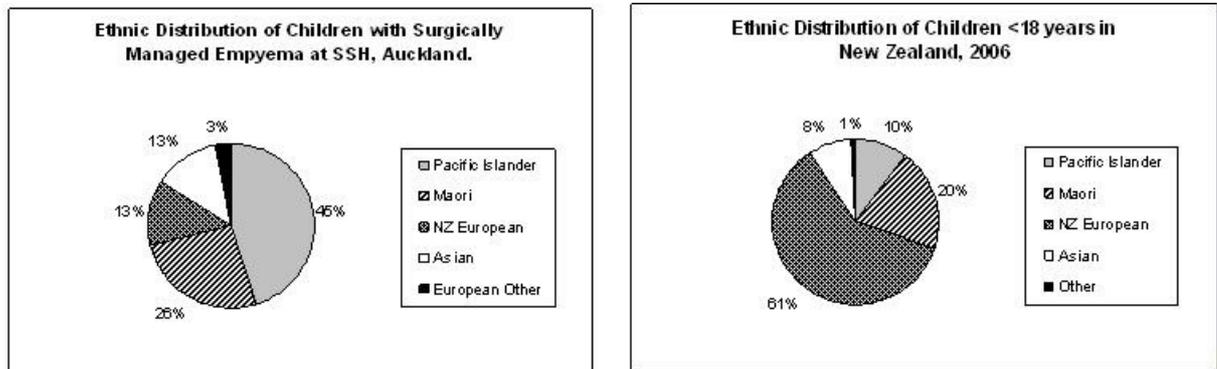
**Table 1. Patient characteristics**

Variables	VATS* (N=55)	Thoracotomy (N=7)
Mean age in months (range)	38 (4–154)	57 (14–175)
Gender, M:F	27:28	5:2
<b>Ethnicity</b>		
Pacific†	23	5
Māori	16	0
NZ European	6	2
Asian	8	0
Other	2	0

\*Video-assisted thoracoscopic surgery; †Mostly of Samoan, Tongan, Niuean, or Cook Islands origin.

Children of Pacific and Māori ethnic origin were over-represented compared to their proportion of the New Zealand paediatric population,  $p < 0.0001$  (Figure 1).<sup>9</sup>

**Figure 1. Ethnic distribution of the study population and New Zealand paediatric population<sup>9</sup>**



The Auckland 2006 Census showed a similar ethnic distribution: 14% Pacific Peoples, 11% Māori, 56% European, 19% Asian, 1% other.<sup>10</sup>

**Radiological investigations**—54 (87%) were investigated with ultrasonography (US) and 37 (60%) underwent chest computed tomography (CT). All children had either US or CT.

**Microbiology (Table 2)**—53 (85%) had a blood culture performed. Of these, 19 (36%) had a positive result. All 62 children had a pleural aspirate performed for culture. Of these 25 (40%) resulted in positive culture.

**Table 2. Microbiological isolates**

Isolates	VATS Total (N=55)	VATS Polynesian Population (N=39)	Thoracotomy Total (N=7)	Thoracotomy Polynesian Population (N=5)
<i>S. aureus</i>	19	13	3	1
<i>S. pneumonia</i>	12	13	1	1
<i>S. pyogenes</i>	6	3	1	1
MRSA	2	2	0	0
<i>Candida albicans</i>	1	1	0	0
<i>Serratia marcescens</i>	1	0	0	0
No isolate	14	7	2	2

MRSA: methicillin-resistant *Staphylococcus aureus*.

**Clinical presentation (Table 3)**—24 (39%) of patients presented directly to SSH. 38 patients (61%) were transferred to SSH from another hospital; 36 patients from 13 hospitals across the North Island, 1 from the South Island and 1 from a Polynesian Island.

Patients requiring a thoracotomy (43% of which were converted from VATS) had a significantly longer time from presentation at primary hospital to surgery than those treated with VATS (median 17 and 6 days respectively,  $p=0.007$ ). 10 patients (16%) had intrapulmonary abscesses (7 were Polynesian) and 7 patients (11%) had multi-organ sepsis (5 were Polynesian).

**Table 3. Clinical presentation (expressed in median, range)**

Clinical presentation	VATS Total (N=55)	VATS Polynesian Population (N=39)	Thoracotomy Total (N=7)	Thoracotomy Polynesian Population (N=5)
Aetiology:				
Pneumonia	55	39	6	4
Costal osteomyelitis	0	0	1	1
Symptom onset to presentation, days	5 (0–28)	5 (0–21)	4 (0–28)	4 (0–7)
Initial presentation to surgery, days	6 (0–28) *	6 (0–28)	17 (3–43) *	17 (7–43)
Interhospital transfer, N (%)	33 (60%)	25 (64%)	5 (71%)	3 (60%)
Duration in primary hospital, days †	3 (0–21)	2 (0–21)	4 (1–23)	4 (1–23)
Arrival at SSH to surgery, days †	2 (0–20)	3 (0–20)	7 (0–17)	9 (0–17)

\*  $p<0.01$  †For transferred patients.

**Outcome (Table 4)**—None of the patients who underwent VATS required a repeat procedure. 3 of those treated by thoracotomy initially underwent VATS but required conversion to an open procedure to allow adequate debridement of infective loculations (5% conversion to thoracotomy). Of those treated by VATS the chest drains remained in situ postoperatively for a median of 3 days.

The total length of hospital stay was significantly longer in those who underwent thoracotomy (34 days) compared to VATS (19 days) ( $p=0.007$ ). 10 children required PICU admission postoperatively and 1 preoperatively (8 of these were Polynesian).

**Table 4. Outcome (expressed in median, range)**

Outcome	VATS Total (N=55)	VATS Polynesian Population (N=39)	Thoracotomy Total (N=7)	Thoracotomy Polynesian Population (N=5)
Surgery to chest drain removal, days	3 (1–11) †	3 (1–11) ‡	4 (2–7)	3 (2–6)
Surgery to discharge, days	14 (2–43) ‡	13 (2–43) ‡	25 (9–76)	22 (9–76)
Total length of hospital stay (SSH), days	19 (6–48)* ‡	19.5 (8–48) * ‡	34 (17–119) *	35 (25–119) *
PICU admission, n (%)	9 (16%)	6 (15%); 1 preoperatively	2 (29%)	1 (20%)
PICU days, median (range)	4 (1–12)	6.5 (2–12)	5 (2–8)	8

PICU, Paediatric Intensive Care Unit; \*  $p<0.01$ ; † Two cases not documented. ‡ One case not documented.

**Complications (Table 5)**—Complications occurred in 16%. One intraoperative complication occurred. A 14-year-old Māori boy with pre-existing severe bronchiectasis presented with empyema and an intrapulmonary abscess on the right side (figure 2). Whilst on the operating table immediately following an uneventful VATS drainage (without single lung ventilation) he developed cardiorespiratory arrest. Copious pus was suctioned from the endotracheal tube suggesting rupture of the intrapulmonary abscess into the bronchial tree. Septic shock ensued requiring 10 days of ventilatory support in PICU and 33 days inpatient treatment postoperatively.

**Table 5. Complications**

Variables	VATS Total (N=55)	VATS Polynesian Population (N=39)	Thoracotomy Total (N=7)	Thoracotomy Polynesian Population (N=5)
Intraoperative cardiorespiratory arrest	1	1	0	0
Recurrent empyema (fungal infection)	1	1	0	0
Contralateral empyema *	2	2	0	0
Persisting pneumothorax, including one tension pneumothorax, requiring further chest drain insertion (one secondary to necrotic right middle lobe)	4	2	1	1
Wound infection	0	0	1	1

\* In these cases there was no clinical or radiological evidence of contralateral empyema prior to VATS. It may be that infective secretions can be aspirated into the healthy lung by postural drainage intraoperatively when a bronchial blocker is not employed. However, we recognise these cases could reflect extent of disease rather than a complication.

**Figure 2. Radiograph and CT scan of empyema with intrapulmonary abscess in a patient with bronchiectasis.**



## Discussion

**Incidence**—Empyema is a significant source of childhood morbidity and accounts for approximately 1/1000 paediatric admissions to SSH. This is consistent with previous

reports of empyema incidence, ranging from 0.4–6/1000 paediatric admissions, and highlights the importance of an optimal management strategy for this patient population.<sup>11</sup>

**Susceptibility to infection**—Children of Māori or Pacific ethnicity represented 71% of children with empyema despite making up just 30% of the NZ paediatric population ( $p < 0.0001$ ).<sup>9</sup> There is evidence to suggest that children of Māori and Pacific ethnicity have an increased susceptibility to and severity of certain infections with increased hospitalisation rates for pneumonia compared to children of European descent and more severe pneumonia within hospitalised populations with higher respiratory rates, heart rates, oxygen and intravenous antibiotic requirements and an elevated relative risk for invasive disease and *Staphylococcus aureus* bacteraemia.<sup>12-15</sup>

Possible reasons include genetic factors, for which specific genes have been identified, and lower socioeconomic status associated with increased smoking rates, overcrowding, micronutrient deficiency (with associated immunodeficiency), delayed presentation and reduced access to medical services.<sup>12,16,17</sup>

Investigators elsewhere have shown that indigenous people worldwide have increased rates of pneumococcal disease compared to others within the same geographical region, including North American Indians, Alaskan and Greenland natives and Australian Aborigines.<sup>18-21</sup>

**Severity of disease**—Despite equal or shorter durations of symptom onset to presentation, time to surgical intervention and chest drainage, Bishay et al, Sonnappa et al and St.Peter et al document considerably shorter median postoperative hospital stays following VATS of 6–7 days compared to 14 days in this study.<sup>4-6</sup>

Chen et al document a similar median time from diagnosis to VATS as this study, but also a similar postoperative length of hospital stay of 13 days.<sup>22</sup> In the latter study there was a high severity of infection indicated by 36.5% of patients having necrotising pneumonia, which they showed through multivariate analyses to be associated with a significantly higher complication rate and postoperative length of stay.

In our study 16% had intrapulmonary abscesses, 11% multi-organ sepsis and 18% required PICU care. There was a high complication rate of 16%, including one life-threatening complication and others requiring further tube thoracostomy. Together these factors resulted in prolonged inpatient treatment. This may have been related to an increased severity of infection within the Polynesian population. Hence, we highlight that severity of empyema and treatment outcome may in part be influenced by ethnicity within a population.

**Limitations**—The present study is a retrospective series presenting our early experience with VATS for paediatric empyema. Choice of intervention was at the surgeons' discretion, surgical technique was not standardised and evolved throughout the study period.

The majority of patients were referred or presented from the North Island of New Zealand, for which specific paediatric ethnic distribution statistics were not available. However, the Auckland specific population data is highly similar to that of the New Zealand paediatric population data.

We have not drawn conclusions on outcome according to treatment modality in view of the retrospective nature of the study and the numerous prospective studies which have already been published on this subject.

**Conclusion**—The incidence of paediatric empyema is significantly higher in the Māori and Pacific population than in the other ethnic groups in our region. Severity of empyema may be higher within the Polynesian population affecting treatment outcome; prospective studies using severity scoring systems are required to investigate this. Further research is required to look at the immunological and environmental factors relating to infections and responses in this population. A high level of suspicion for empyema and intrapulmonary abscesses amongst Polynesian children with pneumonia is required to allow swift referral and institution of treatment. The hope is that this will prevent some of the complications related to the disease process and more invasive therapeutic measures.

**Competing interests:** None.

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**Acknowledgements:** Thanks to Alistair Stewart for statistical advice, and the paediatric surgeons and respiratory paediatricians at SSH for facilitating this study.

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## Professional burnout—a regulatory perspective

Ron Paterson, John Adams

### Abstract

When people in industry or government burnout, the resulting inefficiencies and logjams may frustrate and even harm the citizenry. However, the stakes are higher in health care. If doctors and nurses burnout, one of two things is likely to happen: they are forced to stop work because they can no longer cope with the demands of their job, leaving a gap in an already overstretched health workforce; or they soldier on, and in an exhausted state are more likely to make a mistake that harms a patient. In our respective roles as former Health and Disability Commissioner (HDC), and chairman of the Medical Council, we have seen the harm caused by burnout in the medical profession. In this article, we seek to describe the problem and suggest some strategies to address it.

### Definition, causes and prevalence

Burnout is usually defined as a “syndrome of emotional exhaustion, depersonalisation and a sense of low personal accomplishment that leads to decreased effectiveness at work.”<sup>1</sup> It is well described by psychiatrist Glen Gabbard as “erosion of the soul”, marked by “a sense of joyless striving.”<sup>2</sup>

Burnout may result from chronic work stress. Stress is both a physical and emotional syndrome. It occurs when the demands on someone are greater than their capacity to respond and is mediated by both factors in the external work environment, and internal qualities in the person.<sup>3</sup> A downward spiral is frequently set up, because performance drops when stress mounts.

Felton suggests that employees are vulnerable to burnout when they have little input into how to do a job, are never caught up with work demands, would like to leave but fear doing so, or are experiencing major changes in their workplace.<sup>4</sup> An Israeli study of 890 specialists concluded that “[p]erceived overload, long known to be the most potent predictor of burnout, should be considered as a prime culprit in that it probably leads to both elevated levels of burnout and reduced levels of quality of care.”<sup>5</sup>

Wallace and colleagues list familiar stressors specific to medicine.<sup>6</sup> Workload and fatigue, dealing with emotionally-charged situations associated with suffering, fear, failures and death, difficult interactions with patients, families, and other medical personnel, excessive cognitive demands, increased patient-care demands, remuneration issues, growing bureaucracy, increased accountability, conflict between the needs of the organisation and patients, and a decline in physician autonomy are all suggested as having a role in producing stress and consequent burnout.

Factors in doctors’ personalities also create vulnerabilities. Compulsiveness can be a very helpful attribute in many areas of medicine, but it causes doctors difficulty in saying ‘no’ to additional work, leads to ‘burying’ resultant frustration and anger, makes many doctors put off satisfaction in their lives, and is associated with

perfectionism and fear of failure, which pushes doctors to keep going despite feeling personally compromised. Gabbard has characterised this as the triad of doubt, guilt and an exaggerated sense of responsibility.<sup>7</sup>

Many studies document the prevalence of health problems in health professionals, including a major UK Department of Health Report in 2010, “Invisible Patients”.<sup>8</sup> It noted the higher rates of depression, anxiety and substance misuse in health professionals, the problem of “presenteeism” (staff who turn up for work when they are unwell), and the fear of stigma that often stops health workers seeking professional help. There is no reason to think that the problems would be any less in New Zealand; indeed, being part of a smaller community with fewer degrees of separation, it is likely to be even harder to seek anonymous help for health problems.

Burnout appears common among practising doctors, with rates ranging from 25% to 60%.<sup>9</sup> A 1999 New Zealand postal survey of a random sample of 500 doctors found that 61% reported suffering moderate to severe stress, but only 11% had regular health assessments, and 29% did not have a doctor.<sup>10</sup> In our experience doctors as a group often neglect their own health, are not good at nurturing their family and social supports, and have few outlets for divesting themselves of the significant emotional load they carry from their work. Each area of medicine has its own strains. We also observe that, as a profession, doctors are relatively poor at giving mutual support and constructive feedback to each other, or seeking help.

Burnout is not a problem confined to senior doctors and can begin to develop early in the medical career. In a survey of 2682 medical students in 7 US medical schools, 53% of respondents met criteria for professional burnout. Students with burnout were less likely to hold altruistic views regarding physicians’ responsibility to society.<sup>11</sup> In a prospective cohort study of 110 medical students from the University of Sydney, rates of burnout increased from 28% (in the final year of medical school) to 61% (18 months later in the trainee intern year).<sup>12</sup>

### **Adverse effects on quality of care**

Doctors in the process of burning out will depersonalise or withdraw from patients, leading to a “vicious cycle where physician withdrawal may lead patients to express discontent, thereby creating further physician stress and ... a tendency for the physician to withdraw further during the medical encounter.”<sup>13</sup> Burnout and “compassion fatigue” are a particular problem in specialties that involve intense emotional demands and staff shortages.

A number of published studies indicate that the risks of medical errors and suboptimal patient care are higher for burnt out physicians. A recent study of 1311 German surgeons showed that “burnt out male surgeons are significantly more likely to rate their quality of care as suboptimal.”<sup>14</sup>

The relationship between depression, burnout and errors is complex. In an interesting prospective cohort study of 123 paediatric residents in the United States, 24 (20%) met the criteria for depression and 92 (74%) met the criteria for burnout. Depressed residents (96% of whom also reported burnout) made significantly more errors than their non-depressed peers; however, burnout on its own did not seem to correlate with an increased rate of medical errors.<sup>15</sup>

Patients are often well aware that doctors are overworked—they experience the results firsthand. A breast cancer survivor, whose breast prosthesis was punctured by a surgeon who mistook it for a fluid collection, complained to HDC. In her letter of complaint, she wrote: “Surgeons should not be overworked to the point of mistakes. I hope those involved have been able to learn from this and can thus prevent a mistake which could result in loss of life.” Her statement highlights another point: most patients are very conscious of the demands on busy health professionals, and may be reticent to speak up about concerns that should be brought to a doctor’s attention.

## **Stress from mistakes and complaints**

Firth-Cozens notes that stressors, the personal characteristics of the doctor (including their psychological make-up, coping ability and competence), and the degree of impairment of the doctor, all impact on doctors’ performance.<sup>16</sup> One stressor that is well documented is the impact of a mistake or complaint on the doctor.

Albert Wu has called the doctor who makes a mistake “the second victim” of medical error.<sup>17</sup> He writes:

...In the absence of [support and] mechanisms for healing, physicians find dysfunctional ways to protect themselves. They often respond to their own mistakes with anger and projection of blame, and may act defensively or callously and blame or scold the patient or other members of the healthcare team. Distress escalates in the face of a malpractice suit. In the long run some physicians are deeply wounded, lose their nerve, burnout, or seek solace in alcohol or drugs.

In research published recently in the *Archives of Surgery*, 1 in 16 (of a sample of 7905) American surgeons reported suicidal ideation in the previous year. Suicidal ideation was markedly increased among surgeons who perceived they had made a major medical error in the previous three months. Also alarming was the finding that 60% of surgeons with recent suicidal ideation reported that they were reluctant to seek professional help due to concern that it could affect their medical licence.<sup>18</sup>

One might expect that rates of burnout attributable to the impact of mistakes and complaints to be lower in New Zealand. As noted by the Chief Medical Editor of *HemOnc Today*, “It would be interesting to compare the burnout rate of oncologists in ... countries [with] universal health care ... and minimal malpractice litigation.”<sup>2</sup>

The effective absence of medical malpractice litigation in New Zealand, due to our “no fault” accident compensation scheme covering “treatment injury”, and the strong focus on resolution and remediation from HDC and the Medical Council, might be expected to dilute the stress on doctors from mistakes and complaints. In our experience many doctors report significant stress during HDC and Council processes. Most are conscientious people and struggle with the thought that they have not performed well. A serious incident or complaint may well tip a stressed and overworked doctor into burnout.

## **Preventing and alleviating burnout**

To help prevent burnout, and to alleviate it when it occurs, we see the need for changes in three areas.

**Culture change**—The first is culture change. All doctors make mistakes and every doctor is likely to face complaints in the course of their work. This needs to be more openly acknowledged within the medical profession.

In recent years, we have observed a less punitive environment and a much greater willingness on the part of individual doctors to admit, in front of their peers, having been involved in a serious incident or the subject of a complaint. We see this as a healthy development. A more open and realistic environment should in turn make doctors more willing to seek help. In the words of former *BMJ* editor Richard Smith, “We need to move from a culture that encourages doctors to hide distress and difficulties to one where we share them and ask for help.”<sup>19</sup>

Waitemata physician Pat Alley, who has done much good work in this area, comments that “for a profession that has no shortage of Colleges, the medical profession is surprisingly uncollegial to its members who are in difficulty, and colleagues sadly often look the other way when a doctor becomes unwell from burnout” (personal correspondence, 28 January 2011).

As noted earlier, burnout is not confined to middle-aged physicians. In our view senior doctors have a special responsibility towards medical students and trainees to speak more openly about their own challenges, support mechanisms, and life choices, to help the next generation of doctors see through the myth that “the harder we work, the more patients we have, and the more tired we are, the better physicians we are”. Students, trainee interns and junior doctors need to be taught about ways to respond to mistakes, complaints and the everyday stresses of medical work.

**Support services**—Secondly, employers and colleges need to do a much better job of supporting doctors facing stress of any sort, including from the impact of mistakes and complaints. It stands to reason that early intervention might help prevent a slide into more significant difficulties with an increasing risk of error. Reducing environmental work stressors and identifying, supporting and treating doctors under stress is a crucial quality issue for our health service.

Some support services are available. The Doctors Health Advisory Service, based in Wellington, offers a free, confidential 24-hour support service. The Medical Protection Society and the Medical Assurance Society fund a counselling service for doctors suffering from work-related stress.<sup>20</sup>

An interesting initiative is offered by the Royal Australasian College of Surgeons, under its Surgeons Support Group programme. This involves training volunteer Fellows of the College in the skills necessary to help surgical colleagues involved in stressful medico-legal processes, such as complaints and inquiries. However, the initiative relies on the stressed doctor knowing that the service exists, and having the courage to contact it. In 2003, Bruce and colleagues called for a peer-support system for physicians, after a sample of 50 physicians in the Waikato and Bay of Plenty reported relatively high levels of burnout.<sup>21</sup> Clearly, there is a role for Colleges to do more.

Employers also need to do more. Some district health boards and primary care organisations in New Zealand do a good job in identifying and supporting clinicians at risk of burnout or distress from a significant incident or complaint. But in many cases an individual doctor bears the burden alone. We agree with Pat Alley that

“DHBs should be devoting far more resource than they do to managing burnout in all health professionals” (personal correspondence, 28 January 2011).

**Responsive regulators**—Thirdly, regulators need to handle complaints and inquiries promptly and sensitively. Practitioners understandably dread receiving an envelope from HDC or the Medical Council. Both organisations should aim to ensure that correspondence and interviews are professional but not officious; that parties are kept regularly updated; and that a determination is reached as quickly as possible.

There is a statutory duty on any health practitioner who has reason to believe that a doctor is “unable to perform the functions required for the practice of his or her profession because of some mental or physical condition,” to notify the Medical Council.<sup>22</sup> Such referrals are handled by Council’s Health Committee, which has many years of experience with ill doctors. All referrals are handled sensitively and with appropriate confidentiality, yet many doctors still view referral to the Committee as a disciplinary measure.

The Health Committee makes sure that necessary assessments are performed, helps put treatment in place and monitors progress closely. In addition, through voluntary undertakings with the doctor and contact with employers and colleagues, the committee can help modify the work environment. As at 30 June 2010, 210 doctors being were monitored by the Health Committee. Of the 63 new referrals in the previous year, 36 were for psychiatric difficulties, 6 for alcohol abuse and 2 for drug abuse.

Regulators need to walk a fine line in handling cases involving sick doctors. This is a challenge both for the Medical Council and HDC. Both agencies have a public protective role, and there may be pressure from the media, and from individual patients and families, to take a punitive approach. The Council and HDC recognise the systemic factors that contribute to burnout and, through their processes and decisions, seek to highlight the responsibility of district health boards and other employers to provide appropriate support.

Where a burnt out doctor turns to alcohol or other drugs for relief, and harms a patient while under the influence, there will inevitably be disciplinary consequences. But in other cases where a doctor accepts personal responsibility, says sorry, and is willing to seek professional help, it is in everyone’s interest that a rehabilitative approach is taken. Both Council and HDC have been supportive of the rehabilitation of sick and burnt out doctors.

## **Conclusion**

As a society, and as a profession, we are rather conflicted in our attitudes about sick and burnt out health professionals. All too often we admire the individual who soldiers on, uncomplaining, with a heavy workload and never seems to get sick.

However, such attitudes help produce an environment that contributes to a significant, though largely hidden, quality issue in our health service. As Wallace notes, “... [W]hen physicians are unwell, the performance of the health-care system can be sub optimum. The corollary is that physician wellness might not only benefit the individual physician, but also be vital to the delivery of high-quality health care.”<sup>6</sup>

There needs to be a culture change within the health professions, so that practitioners feel able to seek help. Colleagues must also recognise their ethical responsibility to take action if a health or competence problem is not being adequately addressed.

Professional burnout carries hidden costs: for individual health professionals, their colleagues, their patients and their families. In addition to these physical and emotional costs, it is a financial burden on the health system as a whole. We hope our paper will highlight an important issue and give impetus to steps to prevent, recognise and treat burnout of doctors in New Zealand.

**Competing interests:** None.

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**Acknowledgement:** This article is based on papers we delivered at the University of Otago Inaugural International Cancer Symposium in Wellington on 15 February 2011.

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## The climate change challenge for general practice in New Zealand

Rochelle Phipps, Rebecca Randerson, Grant Blashki

### Abstract

Climate change is one of the greatest public health challenges of our time. Despite some inherent uncertainties in making predictions about climate change, there is wide scientific consensus that global warming is occurring; that it is largely due to manmade greenhouse gas emissions; and that it will have substantial health implications for the future.

The predicted health impacts of climate change are now clearer for New Zealand, and general practitioners can take action to mitigate these impacts and adapt to the future environment.

Actions required involve a combination of 'top-down' and 'ground-up' approaches; effective leadership and policy from our health institutions and, importantly, individual practice initiatives that transform these goals into practical outcomes.

### Climate change—the science

There is wide consensus amongst leading scientific bodies around the world that climate change is occurring and that it is very likely the result of human activity contributing to an enhanced greenhouse effect.<sup>1-4</sup>

Anthropogenic (manmade) influences on the natural carbon cycle include increased greenhouse gas emissions, release of sequestered fossil carbon, and deforestation. The evidence has been well described in leading scientific and medical journals internationally,<sup>5-8</sup> and the conclusions of the Intergovernmental Panel on Climate Change (IPCC)<sup>9</sup> remain robust despite a small number of errors that have now been acknowledged to exist in the 2007 report (for example the melting rate of Himalayan glaciers).<sup>10</sup>

There is now more carbon dioxide (CO<sub>2</sub>) in the atmosphere than at any time during human civilisation<sup>11</sup> and we know that this increased CO<sub>2</sub> has been unlocked from fossil fuels<sup>12</sup> as a result of human industry since the 19th Century. We know that the planet's average global temperature is climbing,<sup>13</sup> that sea levels are rising,<sup>14</sup> and that overall, glaciers are retreating.<sup>15,16</sup>

Given the high likelihood that climate change is going to cause major global health problems for the future, it is prudent for the medical profession to comprehensively engage with this issue. General practitioners (GPs) are well placed to promote both mitigation and adaptation strategies and incorporate environmentally friendly practice into New Zealand primary health care.

## Environmental and health impacts

Consistent with global climate trends, temperature data from around New Zealand shows a warming of 0.7–1.0°C over the 20<sup>th</sup> Century,<sup>17</sup> and this trend has continued over the decade 2000–2010.<sup>18</sup> Other changes include more rain in the southwest, less rain in the northeast,<sup>19</sup> and an annual sea level rise of 1.6 mm.<sup>20</sup> There has been reduced frost frequency, retreat of Southland/Fiordland glaciers and a reduction in alpine snow mass.<sup>21</sup>

Relative to 1990, projected temperature increases for New Zealand range between 0.2–2.0°C by 2040, and 0.7–5.1°C by 2090 with best estimates 0.9°C and 2.1°C respectively.<sup>21</sup> These projections have been derived from an aggregate of global climate models and the best estimates have been assigned a moderate degree of confidence by scientists at the National Institute of Water and Atmospheric Research (NIWA).<sup>21</sup>

NIWA scientists are very confident that New Zealand will continue to experience rising sea levels (0.18–0.59m by 2090),<sup>22</sup> increasing the risk of coastal erosion and saltwater intrusion.<sup>23</sup> More frequent extreme weather events such as droughts, storms and floods are anticipated,<sup>5</sup> and hotter summers are likely to bring increased risk of heat stress, fires and infectious diseases.<sup>14</sup>

The most vulnerable areas for New Zealand are natural ecosystems, water security and coastal communities. By 2050, agriculture, horticulture and forestry are likely to be reduced over eastern New Zealand due to increased droughts and fire risk.<sup>14</sup> Any initial benefits of a warmer climate to New Zealand are expected to be lost by 2030 with the most vulnerable areas likely to be Northland to Bay of Plenty (sea level rise and storms), eastern lowland regions (water security and droughts), and alpine zones (flooding, erosion and landslides).<sup>24</sup>

Table 1 provides a summary of the likely health impacts climate change will bring to New Zealand.

## Mitigation

Despite some uncertainty about the precise rate and extent of climate change, the potential health risks are very severe (see Table 1) and the precautionary principle dictates that we should act now to mitigate those risks.

International collective action to limit climate change through reduced greenhouse gas emissions is not yet a reality and although it is required to achieve real global benefits, action at a local level is also critical.

Local measures are essential in gaining momentum for national (and international) changes in policy. In addition, many of the strategies designed to reduce greenhouse gas emissions have considerable health co-benefits, and these benefits alone should be enough to gain support within general practice for a groundswell of action. For example, the shift from car use to more active forms of transport and public transport leads to increased physical activity (reducing obesity, cardiovascular disease, cancer and depression), safer roads and reduced air pollution.<sup>29</sup> Affordable, accessible and environmentally cleaner forms of public transport will be necessary for this to be successful.

**Table 1. Summary of potential health impacts in New Zealand from climate change**

<p><b>Physical injury</b></p> <ul style="list-style-type: none"> <li>• Death and injury from extreme weather events—flash floods (drowning), landslides, fires and potentially more severe storms.</li> </ul>
<p><b>Heat waves</b></p> <ul style="list-style-type: none"> <li>• Increases in heat-related deaths and morbidity (hyperthermia, dehydration, respiratory illnesses, increased cardiac deaths etc) particularly in the elderly, although winter-related deaths may decline due to better home insulation and warmer temperatures.</li> </ul>
<p><b>Infectious diseases</b></p> <ul style="list-style-type: none"> <li>• Rates of infectious diseases such as gastroenteritis will rise due to both warmer temperatures (campylobacter, salmonella) and threats to water security (cryptosporidium) such as failure of drainage/sewerage systems from frequent flooding, erosion etc.</li> </ul>
<p><b>Skin cancer</b></p> <ul style="list-style-type: none"> <li>• Rates of skin cancer are expected to continue to rise with warmer temperatures promoting increased outdoor sun exposure and climate change may contribute to a delayed recovery of the ozone hole.<sup>25</sup></li> </ul>
<p><b>Mental health</b></p> <ul style="list-style-type: none"> <li>• Increased rates of depression<sup>26</sup> related to loss of livelihood (e.g. farmers with drought, lost crops, flood damage, enforced reattribution of land usage).</li> <li>• Post-traumatic stress disorder seen in victims of environmental disasters (loss of homes, communities, loved ones).</li> <li>• Psychological impacts on young people who may suffer anxieties about potential catastrophic climate change not unlike those experienced by children growing up amidst the fear of nuclear war.<sup>27</sup></li> </ul>
<p><b>Water security</b></p> <ul style="list-style-type: none"> <li>• Salt water intrusion in low lying coastal areas from rising sea levels and storm surges.</li> <li>• Regional droughts and shortages.</li> <li>• Contamination of drinking water from storms and flash flooding.</li> </ul>
<p><b>Food security</b></p> <ul style="list-style-type: none"> <li>• Warmer temperatures are likely to bring an increased range and incidence of pests and diseases to both animal stock and crops.</li> <li>• Overall food security in New Zealand is not considered to be at high risk due to our large capacity for production and comparatively low population.<sup>14</sup> However New Zealand food prices tend to rise in tandem with global prices, and this could impact on those from lower socioeconomic groups leading to poorer nutrition and associated health problems.</li> </ul>
<p><b>Vector-borne disease</b></p> <ul style="list-style-type: none"> <li>• Parts of the North Island are likely to become environmentally suitable for the major dengue vector in the latter part of this century.<sup>28</sup> Australian mosquito-borne arboviruses, such as Ross River Fever, also pose a potential threat. Adaptation measures to prevent the accidental introduction and proliferation of new mosquito vectors will be vital to ensure that these diseases do not become established in New Zealand.</li> </ul>
<p><b>Environmental refugees</b></p> <ul style="list-style-type: none"> <li>• Low-lying atolls such as Tuvalu and Kiribati are at greatest initial risk, but all Pacific Islands have high vulnerability and low adaptation capacity to rising sea levels, more frequent severe storm surges and other impacts of climate change on their health and economy.</li> <li>• It is likely that environmental refugees from the Pacific will migrate to New Zealand, but there may also be high numbers of refugees from other regions. Migrant primary health care will require increasing resources.</li> </ul>
<p><b>At-risk groups</b></p> <ul style="list-style-type: none"> <li>• The elderly and the poor will have increased vulnerability to both the direct and indirect effects of climate change on health. With an ageing population this will become even more pronounced.</li> <li>• Māori and Pacific Island New Zealanders are particularly vulnerable to early impacts of climate change due to their lower average socioeconomic status, and poorer health outcomes. Māori also have high economic investment in areas that are particularly susceptible to climate change including fisheries, agriculture, forestry and tourism.</li> </ul>

Insulated homes are not only more energy efficient and warmer, but in addition occupants of insulated households have been shown to suffer from less respiratory illness.<sup>30</sup> Insulation therefore provides improved health equity for lower socioeconomic groups.<sup>31</sup>

Reduced population intake of red meat can reduce the greenhouse gas emissions from intensive farming and at the same time lead to improved rates of cardiovascular disease and bowel cancer.<sup>32</sup>

Measures to reduce carbon emissions can also lead to better business outcomes with improved supply chain efficiency, energy management, and waste minimisation all leading to reduced expenses and improved business profit.

## Greening your practice

Individual general practices can make low-carbon sustainable changes in the day-to-day running of their business that are cost-saving or cost-neutral from a financial viewpoint and have the potential to provide enormous environmental returns.<sup>33</sup> Triple-bottom-line reporting is now commonplace in business: accounting for the social, ecological as well as financial performance of an organisation.

General practice has traditionally focussed on social and financial outcomes. We now need to introduce environmental sustainability as an integral component of our business planning.

Some suggestions for reducing the carbon footprint of your medical centre are included in Table 2. Please note that these sustainable business practices are not unique to general practice and can be implemented across the wider healthcare industry.<sup>34</sup>

**Table 2. Tips for greening your general practice**

<p><b>Energy use</b></p> <ul style="list-style-type: none"> <li>• Choose an electricity supplier that has sustainable generation sources (hydro/wind)</li> <li>• Use low-energy lighting and switch off when not required</li> <li>• Turn off computers, photocopiers and other appliances at the end of the day</li> <li>• Choose efficient appliances (e.g. fridges)</li> <li>• Ensure efficient practice heating and air conditioning</li> <li>• Insulate your premises</li> </ul>
<p><b>Supply chain sustainability</b></p> <ul style="list-style-type: none"> <li>• Source supplies from local suppliers, minimise packaging and use recycled materials where available</li> <li>• Streamline orders to reduce frequency of deliveries</li> <li>• Encourage suppliers to use a packaging exchange system (e.g. polystyrene bins)</li> </ul>
<p><b>Waste minimisation</b></p> <ul style="list-style-type: none"> <li>• Minimise medication wastage by prudent prescribing, especially when initiating a new medication</li> <li>• Computerise your notes, use electronic referrals, print double-sided where possible</li> <li>• Discontinue unnecessary incoming mail e.g. paper duplication of results, unwanted junk mail, pharmaceutical advertising</li> <li>• Encourage staff to minimise wastage of single-use items such as swabs, dressings etc and return to sterilising/cleaning reusable equipment where possible</li> <li>• Fit aerators to taps, fix leaks, use dual-flush toilets</li> </ul>

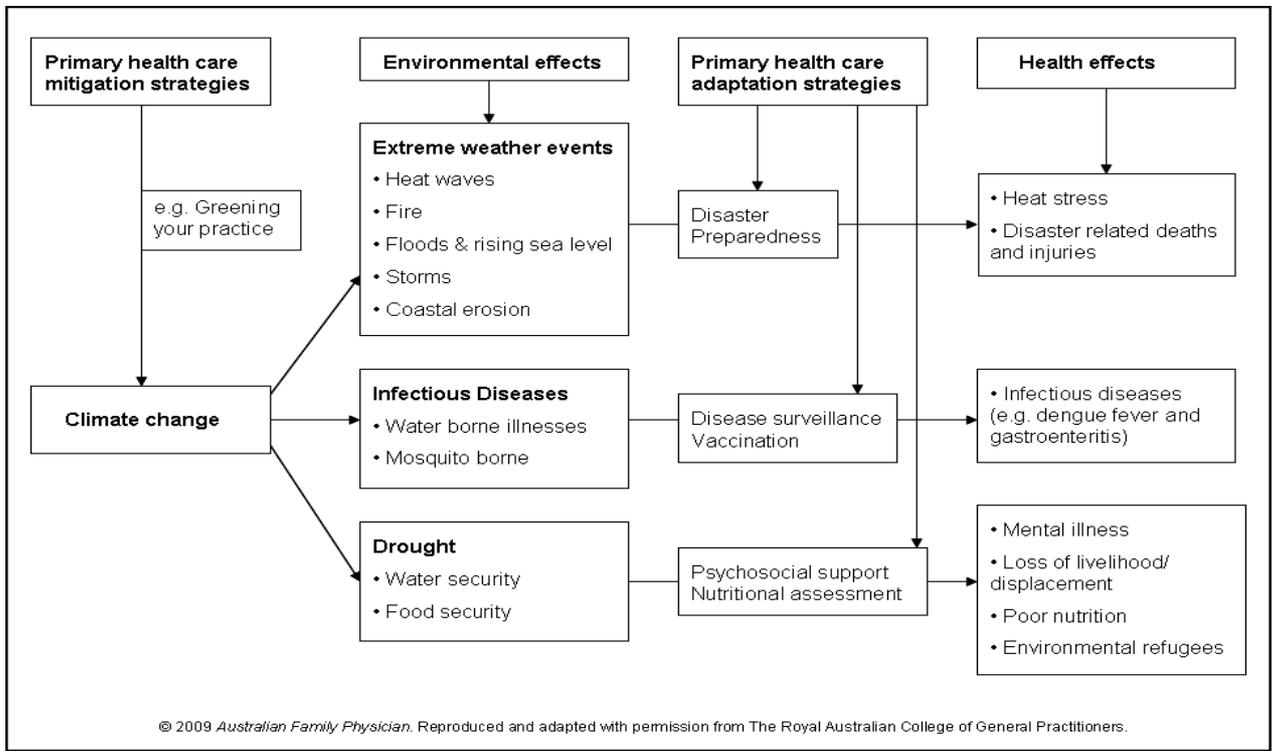
<p><b>Recycle and reuse</b></p> <ul style="list-style-type: none"> <li>• Pick up by council service/local recycler</li> <li>• Buy recycled office supplies, printing paper, toilet paper, hand towels etc</li> </ul>
<p><b>Promote green and healthy lifestyles to staff and patients</b></p> <ul style="list-style-type: none"> <li>• Encourage walking/cycling/public transport</li> <li>• Consider car pooling</li> <li>• Assist eligible patients to gain subsidised home insulation</li> </ul>
<p><b>Other ideas</b></p> <ul style="list-style-type: none"> <li>• Compost food scraps (e.g. Bokashi bench-top composter)</li> <li>• Offset the carbon emissions you cannot avoid (e.g. plant more shrubs/trees around your practice)</li> <li>• Make ethical business investments (investments that consider both the profit potential and the impact on society and the environment)</li> </ul>

**Adaptation strategies**

Adaptation is about identifying and reducing vulnerabilities to climate change. Due to the backlog of existing emissions, even if the world eliminated all greenhouse gas emissions today, it is estimated that there would still be an increase in global average temperatures of 0.6°C by 2100.<sup>24</sup> It is therefore imperative that we look towards adaptation strategies for primary health care in order to best be prepared for the predicted health impacts of climate change.

GPs have a role in health promotion, primary disease prevention, disaster preparedness, and building resilience at a community level (see Figure 1).

**Figure 1. Climate change and primary healthcare strategies**



Source: Adapted from Blashki et al.<sup>35</sup>

## Summary

If temperature rises of 3–4°C do occur (the upper range predicted by 2080)<sup>14</sup> adaptation measures will not be sufficient to deal with the effects of climate change on our society's infrastructure.

It is therefore vital that climate change issues continue to be mainstreamed into health policy, planning and strategic development.

It is a combination of approaches—both 'top-down' policy leadership and 'grassroots-up' individual practice initiatives—that will protect New Zealand from devastating health consequences in the future.

### Table 3. Actions general practitioners can take today

<ul style="list-style-type: none"><li>• Educate yourself</li><li>• The Greening Your Practice Toolkit has been developed for New Zealand GPs (and other medics) and is available in .pdf/CD format (contact: <a href="mailto:greeningyourpractice@gmail.com">greeningyourpractice@gmail.com</a>)</li><li>• Reduce your demand on consumables and lower your personal and business carbon footprints</li><li>• Join with other health professionals concerned about climate change (e.g. OraTaiao: NZ Climate &amp; Health)</li><li>• Provide public education (posters in waiting rooms)</li><li>• Preventive programmes (e.g. educate on food hygiene, nutrition, improve your immunisation rates)</li><li>• Remain alert to mental health impacts</li><li>• Disaster preparedness (develop service continuity plans)</li><li>• Request the support of professional organisations such as Independent Practice Associations (IPA), Primary Health Organisations (PHO) and District Health Boards (DHB) in policy development.</li></ul>
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### Useful websites:

- Ministry for the Environment <http://www.mfe.govt.nz/issues/climate/index.html>
- National Institute of Water and Atmospheric Research <http://www.niwa.co.nz>
- OraTaiao: New Zealand Climate and Health <http://www.orataiao.org.nz>
- Doctors for the Environment Australia [www.dea.org.au](http://www.dea.org.au)
- Intergovernmental Panel on Climate Change [www.ipcc.ch](http://www.ipcc.ch)

**Competing interests:** None.

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## Hyperkalaemic paralysis

David Hamilton, Sergej Cicovic, Mark Rassie

Hyperkalaemia is associated with cardiac manifestations with characteristic electrocardiogram (ECG) changes. It rarely presents with acute tetra-paralysis. We present a case of secondary hyperkalaemic paralysis.

### Case report

A 46-year-old gentleman presented with lethargy, nausea, vomiting and acute ascending weakness. He had end-stage renal failure secondary to diabetes and was on home haemodialysis. He dialysed every second day. He had Type 2 diabetes (on insulin), hypertension (on quinapril and metoprolol), anxiety and depression (on citalopram). Other medications were alphacalcidol, calcium carbonate, aluminium hydroxide, erythropoietin, simvastatin, frusemide and ranitidine.

He was transported to the hospital via ambulance. He complained of weakness in his legs. He had not completed his most recent haemodialysis which was due 3 days previously. On route he became hypotensive (60 mmHg systolic) and bradycardic (35/min). Intravenous adrenalin was commenced and systolic blood pressure improved to 100 mmHg systolic.

On presentation to hospital the weakness ascended and involved his upper limbs. He was afebrile, had a blood pressure of 136/70 mmHg, pulse rate of 30/min and O<sub>2</sub> saturation of 100% on air. JVP was at the angle of the jaw. There was bilateral, symmetrical weakness of the upper and lower limbs (power 1-2/5). Reflexes and plantar responses were reduced.

Venous blood gas analysis showed a pH of 7.24, bicarbonate of 15.0 and a base excess of -9.8. ECG showed a junctional bradycardia with peaked T-waves. Blood tests revealed blood glucose 5.9, serum sodium 130, serum potassium 7.9, haemoglobin 126, WBC 11.7, platelets 270, urea 43.6, creatinine 1390, calcium 2.29 and phosphate 2.38.

His hyperkalaemia was initially managed with calcium gluconate and intravenous insulin. He was transferred to the renal ward where haemodialysis was commenced. He was dialysed for 4 hours and throughout the procedure his tetraparesis gradually improved—this was correlated with a reduction in repeated serum potassium (5.0). A repeat ECG showed normal sinus rhythm. His power was 5/5 universally. He received haemodialysis the following day and was asymptomatic for the remainder of admission.

He had two further presentations of tetra-paresis. Both were associated with hyperkalaemia and improved during haemodialysis. The episodes were due to chronic renal failure and non-compliance with haemodialysis.

## Discussion

There are primary and secondary forms of hyperkalaemic paralysis.

Primary hyperkalaemic paralysis involves a genetically determined defect in sodium ion channels of muscle fibre plasma membranes.<sup>1,2</sup> Presentations of flaccid paralysis happen in the first decade. The attacks last from a few minutes to hours but rarely exceed 4 hours. The attacks are initially infrequent and tend to increase in frequency and severity over time.<sup>1</sup> Common triggers include rest after exercise and intake of potassium.<sup>1,2</sup> Salbutamol, intravenous calcium gluconate and acetazolamide all successfully treat attacks.<sup>1,2</sup>

The exact mechanism of secondary hyperkalaemic paralysis is not known. It may be due to potassium directly affecting the muscle cell membrane or the peripheral nerves.<sup>3</sup> Patients present later in life. Evers et al described 18 cases.<sup>4</sup> Presentation classically involved an ascending flaccid paralysis with mild or no sensory deficit and spared cranial nerves. It may be mistaken for Guillain-Barré syndrome.<sup>4</sup>

Attacks are usually precipitated by chronic renal failure<sup>4</sup> but have also been reported secondary to potassium sparing diuretics,<sup>5</sup> ACE inhibitors,<sup>6</sup> nonsteroidal anti-inflammatories,<sup>7</sup> postoperative renal impairment<sup>8</sup> and traumatic rupture of the bladder.<sup>9</sup>

Management involves correcting physiological disturbance, repeated ECGs and monitoring serum potassium. Treatment is through correcting hyperkalaemia through calcium infusion, insulin, salbutamol or dialysis. Long-term management involves reducing dietary potassium, avoidance of predisposing medications and compliance with dialysis.

The prognosis for secondary hyperkalaemic paralysis is good if recognised and managed appropriately; reported deaths were due to arrhythmias.<sup>4</sup> There have been reports where no ECG changes have been present.<sup>5</sup> Therefore both an ECG and serum potassium levels should be obtained in patients presenting with acute paralysis.

There must be a universal awareness because if not recognised, secondary hyperkalaemic paralysis can be a fatal condition.

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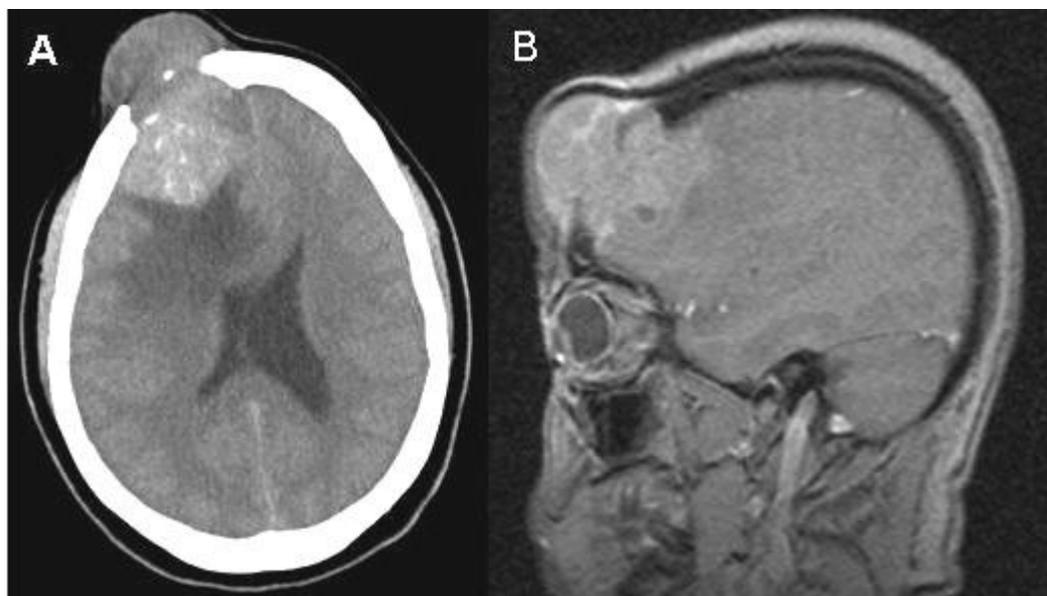
## A forehead lump

Badri Giri, Tapati Ghosh

### Clinical

A 52-year-old female with no significant past medical history presented with a progressively increasing right forehead lump for last 6 months with mild headache for 2 months. A CT scan of the head was performed (Figure 1).

**Figure 1**



*What is the diagnosis?*

## **Answer**

The CT showed a large destructive lesion on the right frontal bone with large extracranial and intracranial component, midline shift and subfalcine herniation. Appearances are consistent with a *meningioma*.

The patient was admitted to the neurosurgical unit. Decadron and Dilantin were started to decrease brain oedema and for seizure prophylaxis respectively. Biopsy of the lump was consistent with meningioma.

Patient underwent resection of the meningioma on the 8<sup>th</sup> admission day. Postoperative CT and MRI showed resolution of tumour, mass effect and decreased vasogenic oedema. The patient was discharged home on the 8<sup>th</sup> postoperative day.

One week later she was seen in clinic, with no neurological deficit.

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## **New Zealand Government should demand International Atomic Energy Agency reform—to help phase out nuclear power**

International attention has been riveted on the impact of the 11 March earthquake and tsunami on Japan's Fukushima nuclear reactors. Short and long-term health effects of radioactive leakage from reactors and spent fuel pools,<sup>1-3</sup> will doubtless be studied in the coming years and decades. This serves to remind us in general that the way we obtain our energy is a global public health issue, and in particular that nuclear power is attended by many serious and unique health and environmental risks. It also reminds us about flawed decision-making processes that have allowed reactors to be built in areas where a major tsunami had occurred in the past<sup>4</sup> and similarly in high-risk areas for earthquakes in other parts of the world.<sup>5</sup>

The risk of irradiation from accidents to reactors and to nuclear waste storage arrangements includes both massive acute radiation near the site and lower-level very widespread chronic radiation. In particular, the Chernobyl reactor accident has increased the risk of thyroid cancer.<sup>6</sup>

There is now evidence that Fukushima radioactive particles have spread to other parts of the Northern Hemisphere, as well as having entered the food chain in local agricultural areas in Japan.<sup>1,2</sup> Whatever radiation health impacts eventuate, the psychosocial impacts<sup>7</sup> to the surrounding population and even other parts of Japan are likely to be considerable.

Selected other problems of nuclear power include the following:

- The unresolved long-term waste storage in nearly all countries with such reactors.
- The potential for nuclear reactors to be terrorist targets or targets in war. The risk of the latter may increase with conflict arising from political change (especially in autocracies) and due to disruption to societies from climate change.<sup>8,9</sup>
- This energy source involves enormous capital investments and there are usually various types of government subsidies (e.g. loan guarantees, research and development support and special government support for insurance coverage). Post-Fukushima demands for increased safety provisions will probably make it even less economically viable.
- Investment in nuclear power also diverts resources away from truly sustainable energy resource development, thus worsening the very serious global health impact of climate change. Furthermore, a current surge of planning to construct more nuclear reactors (at least pre-Fukushima) would further increase the dangerous carbon load of the atmosphere. The often decades-long construction of a nuclear reactor, using enormous quantities of concrete, is heavily carbon-intensive.

- Even when operating normally, there may be an association between proximity to a nuclear reactor and increased childhood cancer risk (e.g., in Germany<sup>10</sup>). But this association, which is complex and difficult to study,<sup>11</sup> has not been found in some other studies (e.g. in the UK<sup>12</sup>).

But by far the most serious problem with nuclear power (in our view) is that this technology can facilitate the subsequent acquisition of nuclear weapons. This appears to have occurred for India, Pakistan, North Korea and probably also Israel.<sup>13</sup>

Some of the other countries with nuclear power could potentially move in the same direction under certain circumstances: “the existing enrichment capacity of countries such as Brazil and Japan makes them virtual weapons states—they could arm in months if they so wished”.<sup>14</sup> The potentially devastating effects of the use of even a small proportion of the global arsenal of nuclear weapons is well known.

Less well-known is the recently modelled ‘nuclear darkness/famine effect’ in which dust from a limited regional nuclear war could spread to the atmosphere above New Zealand in only 11 days after the attacks.<sup>15</sup> The modelling suggests that this dust would reduce the surface air temperature in New Zealand by 2 degrees Celsius in years one to two and reduce the length of the growing season in parts of the country.<sup>16–18</sup> The impact on Northern Hemisphere countries would be very much greater.

The simple conclusion is that nuclear power has been an expensive technological blind alley. It has been well tried and found to pose unacceptable direct and indirect (nuclear weapons) hazards to long-term human health and well-being.

The International Atomic Energy Agency (IAEA) is an important promoter of nuclear power. Its Department of Energy assists countries in setting up nuclear power programmes.<sup>19</sup> This it does alongside its other functions of monitoring the non-proliferation of nuclear weapons and standards of nuclear safety in existing reactors, and promotion of medical uses of radioactive materials. These functions are in implicit conflict of interest.

Those interested in the promotion of nuclear power will not welcome, for example, dissemination of data on negative health impacts of its use. This may be why the IAEA appears to have caused the World Health Organization (WHO) to surrender its right to research and publicise data on ionising radiation, in a confidential agreement made in 1959.<sup>20</sup> It has led to lack of public trust in both organisations on this issue.

Given this background, New Zealand as a member of the IAEA and a responsible member of the international community, should now demand urgent reform of this body. In particular it should demand phasing out the IAEA’s Department of Energy (nuclear power) and strengthening its other functions. It could work to achieve this with other like-minded non-nuclear countries and those such as Germany, which is now reaffirming its commitment to a nuclear power phase-out.

Fortunately, this is an area in which New Zealand has credibility with long-standing nuclear-free legislation,<sup>21</sup> a track record in promoting nuclear disarmament,<sup>22</sup> and a relatively high level of energy from renewable energy (at the top of the OECD with Norway and Iceland).

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## **New Zealand pertussis epidemiology and the Global Pertussis Initiative immunisation strategies**

In July 2010 a Strategy Workshop was convened to review New Zealand pertussis epidemiology and the Global Pertussis Initiative immunisation strategies. The meeting was co-chaired by the Ministry of Health with GlaxoSmithKline (GSK) providing the venue and some travel support.

Attendees included delegates from district health boards (DHBs), Environmental Science and Research (ESR), RNZCGP and the Ministry of Health's Immunisation Technical Forum.

It has become increasingly clear that achieving high childhood immunisation coverage alone does not completely protect infants from pertussis. Both natural and vaccine derived immunity are not lifelong, lasting only a few years. This means that older siblings, adult household members and other adults, such as grandparents, with a cough illness can be a source of infection for those too young to have completed primary immunisation.<sup>1,2</sup> At least 8% of adults with a cough illness of more than 7 days duration are likely to have pertussis.<sup>3</sup> The source of infection of infants hospitalised with pertussis, when it can be identified, is usually an older household member, most commonly the mother.<sup>4</sup>

The Global Pertussis Initiative (GPI) addressed how best to control pertussis and described seven key strategies to improve pertussis control. These are:

- (1) Reinforce and/or improve current infant and toddler immunisation strategies;
- (2) Universal preschool booster doses at 4 to 6 years of age;
- (3) Universal adolescent immunisation;
- (4) Universal adult immunisation;
- (5) Selective immunisation of new mothers, family, and close contacts of newborns;
- (6) Selective immunisation of health care workers;
- (7) Selective immunisation of child care workers.<sup>5</sup>

New Zealand already has the three routine childhood vaccination strategies recommended by the GPI, namely an infant immunisation programme, a four year old childhood booster dose and an adolescent dose. Coverage for the infant schedule in New Zealand is increasing and now 90%, though only approximately one-half of children receive their immunisations on time, within four weeks.

Data on the coverage of the 4-year and 11-year booster doses are lacking. The recent epidemiology suggests that improved vaccination coverage has had an impact on the incidence of pertussis with the current epidemic not reaching the heights of prior epidemics.

Following presentations to set the scene and detailed discussion the key recommendations of the forum were to improve delivery of the current immunisation programme ensuring that 95% of infants received 3 doses of a pertussis containing vaccine by 6 months of age, to fund DHBs to offer pertussis immunisation to healthcare workers.

In particular, those who work with neonates and young children should receive a pertussis containing vaccine every 10 years and to pilot the promotion of cocoon immunisation around newborns. This would involve ensuring that, on diagnosis of pregnancy, all other children in the household are up-to-date with their immunisation schedules, immunising all mothers after birth unless a dose of a pertussis containing vaccine has been received within the last 10 years and providing information to new parents to encourage grandparents and other household and regular contacts to be immunised.

Universal adult immunisation and immunisation of childcare workers were not supported, at present, by the forum.

These recommendations, with greater supporting detail, have been forwarded to the Ministry of Health for consideration. A full report is available from Dr Stewart Reid at the email address below.

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## Promotion of nicotine replacement therapy and smoking cessation services at grocery stores

**Background**—For New Zealand (NZ) to be smoke-free by 2025, current smokers need to make more quit attempts and use effective support when doing so. Nicotine replacement therapies (NRT) are safe and double an individual's chance of successfully quitting,<sup>1</sup> yet in 2009 only 22% of NZ smokers aged 15-64 used NRT to support their most recent quit attempt.<sup>2</sup>

The 2010 Māori Affairs Select Committee's (MASC) Inquiry into the tobacco industry recommended "*That nicotine replacement therapies be required to be sold everywhere tobacco is sold, thereby ensuring smokers can choose a safe option whenever they crave nicotine.*"<sup>3</sup> In 2009, two-thirds (67%) of NZ smokers regularly bought tobacco from 'dairies' (small independent grocery stores selling mainly tobacco, confectionary and basic grocery items). Yet, those who used NRT typically obtained it from a pharmacy either via the government subsidised Quitcard scheme (75%) or purchased at full price (14%).<sup>2</sup> Only 2% bought it from a supermarket.<sup>2</sup> The potential of using dairies to promote NRT and quit smoking services was investigated in a small cross-sectional exploratory survey.

**Method**—Between January and February 2010 a researcher identified and aimed to visit ten dairies that sold and displayed tobacco and were within 20 km of the researcher's offices at the Tamaki campus, University of Auckland. The retailer at the counter at the time of each visit was invited to take part in a 15-minute face-to-face survey. Action on Smoking and Health NZ provided a list of dairies, cafés and small supermarkets that sold but did not display tobacco (n=18) or did not sell tobacco (n=17). These stores were contacted by telephone as they were situated in rural and urban locations throughout NZ. The retailer who answered the telephone was invited to take part in the survey.

The interviewer-administered, paper-based semi-quantitative survey included questions on; knowledge of quit smoking products, opportunities and barriers to selling NRT, attitudes towards the in-store promotion of quit smoking products and services, and attitudes towards possible legislative measures around the sale of tobacco. The study design was approved by the NZ multi-region ethics committee (MEC/09/89/EXP).

**Results**—Retailers from nine dairies that sold and displayed tobacco agreed to participate in the survey, as did retailers from five stores that did not display tobacco and eight stores that did not sell tobacco. The 22 participating retailers had an average age of 44 years (SD=13), 13 were female, two were Māori, 12 were Asian and 9 were of NZ European ethnicity. Four retailers were current smokers and six were ex-smokers. Half of the retailers were the store owner/manager. Thirteen of the 22 retailers mentioned NRT when asked to name all the smoking cessation products they knew of. One retailer currently sold NRT patches and gum, and four others had tried to sell NRT in the past. Obstacles to selling NRT included weak consumer demand and a lack of manufacturer and distribution support for NRT.

Eighteen of the 22 retailers felt dairies should have a role in promoting quit smoking products and/or services but preferred indirect measures such as displaying posters advertising NRT or Quitline, providing educational pamphlets or giving out free product samples. Three retailers said they would be willing to offer brief verbal advice to customers and eight said they would be prepared to undertake a short (30-minute) online training course to become a Quitcard provider. Opponents said they didn't have the time, lacked the required knowledge or training, or felt they might offend customers.

Eleven of the 22 retailers, including five that sold tobacco, agreed that stores that sell tobacco should be legally required to provide and promote quit smoking products and services. The remaining 11 retailers felt it should remain the owner's choice.

**Discussion**—This is the first study undertaken in NZ to seek small retailers' views about promoting quit smoking products and services in-store. Some limitations should be noted. First, only a small select group of retailers was interviewed, and other retailers may have different views and experiences. Second, the decision to interview the retailer present on the day was a pragmatic one and the 11 store assistants who were interviewed may have had limited knowledge of store practices or ability to influence them. Finally, all retailers were interviewed while at work and so their responses were generally brief.

The Government's response to the MASC recommendation was that NRT "*be available as widely as possible where it is accompanied by safe and clinically appropriate advice*".<sup>4</sup> That the retailers interviewed experienced a lack of customer demand for NRT is perhaps not surprising given the availability of subsidised NRT through pharmacies and the limited promotion of NRT through general sale.<sup>5,6</sup> Approximately 16% of those who use NRT buy it at full price.<sup>2</sup>

A 2011 survey found that people who bought NRT from supermarkets did so because the NRT was immediately available and they felt supermarkets were an easily accessible and non-judgemental environment.<sup>7</sup> Dairies possess these same qualities and retailers in dairies appear motivated to promote smoking cessation services and potentially sell smoking cessation products if the marketing and distribution of such treatments are improved.

Future research should explore how NRT should best be promoted in dairies to make it a viable product line.<sup>7</sup> It would also be important to assess the extent that tobacco companies can influence retailers' practices around the sale of NRT.<sup>8</sup>

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**Acknowledgements:** This work was supported by a University of Auckland summer studentship to KF. (The study was designed, conducted and analysed by the researchers independently of funders.) The authors also thank the interviewed retailers for agreeing to participate in this study; ASH (NZ) for assisting with the list of stores that did not display or did not sell tobacco products; and the CTRU staff that helped support this study and reviewed earlier drafts of this publication.

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## **Prescribing antipsychotic medications to people with dementia**

Readers may be aware of the article published in the April 16–22 2011 edition of the *New Zealand Listener* covering aspects of the management of dementia, titled “Good morning sweetheart”. Whilst the article records many good things, it has reported only half, and a very particular half, of the views I hold on prescribing antipsychotic medications to people with dementia. What was intended as a considered shot across the bows of prescribers reads more like a thermonuclear explosion on the foredeck.

I encourage all doctors and health professionals who are fellow-prescribers of these medicines to read the RANZCP’s Faculty of Psychiatry of Old Age (NZ) Guidelines on the topic. These can be accessed for free on line at :

<http://www.bpac.org.nz/a4d/ranzcpGuide.asp> and ordered for free in hardcopy form from the PHARMAC website: [www.pharmaonline.co.nz](http://www.pharmaonline.co.nz)

The key messages of this document stand:

- (1) Prescribe the right medicine at the right time for the right patient,
- (2) Always prescribe these medicines in tandem with non-pharmacological management for behavioural and psychological symptoms in dementia, and
- (3) Routinely review these medicines for possible trial withdrawal after 3 months.

Matthew Croucher  
Psychiatrist of Old Age  
Christchurch, New Zealand



## Response by Homeopath to Dr Holt's letter

Dr Shaun Holt has published a letter in your latest *Journal* issue, reproduced also in *The Sunday Herald*, in which he slanders and defames, once again, Homeopathy.

I am very much aware that most of the Registered conventional MDs in NZ are regarding Homeopathy as nothing better than hogwash. Nevertheless I would like to draw your attention to this:

Your [NZMA's] Code of Ethics, #43, states the following:

43. Doctors should accept that their professional reputation must be based upon their ability, technical skills and integrity. Doctors should advertise professional services or make professional announcements only in circumstances where the primary purpose of any notification is factual presentation of information reasonably needed by any person wishing to make an informed decision about the appropriateness and availability of services that may meet his or her medical needs. Any such announcement or advertisement must be demonstrably true in all respects and contain no testimonial material or endorsement of clinical skills. Qualifications not recognised by appropriate New Zealand statutory bodies should not be quoted.

Dr Shaun Holt presents himself as a Professor at Victoria University, yet he does not appear anywhere on their staff listing in any faculty in any position: is that "demonstrably true".

Dr Shaun Holt claims knowledge of homeopathy and other branches of natural medicine, but has no certificate, diploma or degree, by any school, college or university, whether officially recognised or not, to prove this. To my knowledge, neither homeopathy, nor herbalism or naturopathy are part of the studies' curriculum in any Faculty of Medicine or Pharmacy.

Moreover, by his own admission (private email available on request), his "knowledge" is based on reading articles. How does that "ability" proves true and how is this useful to "any person wishing to make an informed decision"?

How does that reflect on the integrity and professionalism of the whole conventional medical fraternity?

I am not asking you to promote homeopathy and natural medicine: it is not your task or your purpose. But the patient's choice is primordial and should always be respected. The continuous misleading information propagated by Dr Holt and his acolytes with what appears to be your silent approbation is definitely not conducive to informed choice and proper education of the public and of professional health practitioners.

Thank you for your attention.

Dr Joseph Rozencwajg (NMD)

"The greatest enemy of any science is a closed mind"

[www.naturamedica.webs.com](http://www.naturamedica.webs.com)



## More reaction to Dr Holt's letter

I have been in successful Homeopathic clinical practice for 15 years and have had a very supportive and collegial relationship with other health professionals. It concerns me that this relationship has been jeopardized by the comments of a GP in Tauranga, Shaun Holt.<sup>1</sup>

I would be grateful to receive a CV of his formal qualifications and at which teaching organisation has adjunct Professor/Dr Holt graduated; and is this advice—that a medical practitioners referral choice to do what is best for their patients should not include Homeopathy—supported by the New Zealand Medical Association?

The letter is most concerning, as in 2009 Shaun Holt published a short survey on Homeopathy in your *New Zealand Medical Journal* and the people surveyed had a positive and significant response to Homeopathic treatment.<sup>2</sup> The printed reply from the New Zealand Council of Homeopaths (NZCH) was very supportive of this survey and called for more funding to be available to conduct further clinical studies on Homeopathy.

It is unfortunate that there are few published studies in Medical Journals on Homeopathy, however this could be because the medical professionals are not practitioners of Homeopathy and their training is in the use of pharmaceutical medicine—or it could be that Homeopathy does not have the same dose risks that pharmaceutical medicines have so do not need to undergo such rigorous clinical trials? It is reassuring, however, that published research is being conducted into high dilutions.<sup>3,4</sup>

I am disappointed that the benefits that both our professions give to our clients should be jeopardized by such a call and I hope that our patients do not suffer as a result.

Claire Bleakley (RC Hom, BSc/Psyc)

Wrigley Street Health  
Masterton

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## Two cases of goitre

*Excerpt from article "On Goitre" by Dr Colquhoun published in NZMJ 1910 Feb;8(33):17-71.*

Another case is that of Miss Y., aged 13 years in June, 1908. Of a highly neurotic stock ; had a large goitre, neck 15in., weight 7st.; she had been treated for Graves' disease. Her history during the two past years. has been that her nervousness continues, she easily gets tachycardia (up to 140), menstruation has been rather irregular ; but on the whole she has gained in self-control, has increased in weight to 7st. 9lbs., shows no muscular tremors.

I cannot label either of these cases ; one man would say "Graves'," another would say "ordinary Bronchocele." I offer merely as a tentative opinion the suggestion that they are mixed cases—that is, that the thyroid secretion is partly depressed and partly exalted, and I think this opinion can only be defended on the grounds that the secretion is a complex one, and that pathologically it may show irregularities of several kinds.

Finally, I cite a case which seems to show that passive goitre may be converted into the active form. Mrs. S., aged 39, mother of seven children, aged from 11 months to 15 years, consulted me in January, 1910. Eight years ago, when a child was born, she developed a goitre, which gave her no trouble. The town she lived in was, she said, full of people with just such throats (I may say that the medical man practising in that district reported, "Goitre uncommon and only sporadic"), and she had not consulted anyone about it.

In December, 1909, while away for a holiday, her mother and one of her children who was with her became very ill, and she had a few weeks of excessive strain and worry. When I saw her in January, she had the typical appearance of active goitre—Tachycardia, emaciation, tremors, dance of arteries, pigmentation of neck, face and abdomen-exophthalmos and goitre.

In conclusion, it seems to me that the first business of the profession, in connection with the various forms of goitre, is to get accurate knowledge of their etiology.



## **Unusual adverse effects of well-known drugs**

Lipitor (atorvastatin) and Viagra (sildenafil), coming off patent in the United States in 2012 is a significant problem for Pfizer, the world's biggest selling drug company. The reason for concern arises from the fact that these two drugs are big earners for the company. Lipitor alone is responsible for nearly a fifth of Pfizer's revenues. This report indicates that a retrenchment to counterbalance includes closing down Pfizer's Research & Development plant in Sandwich, Kent, UK which will result in the loss of 2400 jobs. A very sad down the track "adverse drug effect", particularly as the Sandwich lab was where Viagra was developed.

BMJ 2011;342:d771.

## **Gender empowerment and cigarette smoking**

This paper explores the hypothesis that in countries with high gender empowerment the female-to-male smoking prevalence ratio is also higher. Gender empowerment is not an expression that your scribe had met before but it relates to one gender being more powerful than the other.

In the more prosperous countries women have acquired increased economic resources, greater social equality and often greater political clout. Along with these they have unfortunately taken to the weed in greater numbers and these researchers attempt to quantify this by comparing the gender empowerment measure (GEM) with the female/male cigarette smoking prevalence or gender smoking ratio (GSR).

As you would expect the Nordic countries (Denmark, Norway, Sweden, Finland and Iceland) top the list for GEM and most are also top of the GSR. Whereas the Middle East trails at the bottom with their females underpowered and minimal smoking. And I am pleased to report that the GEM figure for New Zealand is approximately 4<sup>th</sup> place. Unfortunately, however, Kiwi females are in the top 10 of the GSR.

Bull WHO 2011;89:195–202.

## **Management of osteoporosis – intravenous zoledronic acid or oral alendronate?**

Osteoporosis-related low trauma fractures are associated with increased morbidity and mortality, and diminished quality of life. Oral bisphosphonate therapy has been shown to reduce the risk of subsequent fractures and alendronate (ALN) is frequently used in a dose of 70mg orally once per week.

The authors of this study note that adherence to weekly alendronate is often poor and has been reported as low as 50%. They speculate that an annual dose of 4mg of intravenous zoledronate (ZOL) would be as efficacious and safe. Their retrospective cohort study compared these regimens. Lumbar spine bone mineral density (BMD) improved 5.6% in the ZOL patients and 5.5% in the ALN group.

The figures for hip BMD were 2% in the ZOL patients and 2.5% in the ALN group. However, there were significantly more new fractures ( $p < 0.001$ ) in the ZOL group (7.2%) than the ALN group (1%). The ZOL group were significantly older ( $p < 0.01$ ) and had a significantly higher proportion of males ( $p < 0.05$ ) at baseline. There were no serious adverse reactions in either group so probably equally good, except for older men. I note that in NZ a year of ALN would cost \$467 and 5mg (not 4) of ZOL would cost \$600.

Int Med J 2011;41:186–90.

## **Loop diuretic tactics in patients with acute decompensated heart failure**

This paper concerns the various tactics possible for the patient who develops worsening failure on high dose oral frusemide. They randomised 308 such patients to treatment with frusemide administered intravenously by means of either a bolus every 12 hours or continuous infusion and at either a low dose (equivalent to the patient's previous oral dose) or a high dose (2.5 times the previous oral dose). Their endpoints were the patient's global assessment of symptoms and the mean changes in the serum creatinine.

The researchers found no significant difference in either end point between bolus and infusion techniques. There was also no difference in end points between the high and low dose groups. So they would recommend bolus IV frusemide at the same dose as was given orally? However, they also report that the higher IV bolus group had a greater diuresis but a transient worsening of renal function. Methinks, bolus at somewhat higher dose might be best.

N Engl Med 2011;364:797–805.

## **Paracetamol overdose induced acute severe hepatotoxicity**

Paracetamol (acetaminophen) hepatotoxicity is the commonest cause of acute liver failure (ALF) in the UK and I would venture to say that this is also the case in NZ. This report looks at data from 663 such patients admitted to the Scottish Liver Transplant Unit. The overdose was intentional in 75.4% and accidental in 16.6% whilst the pattern was unclear in 8%. Unintentional overdose patients were significantly older, more likely to abuse alcohol, and more commonly overdosed on compound narcotic/paracetamol analgesics compared with intentional overdose patients.

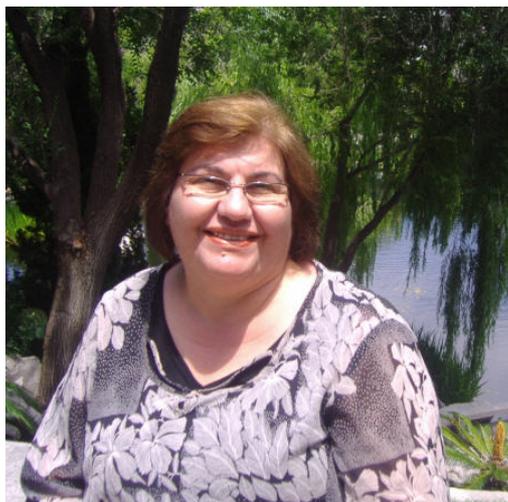
The paracetamol blood concentration and liver function tests were significantly lower in the unintentional patients. However their mortality rate, 38.2% was significantly higher than that of those with an intentional overdose (25.6%) and this was attributed to greater organ dysfunction at admission. As expected. Perhaps the accidental overdose subjects should have a lower threshold for N-acetyl cysteine and early referral to liver transplant units?

Br J Clin Pharmacol 2011;71:272–82.



## Maysoon Mahdi Abbas

Maysoon sadly lost her life on 22 February 2011 due to the catastrophic collapse of the CTV Building as a result of the 6.3 magnitude earthquake that hit Christchurch. Maysoon was examining a patient at that time; she lost her life while she was doing what she has always been proud of and passionate about.



Maysoon was born in Baghdad, Iraq. She graduated in 1973 with MBChB degree (Bachelor in Medicine and Surgery) from the College of Medicine, Baghdad University.

After progressing from house officer, senior house officer and registrar in different hospital departments in Baghdad, she was awarded a postgraduate scholarship and obtained MMedSci (Master of Medical Sciences) from Sheffield University, UK in 1981.

Photo taken at The Chinese Garden of Friendship near Darling Harbour, Sydney in 2010

Maysoon returned to Iraq in 1981 and lectured at the Medical School of Al-Mustansiriya University, in Baghdad for several years teaching immunology (her MMedSci specialisation) before leaving Iraq with her family in 1991 when the first Gulf War broke out.

From 1991 to 1993 she worked at a medical practice in Algeria as a GP before moving to Amman, Jordan where she worked for 2 years (1994–1995) as an immunology specialist at Al-Bashir Hospital, the main hospital in Amman.

In September 1995 Maysoon and her family migrated to New Zealand and settled in Christchurch, the city she loved and considered home. From 1996 to 2003 Maysoon worked as a Research Fellow at the Department of Obstetrics and Gynaecology, Christchurch School of Medicine, University of Otago. She was credited for establishing the cell immunoblot method, and set up the Western blotting for c-fos protein in gonadotroph cells where she published several papers on this subject.

Maysoon has important contribution to the research programme at the University of Canterbury bionanotechnologies that is now an integral part of the MacDiarmid Institute; Maysoon's position as a medical researcher at the School of Medicine during her early years in Christchurch helped to connect the Medical School, Otago University and the School of Engineering, Canterbury University through her husband (Associate Professor Maan Alkaisi) to begin strong and successful bionanotechnology programmes.

Maysoon was a strong woman and very determined; she made her family believe in themselves and taught them how to achieve their best. She devoted her life for her family and loved her profession as a medical doctor treating patients from different cultures. She worked and lived in five different countries (Iraq, United Kingdom, Algeria, Jordan and New Zealand). She enjoyed travelling and exploring new cultures and she loved artwork and cooking.

In 2003 Maysoon decided to go back to clinical practice and managed to pass successfully the NZREX Clinical Training Programme. She worked at different departments in Christchurch's main hospital and other hospitals (The Princess Margaret Hospital, Acute Psychiatry at Hillmorton Hospital).

Then in 2006 she joined the General Practitioner Training Programme and started working as GP in February 2007 in the West Coast for a rural attachment at High Street Medical Centre, Greymouth, and rural attachment at Westland Medical Centre, Hokitika which she enjoyed tremendously.

Due to family commitment she returned back to Christchurch to practice as a GP at the Moorhouse Medical Centre, 24 Hour Surgery, and lastly at The Clinic Medical Centre.

The respect and regard that Maysoon earned as a GP in the many, many tributes that have been posted online in her memory is demonstrated by the following examples from a patient, the Salvation Army, and a colleague respectively:

- I am one of the Clinic's patients and saw Maysoon often. I want her family to know that I am so thankful she wasn't happy with a mole on my back, correctly diagnosed a skin cancer and successfully removed it for me. She was such a patient and methodical person, dogged in her determination to get a correct diagnosis and treatment and I will miss her very much. She was taken from you far too soon.
- The Salvation Army Reintegration team want to send our condolences to the family of Dr Maysoon. We have worked with the doctors at the Clinic for the past couple of years. Dr Maysoon helped many of our clients and I know she will be remembered by them as well as our team at the Salvation Army. Dr Maysoon will be sadly missed, but always remembered as a doctor that really cared.
- Dear Maysoon, You are one of the kindest, most compassionate, professional and patient Health Professionals I have ever had the honour to have known. Your sense of humour, and pride and love for your family are well remembered. It has been an honour to have known and worked with you.

Maysoon was a wonderful wife, caring mum of three daughters, passionate doctor and will be missed dearly by her family, friends and patients. She worked very hard to see her family strong, successful and happy. Maysoon is best known for her infectious smile and that is how her family will always remember her and hope that everyone will remember her in that way too.

She is survived by husband Maan Alkaisi (Associate Professor, Department of Electrical and Computer Engineering, University of Canterbury, Christchurch); and daughters Sarah Alkaisi (Consultant Software Engineer), Marwa Alkaisi (Associate Project Engineer) and Mariam Alkaisi (University of Canterbury Student Environmental Science).

Maysoon's husband and three daughters wrote this obituary.

# THE NEW ZEALAND MEDICAL JOURNAL

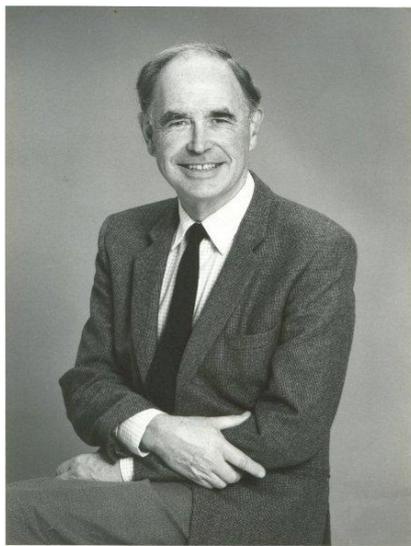
Journal of the New Zealand Medical Association



## Samuel Philip Wrightson

*20 February 1922 – 8 February 2011; MBE, BA(1942), MB, BChir(1945), MA(1946) (Camb.), FRCS (Edin.) 1948, FRACS*

Philip Wrightson was a neurosurgeon at Auckland Hospital from 1955 to 1987. He was an internationally acclaimed authority on concussion and a pioneer in the rehabilitation of head injury patients.



He was born in Darlington, England, where his father was the director of an engineering firm. He attended Aysgarth and Oundle Schools before entering Emmanuel College, Cambridge University. He studied natural sciences and then medicine. He received his clinical training at Newcastle General Hospital. After graduation he was a house surgeon in Darlington and then Surgical Registrar at Cherry Knowle Hospital, Northumberland for 18 months. After passing the FRCS examination in Edinburgh, he joined the surgical service of the Royal Air Force (RAF) and worked as an orthopaedic and general surgeon. While he was a medical officer in the RAF he met Prue Pumphrey, a physiotherapist from New Zealand.

They married in 1949 and 2 years later they came to New Zealand. He was a locum general surgeon at Taranaki Base and Wellington Hospitals and then was appointed as a general surgeon at Hutt Hospital.

In 1955 he successfully applied for a position as Junior Neurosurgeon at Auckland Hospital. He had no prior experience in neurosurgery and learnt from his two senior colleagues (Donald McKenzie and David Robertson) and from practical experience. In 1956 he was appointed Senior Neurosurgical Specialist and remained on the staff until he retired in 1987. He played a key role in the administration, and the clinical and educational activities of the Department of Neurosurgery. After visiting the Montreal Neurological Institute he introduced surgery for temporal lobe epilepsy to Auckland. He also developed the surgical treatment of pituitary tumours, first with implantation of radioactive seeds and later by transnasal surgery.

He was best known for his studies of the cognitive effects of mild head injury. Before the 1960s the prevailing opinion was that patients reporting persistent symptoms following mild head injury were either neurotic or malingering. This point-of-view was supported by the lack of abnormalities on the neurological examination and standard tests of mental function.

Dr Dorothy Gronwall, a neuropsychologist, devised the paced auditory serial addition test (PASAT) as a measure of the rate of information processing. Using the PASAT, Wrightson and Gronwall demonstrated slowing of cognitive processes following mild

head injuries. These studies were reported in the *Lancet* and have been acclaimed as landmark contributions on the subject.

Wrightson and his colleagues published other papers and two influential monographs on head injury: *Head injury: the facts: a guide for families and care-givers* (1990) and *Mild head injury: a guide to management* (Oxford University Press, 1999). He was a powerful advocate for appropriate rehabilitation following head injury. Wrightson and Gronwall established the first outpatient rehabilitation programme for patients suffering from concussion. He was the first patron of the Brain Injury Association.

Wrightson and Professor Val Chapman played a key role in establishing the New Zealand Neurological Foundation in 1976. Wrightson was the first Chairman of the Scientific Advisory Committee and the Foundation's Medical Director from 1983 to 1994. In 1997 the Foundation named a Post-doctoral Fellowship in his honour.

He served two terms as the President of the Neurological Association of New Zealand and was President of the Neurosurgical Society of Australasia from 1982–83. He was a Foundation Fellow of the Australasian Faculty of Rehabilitation Medicine. A Centre of Excellence established to develop and promote national standards in rehabilitation was named in his honour. In 1984 he received an MBE.

By nature he was serious, but he commanded a masterly use of puns. He was tall, gentlemanly in manner and softly spoken. On the few occasions when he was angry, the volume of his voice barely increased, but the biting sarcasm was unmistakable. His clinical decisions were made with great care and thought. His patients and their families remember him with immense gratitude and respect for his skill, devotion, patience and compassion.

After retirement he remained active in the affairs of the Neurological Foundation and in matters relating to head injuries. His advice and reports helped overturn Kevin Callan's conviction for murdering a 4 year-old child by shaking in England. He played the clarinet and piano and he was a skilled craftsman. He built himself a harpsichord.

Philip's health deteriorated after Prue died in 2009 and he died on 8 February 2011 from a cerebellar haemorrhage. He will be greatly missed by his son Matthew, daughter Amala, and his grand-children and great-grandchildren.

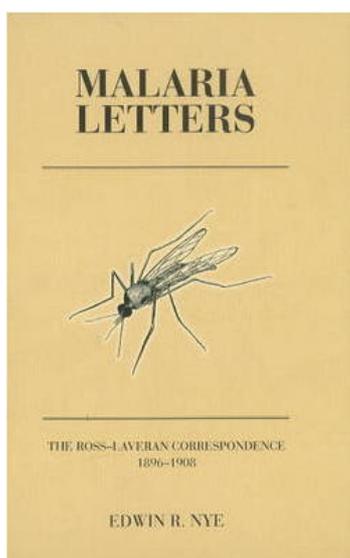
Dr Neil Anderson (Neurologist, Auckland City Hospital) wrote this obituary.



## Malaria Letters. The Ross-Laveran Correspondence 1896–1908

Edwin R Nye. Published by [Otago University Press](http://www.otago.ac.nz/press/), 2010. ISBN 9781877372667. Contains 64 pages. Price \$45.00

I feel I cannot comment on the book *Malaria Letters*,<sup>1</sup> without first talking about its author. I first came across Edwin Nye's name during my PhD research, when I read his 1962 Transactions of the Royal Society of New Zealand note that first described the presence of the Australian mosquito *Aedes australis* in the South Island of New Zealand.<sup>2</sup> It was only years later that I had the opportunity to meet him in person.



Ted, whom I believe is approximately 85 years-old now, is one of those doctor-scientists with a different investigative mind, the sort of breed that appears to be nearly extinct today, whose scientific interests venture into a wide range of fields. In the case of Ted, it was Entomology that attracted his interest, during his younger days at the London School of Hygiene and Tropical Medicine, no doubt inspired by the work of men like Alphonse Laveran and Ronald Ross.

It is therefore no surprise that Ted has written another book on doctors like himself, i.e. Laveran and Ross. Laveran was a *parisien* medical doctor, who won the 1907 Nobel Prize in Physiology and Medicine for his work demonstrating that protozoa were the causative agents of malaria.

Ross was an Indian-born doctor who followed on from Laveran's work, eventually showing that mosquitoes were responsible for the transmission of the malaria parasites. Ross' work won him the 1902 Nobel on the same category as Laveran.

This short book is remarkable in its simplicity, as it transports us to a forgotten time of a relatively recent history. To a time that it is difficult for those leaving medical school today to imagine. As Ted highlights in the chapter *The Correspondence*, those were times when communication across vast distances was an obvious challenge. One could argue that then, words sent away via mail were more carefully thought through, and not simply regurgitated in a matter of minutes. Further, as these letters would often take weeks to reach their addressees, they represented the writer's ideas and feelings over a much longer period of time, in comparison to the brief moments represented by email communications. Thus, I read with great interest this exchange between two scientists, in particular Ross' detailed and exciting account on the progress of his work, until he eventually proved that birds bitten by parasite-infected mosquitoes would become themselves infected.

These letters give the reader an insight into the work of two great scientists. Even if you do not have a particular interest in vector-borne diseases, I think these letters would be of interest as a window to the past.

It is a pity that the book does not contain a glossary of technical terms, which would have made it more accessible to a wider audience. Nonetheless, the book is a short and very interesting read. Personally, I see only one flaw in it: that it lacks a brief biography on its author (beyond a couple of sentences on the back cover), a man with a no less interesting life than his predecessors...

Dr José G B Derraik

Disease and Vector Research Group, Institute of Natural Sciences, Massey University, Auckland—and Liggins Institute, University of Auckland, Auckland, New Zealand

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2. Nye ER. *Aedes (Pseudoskusea) australis* Erichson (Diptera: Culicidae) in New Zealand. Trans Roy Soc NZ Zool 1962;3:33–34.