Australian Defence Force' Role in Regional Health Security: Missions Defined by Infectious Diseases

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> *'God alone would not have sent such an epidemic.'*
>
> Samoan Chief during New Zealand Samoan Epidemic Commission hearings 1919.[1]

History shows that infectious diseases often determined the ability of armed forces to maintain soldiers on campaign and sailors in ships. Prior to the industrialisation of warfare in World War I, disease casualties outnumbered combat casualties often by a large margin. For example, during the last stages of the Australian Imperial Force's Palestine campaign, disease casualties outnumbered combat injuries > 30:1.[2] Infectious disease threats still require careful pre-deployment planning and good medical support, especially in tropical operations where insect vectors may greatly increase disease risks. On occasion, however, infectious disease has been the mission focus rather than just part of the battlespace equation. Weapons of mass destruction include epidemic infectious diseases, whether purposefully introduced or—more likely—as an evolution of a naturally occurring infection. Because such missions are very context and disease-specific, it is worth examining the Australian Defence Force's (ADF) experience with military missions defined by an infectious disease epidemic. As new infectious diseases (Zika, Chikungunya, COVID-19) emerge to spread across the region potentially destabilising fragile island nations rapidly, the ADF needs to consider its history in order to inform its planning for future scenarios where its transport and logistical assets from both the military and civilian sector could be applied in defending Australia by controlling an epidemic in the region.[3]

Military forces have been applied to control infectious diseases historically when no other state function was available or seemed appropriate. During the last major outbreak of bubonic plague in Europe in 1720, the French Army constructed fortifications including a long perimeter wall to keep the citizens of Marseille confined in a type of quarantine to protect the rest of the nation.[4] The soldiers of the British regiment the King's Shropshire Light Infantry were awarded a campaign medal for their efforts in controlling plague in Hong Kong in 1894.[5] Human infections have not been the only ones requiring military forces. Animal 'depopulation' exercises in order to protect a livestock industry and prevent zoonotic infections spreading to humans have been conducted by the Malaysian Army in 1999 to destroy Nipah infected pigs, the British Army to kill cattle in areas of hoof and mouth disease in 2001 and the Thai Army to kill and dispose of avian influenza-infected chickens during the early 2000s.[6, 7] The ADF's own experience has been largely limited to pandemic (globally epidemic) influenza. The ADF's first-ever humanitarian mission was to send medical teams in *HMAS Encounter* to the influenza-stricken islands of Samoa in 1918.[8] In 1969 ADF medical teams were airlifted into the Papua New Guinea Highlands when pandemic influenza hit this particularly vulnerable, socially isolated population.[9] Both operations bear examination for future lessons regarding the use of military forces to control epidemic infectious diseases as part of humanitarian assistance missions.

HMAS Encounter to Samoa during the Influenza Pandemic of 1918

Influenza is one of the few diseases that can rapidly incapacitate an entire population leaving it vulnerable to other social disruptions. The influenza pandemic of 1918–1920 remains the world's most notable recent human mortality event, with an estimated 50 million people killed across the world. The ADF in Europe and the Middle East in 1918 suffered at least 1200 deaths due to influenza; some military missions were cancelled for lack of sufficiently healthy men.[10] Immediately following the defeat of the Turkish Armies in Palestine in September 1918, entire cavalry divisions were unable to move and barely able to water their horses due to influenza.[11] Influenza struck Australia in early 1919 and remains the nation's greatest natural disaster ever recorded

with at least 12 000 deaths occurring within a few months.[12] Some Pacific Island states were completely devastated by this respiratory virus. More than 8000 persons died in New Zealand from influenza during the 'Black November' of 1918[13] (See Figure 1). Approximately the same number of people died in Western Samoa from a population three per cent of the size of New Zealand.[14] This occurred following the New Zealand Army's capture of the German Colony of Samoa during the islands' military occupation at the end of World War I. A tramp steamer, the *SS Talune*, had managed to infect Fiji, Tonga and Samoa on a single trip leaving Auckland on 30 October.[15] Then as now, isolated Pacific islands remain highly dependent on imported items, especially food, energy and medical supplies. The New Zealand Government, on 19 November, requested that the Australians help Samoa as the New Zealand soldiers on Samoa had been overwhelmed; Auckland had no spare medical personnel due to its own influenza epidemic, and Australia had not yet been infected in late 1918.[1]

Figure 1: Karori Commonwealth War Graves Cemetery in Wellington, New Zealand showing tombstones of some of the 110 military recruits who died of influenza during two weeks in 1918.

Source: GD Shanks, February 2018.

The only available naval unit able to reach Samoa was the Royal Australian Navy's (RAN) *HMAS Encounter*, a cruiser that had just returned to Melbourne[16] (See Figure 2). A warning order was issued on 20 November, and the ship moved to Sydney to take on a Royal Australian Army Medical Corps (RAAMC) medical team of seven medical officers and 33 medical orderlies and a large cargo of medical supplies. Coal was a critical factor as the ship could not proceed at maximum speed and still reach the first refuelling point in Suva, Fiji, so it left Sydney moving at 13 knots. The crew and medical team were all 'vaccinated' in route with a Commonwealth Serum Laboratory's mixed bacterial vaccine which hurt everyone's arm but was unlikely to have provided any protection against the as yet undiscovered influenza virus.[17] *HMAS Encounter* arrived in Suva on 30 November; on discovering that Tonga had also been hit by influenza, a medical team of seven was detached to go to Nuku'alofa on another ship. Although a well-meaning decision of the RAN medical officer in charge, the sloop *HMAS Fantome* stationed in Suva was unable to sail to Tonga due to 67 sailors sick with influenza and the alternative civilian vessel developed mechanical failures and had to return without reaching Nuku'alofa.[16]

Figure 2: *HMAS Encounter* was the RAN cruiser sent on a medical relief mission to Samoa in November 1918 during the highly lethal influenza pandemic.

Source: http://www.navy.gov.au/hmas-encounter-i

HMAS Encounter proceeded to Apia, Samoa arriving on 3 December, by which time the epidemic was already waning, and most of the deaths had already occurred. Medical teams consisting of a medical officer and six medical orderlies were sent to different parts of Samoa to render what aid they could. *HMAS Encounter's* role was primarily limited to transportation of the medical teams to the point of embarkation. Most of the tents and blankets loaded in Sydney in anticipation of a different type of population disaster were not required and returned with the ship to Sydney on 17 December. Military personnel landed in Samoa did not return with *HMAS Encounter* to avoid any appearance of bringing influenza back into Australia. *HMAS Encounter's* crew underwent quarantine in Sydney and were not released from the ship until 26 December. The medical teams remained in Samoa until their return to Australia 7 February 1919. Ironically, they initially travelled to Suva on the *SS Talune* and arrived in Australia on the *SS Atua* just as influenza was spreading from Melbourne. It is uncertain how much use was made of the influenza vaccine among the Samoan people as opposed to the Australian soldiers/sailors.[16]

Although certainly appreciated by the local civilian medical and New Zealand military staff, the fastest possible response from the ADF arrived too late to deflect the enormous disaffection felt by the Samoan people towards the New Zealand military government. Over a fifth of the Samoan population had died following the introduction of a virus that could be directly traced to Auckland. This compared poorly with the successful quarantine of American Samoa 40km away where the US Naval Base Commander stopped all direct contact with populations outside Pago Pago; American Samoa was one of the few places globally that completely escaped the 1918–1920 influenza pandemic.[18] The military governor of Samoa LTCOL Logan was relieved, and a commission of inquiry set up. The commission noted that the captain of *SS Talune* was economical with the truth when he claimed not to know that influenza was infectious.[1] The Samoan independence movement traced its beginnings to the influenza disaster in 1918. This remained a serious matter for political discussion as late as 2002 when the New Zealand Prime Minister Helen Clark apologised to Samoa for the infectious disease epidemic that had been brought to Samoa 84 years previously as a tragic mistake caused by inept and incompetent administration.[19]

Papua New Guinea Highlands Relief Mission during Influenza Pandemic 1968–69

In 1918 the large populations living in the New Guinea Highlands were unknown. Subsequent medical experience, however, showed that such socially isolated groups were vulnerable to new respiratory infections, especially influenza, which often developed into lethal pneumonia.[20] Another influenza pandemic known as the 'Hong Kong' flu began in Asia in 1968 when the virus changed its surface proteins, thus escaping neutralisation by the human immune system.[21] Public health authorities in Papua New Guinea were aware of the threat and obtained current supplies of the now efficacious influenza vaccine from Australia, but were reassured when initial reports of influenza from the lowlands were less severe than feared. Over 200 000 doses of influenza vaccine were used in preparation for the arrival of the new influenza strain, but that was not a lot compared to the total Papua New Guinea population of a few million. In 1969 the two battalions of the Pacific Islands Regiment were still under ADF control as part of the Territory of Papua New Guinea. There were three DHC-4 Caribou aircraft from No 38 Squadron based in Port Moresby with occasional C-130 Hercules missions from No 36 Squadron in Australia[16] (See Figure 3).

Figure 3: Koroba airstrip in the southern highlands of Papua New Guinea showing RAAF C-130 Hercules and DHC-4 Caribou in 1969 at approximately the same time as medical relief operations due to the influenza epidemic.

Source: James Hunter[22]

Influenza returned to Port Moresby in May 1969 and had spread into the highland areas by August. The remoteness of the highland populations with little medical infrastructure partially explains the poor outcomes that occurred. By October, the public health authorities were aware of over 1000 influenza-related deaths and knew these were only the ones that the administration had managed to count; the actual mortality was likely to be much higher. An Influenza Relief Committee was formed 20 October 1969 chaired by the Minister of Health. The next day the committee met with ADF unit commanders and began planning what became known as 'Operation Enza'. It was past the time when an influenza vaccine would have been able to stop an epidemic, so emphasis was placed on delivering medical support to remote highland areas with the goal to prevent pneumonia deaths primarily through the administration of penicillin. Initially, the mission was to establish three small field hospitals as bases of operations in the highlands and then to send out foot patrols to remote areas with serious cases being medically evacuated by light aircraft or helicopter. The Commanding Officer of the 1st Battalion Pacific Islands Regiment (PIR) was in charge of ground operations with airlift being provided by 183rd Reconnaissance Flight at Lae and three UH-1 helicopters from No. 5 Squadron then on exercises in Papua New Guinea.[16]

Each of the three contingents was based on a PIR company to which a medical officer and 15 medical assistants were added. Mendi in the southern highlands was the base of operations, which began functioning from 22 October. By 24 October, 350 military personnel were in the highlands assisting

the existing civilian medical personnel. Further medical support was determined to be required on 27 October. Six medical officers with 61 medical assistants from two RAAMC field ambulance units were deployed from Brisbane between 28–31 October. An experienced senior medical officer was the liaison officer to the primary command cell, which was based in Port Moresby. Fourteen medical patrols, each consisting of a medical orderly, radio operator, several PIR soldiers and local health personnel, were expected to travel to remote areas on foot and then treat up to 1000 people per day. Cultural attitudes limited the willingness of severely ill people to leave their villages, so most treatment consisted of injections of penicillin with few evacuations.[9, 16]

By early November it was apparent that the influenza epidemic was waning. Most of the Australian based medical personnel returned to Australia on 20 November with airlift provided by RAAF DHC-4 Caribou and C-130 Hercules aircraft. At its peak, Operation Enza involved 700 military personnel for up to six weeks in the highland areas. Approximately 3500 deaths occurred during the influenza epidemic based on official counts. Although the military support was much appreciated in Papua New Guinea as a sign of commitment to help during a crisis, the reality was that once an epidemic was large enough to cause public health concern sufficient to ask for help, there was little that could be done to ameliorate the outcome.[9, 16]

Influenza remained a medical risk to the ADF in Australia, especially in training units. In 1985 the recruit training battalion at Kapooka was closed by an influenza epidemic. Wagga Wagga's 7 Camp Hospital was over capacity with 60 additional inpatients sent to 3 Camp Hospital in Puckapunyal. Attack rates of only 1–2% were still able to strain the deployed medical facilities during Talisman Sabre 2005 and 2019. The Royal Military College's field exercise of 2006 was cancelled due to 200 cadets with influenza. Although COVID-19 has not caused any epidemics within the ADF (as of June 2020) this possibility certainly cannot be ignored as a potential threat.

Criteria and limitations for infectious disease defined missions

Even from the limited examples cited, one can see that infectious disease epidemics are less predictable that most natural disasters where the ADF might be tasked to respond. Uncertainty is the enemy of planning, but some basic principles can be derived from previous experience. In most situations, the ADF will be in a supporting role to civilian health authorities where the capabilities required are primarily transport and logistics. Situations in which the military could have the leading role might include epidemics in an active war zone where no civilian authority exists, critical incidents where the possibility of a deliberate biological agent attack cannot be ruled out, and epidemics that primarily involve military units.

A recent example is the 2015 deployment of US (engineers) and UK (medics) military forces to Liberia and Sierra Leone to assist in stopping an Ebola epidemic.[23] Although ADF help was requested to assist staffing the UK military field hospital, unlike the Irish and Canadian Armies, Australia devised a civilian response. The decision not to send any ADF members was multi-factorial, including the great distance of the epidemic from Australia and the inability of the RAAF to safely evacuate patients with highly lethal infectious diseases back to Australia. It is likely that future infectious disease epidemic responses from Australia will emphasise civilian rather than military units.

There are distinct limitations to the ADF's or any arm of the Australian Government's ability to intervene successfully in an infectious disease epidemic. Many of these limitations are biologically based, such as once an epidemic has been fully generated, effective options for prevention are limited. Quarantine is a classical public health intervention that has little role in such an interconnected world where a person can be anywhere else in the world in a single day, while asymptomatically incubating an infection. Using military units to try to enforce the isolation of Marseille in 1720 was extremely unpopular and any similar situation today is likely to be infinitely unpopular, impractical and ineffective. Expatriate medical staff make good media impact as a sign of concern and commitment, but they are not a sustainable intervention for developing countries. Advanced diagnostic capability in Indo-Pacific Region is very limited, which means new information about an infectious disease epidemic is likely to be either very limited or completely incorrect (e.g. malaria epidemic turns out to be influenza), which only adds to high levels of uncertainty. Australia has had several bad experiences with biological agents that did not behave as initially planned, such as rabbits and cane toads; therefore, strong prohibitions exist against bringing exotic infectious agents into Australia. This is especially true for veterinary pathogens that could cause tremendous economic damage even if, like foot-and-mouth disease or African swine fever, they never infect humans. One has to always be cognizant of the actual medical capacity of the ADF, which is quite limited. Medical specialists are nearly

all in the Reserve Components, and the only Active Duty specialist infectious disease unit in the ADF is the ADF Malaria and Infectious Diseases Institute at Gallipoli Barracks in Queensland. Deployment of entire ADF medical unit such as a field hospital could severely limit deployment of other ADF units depending on such support and thus compromise more traditional military missions for which there are no alternatives. Smaller ADF medical units have been successfully deployed in the recent past in the Pacific without major decrements to capability.

Possible future scenarios

A few hypothetical scenarios are worth examining to clarify one's thinking about infectious disease epidemics. Persons with fever, rash, headache and joint pains have dengue-like infections, which are caused by several viruses besides the classical dengue viruses. In a person just returned from Bangkok or Bali, dengue is a likely pathogen. Dengue can be indigenously spread by Australian mosquitoes north of Rockhampton. The economic impact of a dengue epidemic in holiday areas of Queensland would be severe, as tourists may cancel hotel bookings. Dengue introductions into Australia might also be blamed on returned military members regardless of the epidemiological evidence. In areas where the ADF have military exercises (Shoalwater Bay Training Area), fever and rash symptoms would be more likely due to Ross River Virus (RRV).[24] RRV is usually not a serious infection, except for the unfortunate few who develop chronic arthritis. RRV has another characteristic that makes it of interest to the ADF; it proved in 1978–80 that it was capable of spreading through small island nations (Fiji, Tonga, French Polynesia) due to the virus' ability to use multiple species of mosquito vector.[25] Island epidemics, when they occur, are explosive, infecting large numbers suddenly, thus incapacitating more people than would be the case for an endemic virus that has a continuous low level of transmission. Having a distinctly Australian virus incapacitate an entire Pacific Island nation has some political implications besides its medical importance.

Haemorrhagic fevers similar to Nipah or Hendra virus are rare zoonoses (disease spread from animals to humans) with a great deal of associated fear due to the high mortality rates that occur in confirmed infections.[26] Such viruses may have a social impact much higher than their actual medical importance due to the ability of various mass media to attract attention to anything that is both novel and lethal. Given social media's propensity to spread conspiracy theories and blame malignant external forces, rare natural infections may be incorrectly presented to the general public as biological weapons. Although extremely unlikely, it is difficult to rule out intentional acts in an infectious disease epidemic, especially when various terrorist groups routinely claim credit for news events entirely unconnected to them. Once the actual epidemiology of an outbreak is documented, it is usually apparent that one is dealing with a naturally occurring infectious disease, but getting to that point may not be quick or easy.

Sometimes, common infections occurring in special populations take on undue importance that may involve the military. Consider the difference in an outbreak of food poisoning in a gathering of state school teachers as opposed to one on the Prime Minister's official aircraft. Unknown fevers occurring in specific groups of Australians living in Asia could also take on importance beyond the facts of the actual illnesses. At times when officials want a quick answer to a difficult problem, they will think of the military as a ready solution. Being able to clearly state what capabilities the ADF does and does not have in such situations can help such officials come to appropriate choices when faced with news media's insistence to do something.

Conclusion

Infectious diseases are a type of threat agent that, has in the past and will certainly in the future, influence military operations. Usually, this will be an additional occupational hazard of the battlefield as with malaria during jungle operations. On occasion, however, infectious disease will become the primary focus of a military mission. If outside a zone of armed conflict, it is likely that the ADF will play a supporting role with other governmental agencies leading the response as in other natural disaster interventions. Careful thought needs to be given to regional contingencies that might be driven by changes in known pathogen (e.g. RRV) or the emergence of a completely new and unfamiliar agent (e.g. COVID-19). Although natural infections are always the most likely possibility, the ADF needs to have access to advanced diagnostic capabilities if required to rule out the intentional release of a biological agent for malign purposes. The ADF's ability to quickly deploy into difficult areas will likely be called on in the future to deal with unanticipated infectious disease problems in the Indo-Pacific Region.

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