Research about New Zealand's nuclear veterans

A summary of information and research that has influenced the Crown's policies regarding New Zealand nuclear veterans.

> **Events, research, and reports are displayed chronologically from oldest to most recent.**

Jump to the most recent report (https://www.veteransaffairs.mil.nz/about-veterans-affairs/our-documents-and-publications/research/research-about-new-zealands-nuclear-veterans/#nuclear-2023)

Hiroshima, Nagasaki, and the occupation of Japan

Dropping of atomic bombs, August 1945

The US dropped 2 atomic bombs on Japan in August 1945:

- uranium bomb on the city of Hiroshima on 6 August 1945
- plutonium bomb on the city of Nagasaki on 9 August 1945.

Estimates of deaths from acute effects of the bombs within first 4 months range from 129,000 to over 246,000, with approximately half occurring on the first day. In the following months many more people died from burns, radiation sickness, and other injuries.

Clean up of Hiroshima started the day after the atomic bomb was dropped. It took 2 years to clear the rubble and debris. Hiroshima now has no detectable radiation from the atomic bombing and an estimated population of 1.15 million as of 2006.

The study of illness and death in atomic bomb survivors has formed most of our knowledge about:

- what is a harmful dose of ionising radiation and
- what are the impacts of harmful doses of ionising radiation on human health.

Jayforce, February 1946 to March 1949

New Zealand took part in the occupation of Japan as part of the British Commonwealth Occupation Force. The NZ force was an infantry brigade group, joined by 14 squadron from RNZAF in March 1946. The NZ troops were commonly referred to as Jayforce.

Jayforce's two main tasks were demilitarisation and demobilisation. Later it became involved in policing duties. It was initially deployed in Yamaguchi prefecture and Eta Jima Island. It took over responsibility for neighbouring Shimane prefecture after departure of the Indian contingent of the British Commonwealth Occupation Force. Approximately 12,000 New Zealanders, including several hundred women, served in Jayforce.

Parts of Eta Jima Island are within 10 miles of the Hiroshima's city limits. This is significant as the US-government definition of veterans exposed to harmful doses of ionising radiation includes personnel that had official military duties within 10 miles of the city limits of either Hiroshima or Nagasaki commencing 6 August 1945 and ending 1 July 1946. It is unknown how many New Zealand service personnel were deployed on Eta Jima Island and how long they were deployed

there.

The distance between Hiroshima and the borders of Yamaguchi and Shimane Prefecture are approximately 24 miles in a direct line. The distances between Nagasaki and the localities that Jayforce occupied are much further.

The state of war with Japan didn't legally cease until 28 April 1952.

British and United States nuclear tests

Operation Hurricane, 1952

This was Britain's first nuclear test. It was conducted off the North West Australian coast on 3 October 1952. The RNZAF took part in monitoring the radioactivity, by conducting flights to the North and South of Auckland and a return flight to Suva.

NZ observers and indoctrinees at nuclear-weapon tests, 1956 to 1958

In the 1950s, 11 NZ Forces observers attended British and US tests of nuclear weapons, including Operation Grapple.

Some observers, at British tests at Maralinga in South Australia,1956, took part in an Indoctrinee Force, for experience of nuclear-explosion effects to pass on to NZ colleagues. Activities included:

- visiting area around ground zero after detonations
- testing protective value of types of clothing for military activities in the fall-out zone.

Those who took part in the Indoctrinee Force were the most at risk of exposure to harmful ionising-radiation doses. British authorities monitored radiation exposure of all officers taking part in the Indoctrinee Force. None received a dose in excess of the maximum safe dose set for the operation.

In 2001, in response to public concern, the government followed up the eleven for any adverse health effects from their observation of the nuclear tests:

- 6 were alive, aged 71-87
- 5 were aged 54, 59, 67, 71 or 81 at time of death.

None of the 6 living were on War Disablement Pensions for a condition on the conclusively presumed list for ionising radiation. The Ministry of Health advised it was extremely unlikely any of the recorded causes of death were linked to observation of the tests.

UK personnel for duty at Maralinga - a memo for British War Office on safety measures, 1957 [PDF, 1.3 MB] (https://www.veteransaffairs.mil.nz/assets/Research/58308993e7/UK-Nuclear-service-at-Maralinga-requirements-19-November-1957.pdf)

NZ observers and indoctrinees at nuclear weapon tests report by John Crawford, Deputy Director History (NZDF), 2001 (https://www.veteransaffairs.mil.nz/assets/Research/8ec5dce7a5/Research-on-NZ-at-Nuclear-testing-1957-1958.pdf)

Nuclear test investigation completed – press release by Minister of Veterans' Affairs, 2001 [PDF, 148 KB] (https://www.veteransaffairs.mil.nz/assets/Research/7296cedc0d/Nuclear-Test-investitigation-media-statement-15-July-2001.pdf)

Operation Grapple, 1957 to 1958

In 1957 and 1958 the United Kingdom conducted tests of thermonuclear weapons off Christmas Island and Malden Island in the Line Islands. These islands are now part of the Republic of Kiribati. All the tests were air bursts. An air burst is when the fireball generated by the explosion does not touch the Earth's surface. This kind of nuclear explosion produces much less local radioactive fallout than ground bursts. A comprehensive set of procedures and arrangements were put in place by British authorities to minimise risks associated. The precautions were based on the best available knowledge at the time. They included stationing ships, whenever possible:

time. They included stationing ships, whenever possible:

- away from areas likely to be contaminated if a surface burst occurred
- up-wind of the test site.

HMNZS Pukaki and HMNZS Rotoiti acted as weather ships for:

- 4 tests off Malden Island during May and June 1957 (Pukaki and Rotoiti)
- 1 test off Christmas Island on 8 November 1957 (Pukaki and Rotoiti)
- 5 tests off Christmas Island in August and September 1958 (Pukaki)

The crews of HMNZS Pukaki and HMNZS Rotoiti spent time on Christmas Island between tests.

Radiation monitoring equipment was on board both HMNZS Pukaki and HMNZS Rotoiti. Available information indicates only one instance of detected radiation. On 29 April 1958 HMNZS Pukaki passed through surface zero the day after a test. A very low of level of radiation was detected in HMNZS Pukaki's boiler room inlets.

It appears that each crewman was also issued with a film badge to monitor personal exposure to radiation before each test. But these film badges were not processed, principally because of problems with storing the chemicals need for processing. The film badges that were processed, mostly from British personnel stationed near the test sites, indicated very low exposure to radiation. During the first two tests analysis of film badges indicated exposure of the less than 50 milliroentgens.

Stations were also established to monitor radioactive fallout, at:

- Christmas and Canton Islands
- Penrhyn Island, in the Cook Islands
- Apia in Western Samoa.

A report by the Atomic Weapons Research Establishment on the fallout from the first series of tests was passed to the NZ government in October 1957. It reported that very little fallout had been recorded. For instance, at Apia fallout due to the tests amounted to 7% of the dose due to natural background radiation in one year. Marine life was also monitored for radioactive contamination. No contamination was found.

Observation of British H-bomb test in Pacific, 15 May 1957, report by NZ scientist [PDF, 1.6 MB] (https://www.veteransaffairs.mil.nz/assets/Research/ebbf0a418f/Report-on-observation-of-H-Bomb-test-in-the-Pacific-15-May-1957.pdf)

Involvement of RNZN in British nuclear testing programmes, 1957 & 1958, report by John Crawford [PDF, 5.6 MB] (https://www.veteransaffairs.mil.nz/assets/Research/ba979eab81/Involvement-of-RNZN-in-British-Nuclear-testing-1957-1958.pdf)

New Zealand frigates protesting French atmospheric nuclear tests in Mururoa, 1973

In 1973 the New Zealand government sent two Royal New Zealand Navy frigates to stand off Mururoa as a protest. HMNZS Otago observed the first test on 21 July and was replaced by HMNZS Canterbury who observed the second test on 28 July.

The devices exploded by the French were nuclear triggers, not nuclear weapons. The NZ frigate commanders had established a safety link to the French armed forces. This advised the NZ commanders when a test was being detonated, so they could ensure the frigates would be at a safe distance. The minimum safe distance from the detonations was 12 nautical miles. Neither frigate came within 20 nautical miles of a detonation.

Both frigates had radiation detection equipment on board. This included film-type dosimeters ("badges") for personal dosimeter measurements. The dosimeters were given to a representative sample of the ship's company, particularly those most likely to be exposed to ionising radiation. The dosimeters didn't detect any dose from external ionising

radiation that exceeded the minimum detectable dose of 12 millirad.

Documents from National Radiation Laboratory [PDF, 600 KB] (https://www.veteransaffairs.mil.nz/assets/Research/be19654f15/Radiological-protection-for-RNZN-Ship-25-June-1973.pdf)

Radiological survey of Christmas Island, 1981

In 1981 the NZ National Radiation Laboratory did a radiological survey of Christmas Island, at the request of the British Overseas Development Administration. This was in response to a request from the newly independent Republic of Kiribati.

The survey found no significant deposits of radioactive fallout on Christmas Island. This was consistent with British monitoring of personnel during Operation Grapple, which found only small groups of personnel (such as aircrew involved in cloud-sampling) exposed to significant doses of ionising radiation.

NZ Archives holds a copy of the radiological survey (http://archway.archives.govt.nz/)

Reports by UK Nuclear Radiation Protect Board, 1988 to 2003

In 1983 the UK Ministry of Defence commissioned the National Radiological Protection Board to investigate if British atmospheric nuclear weapon tests and a related experimental programme had had a detrimental impact on participants' health. The study compared rates of mortality and cancer incidence of:

- over 20,000 test participants
- similar-sized control group of ex-servicemen who hadn't taken part in the test programme.

First report was released January 1988. It concluded that there was an increased risk of multiple myeloma and leukaemia (other than chronic lymphatic leukaemia) in test participants compared to the control group.

First report of the Nuclear Radiation Protect Board [PDF, 13 MB] (https://www.veteransaffairs.mil.nz/assets/Research/bea9ae09c7/Mortality-and-Cancer-incidence-in-UK-participants-nuclear-weapon-tests.pdf)

Second report was released in 1993. It concluded the increased risk of multiple myeloma suggested in first report wasn't supported by additional data. There remained an increased risk of leukaemia (other than chronic lymphatic leukaemia) in test participants compared to the control group.

Second report of the Nuclear Radiation Protect Board [PDF, 11 MB] (https://www.veteransaffairs.mil.nz/assets/Research/b902bcd83b/Mortality-and-Cancer-incidence-1952-1990-for-pers-in-UK-Nuke-Weapon-Tests.pdf)

Third report was released February 2003. It confirmed no increased risk of multiple myeloma in test participants compared to the control group. It also concluded:

> "There is some evidence of a raised risk among test participants relative to controls, particularly when focussing on leukaemia other than CLL [Chronic Lymphatic Leukaemia]. This could be a chance finding ... However, the possibility that test participation caused a small absolute risk of leukaemia other than CLL among men cannot be ruled out; the evidence for any increased risk appears to have been greatest in the early years after the

> appears to have been greatest in the early years after the tests, but a small risk may have persisted in more recent years."

Third report of the Nuclear Radiation Protect Board [PDF, 587 KB] (https://www.veteransaffairs.mil.nz/assets/Research/55e7309ef8/Mortality-and-Cancer-incidence-1952-1998-in-UK-nuke-weapon-test-pers.pdf)

Study of mortality & cancer in Operation Grapple veterans 1990 and 1996

The NZ Ministry of Defence commissioned a study analysing patterns of mortality & cancer incidence in NZ Operation Grapple veterans, in response to veterans' concerns. The study was conducted by a Wellington School of Medicine team, led by Dr Neil Pearce and Dr Ian Prior.

The study published 2 reports, one in 1990 and a follow-up in 1996. The study concluded that some leukaemias, and possibly some other haematological cancers (cancers of the blood), may have resulted from participation in Operation Grapple. It found no increased risk of death from non-haematological cancers or from causes-of -death other than cancer.

The government responded by announcing (1990) that test veterans who developed haematological cancers would be eligible for war pensions. The Secretary for War Pensions introduced (2007) a list of presumptively-accepted conditions linked to ionising-radiation exposure. The list includes haematological cancers.

The study has flaws calling into doubt the validity of its findings. In 1999 Dr McEwan commented on it as part of the Inquiry into the Health Status of Children of Vietnam and Operation Grapple Veterans (Reeves Report). He noted that:

- elevated risk of haematological cancers was mainly due to 4 deaths from leukaemia—however, 1 case was chronic lymphocytic leukaemia, which hasn't been demonstrated to be caused by radiation
- 25 years post-exposure, the increased leukaemia risk in exposed Japanese populations from Hiroshima and Nagasaki (15-29 age-group) falls to zero.

Consequently, Dr McEwan concluded that the study's findings:

> without further evidence ... cannot be considered to provide any support for radiation exposure as a cause of the small increase in leukemias.

The NZ Nuclear Test Veterans' Association (NZNTVA), representing Operation Grapple veterans, was offered (2010) the opportunity to take part in another study. This would have addressed the flaws in the study commissioned by the Ministry of Defence. The NZNTVA declined the invitation.

First report (Wellington School of Medicine), March 1990 [PDF, 5 MB] (https://www.veteransaffairs.mil.nz/assets/Research/8c257b054b/Mortality-and-cancer-incidience-in-NZ-pers-in-UK-Nuke-weapon-tests.pdf)

Second report (Wellington School of Medicine), June 1996 [PDF, 3.6 MB] (https://www.veteransaffairs.mil.nz/assets/Research/1cb13c8eca/Mortality-and-incidence-nz-pers-in-UK-nuke-weapon-tests.pdf)

Press release by Minister of Veterans' Affairs on the results of 1996 report [PDF, 1.4 MB] (https://www.veteransaffairs.mil.nz/assets/Research/fd47dfa88b/Minister-releases-report-on-Nuclear-Test-

Veterans.pdf)

Comments by Dr McEwan for Reeves Report on the potential for radiation induced genetic effects in children of Christmas-Island veterans [PDF, 431 KB] (https://www.veteransaffairs.mil.nz/assets/Research/fdfef7ce1f/Report-on-potential-for-radiation-induced-genetic-effects-in-Christmas-Island-Veteran-children.pdf)

Study of mortality of participants in Crossroads Nuclear Test (1996)

In mid 1946 the US conducted a series of two tests at Bikini Atoll, codenamed Operation Crossroads. The sea spray caused by the second test caused extensive radioactive contamination.

The Mortality of Veteran Participants in Crossroads report was released 1996 by US Institute of Medicine (IoM). It found a higher mortality among Crossroads participants compared with other naval personnel, but this was not statistically significant for the disease groups, including cancers, that were considered. The study concluded that the findings did not support a hypothesis that exposure to ionising radiation was the cause of increased mortality among Crossroads participants.

Mortality of Veteran Participants in Crossroads (http://www.nap.edu/catalog/5428/mortality-of-veteran-participants-in-the-crossroads-nuclear-test)

Review of health studies on atmospheric nuclear-weapon test participant, 1997

Literature review

A review was commissioned by the War Pensions Medical Research Trust Fund Board, and published 1997. The purpose was to provide information that could be used to:

- provide assessment guidelines
- inform decisions about what further research, if any, should be undertaken.

Review of health studies of atmospheric test participants [PDF, 6.5 MB] (https://www.veteransaffairs.mil.nz/assets/Research/701c196a28/Critical-review-of-health-effects-in-participants-of-nuclear-weapon-tests.pdf)

The report found:

> no clear evidence or consistent pattern of increased mortality and cancer risk among atomic veterans, despite a number of suggestive findings.

It questioned the merits of conducting further epidemiological research given the difficulties involved, such as:

- small number of New Zealand veterans
- lack of information about the doses of ionising radiation they were exposed to.

The report concluded:

- evidence was insufficient to support significant changes in the assessment guidelines at present
- further epidemiological research was not feasible at the time.

Professor Pearce's comments

Comments were sought from Professor Pearce on the report. He agreed there was little point conducting further research into Operation Grapple veterans. But he was critical of both:

research into Operation Grapple veterans. But he was critical of both:

- the way the review had been conducted and
- the researcher's lack of understanding of epidemiology.

He recommended that, next time the War Pensions Medical Research Trust Fund Board commissioned a review of the scientific literature, it:

> hire an experienced epidemiologist, who is able to critically review the material, rather than just quoting what other reviewers say, and is prepared to make the draft report available to interested parties ... to allow factual errors to be corrected and methodological issues to be clarified.

Comments of Professor Pearce, Wellington School of Medicine [PDF, 898 KB] (https://www.veteransaffairs.mil.nz/assets/Research/0f9f04969a/Neal-Pearce-response-to-critical-review.pdf)

Reeves report, 1999

Inquiry

The inquiry into health-status of children of Vietnam and Operation Grapple veterans was initiated in 1998 by the Prime Minister, in response to veterans' concerns. The purpose was to:

- determine if exposure to chemical agents or nuclear radiation was responsible for health problems in the children of those who had served
- (if so) recommend measures to assist affected children. Sir Paul Reeves chaired the advisory committee that undertook the Inquiry.

To classify the children's health, the Inquiry adopted 4 categories of association (similar to those used by the IoM for its reports on the health of US veterans):

- sufficient evidence of an association
- limited/suggestive evidence of association
- inadequate/insufficient evidence of association
- limited/suggestive evidence of no association.

Findings were presented in June 1999. For children of Operation Grapple veterans, all conditions were classified as 'limited/suggestive evidence of no association'. That meant current scientific & medical knowledge didn't support a link between veterans' exposure to ionising radiation and their children's health.

But the Inquiry noted that:

- scientific analysis couldn't provide a categorical assurance to dispel children's belief that they'd been harmed by their parent's service
- veterans and their families have a particular status in New Zealand, and the government has a duty to look after them.

Recommendations

The Inquiry recommended:

The inquiry recommended:

- children whose condition falls into the ‘sufficient evidence of association’ or ‘limited/suggestive evidence of an association’ categories be provided with non-means-tested medical treatment & social care
- A programme of special assistance—case management, family counselling, genetic counselling—be established for the children
- The Office of Veterans’ Affairs be responsible for helping the children, providing information & training for health professionals and others who work with veterans' children and establishing research capability to provide information on their health.

Outcome

Cabinet accepted the recommendations. A programme of special assistance for children of Operation Grapple veterans was introduced (2001):

- case management,
- family counselling
- genetic counselling for natural-born children of Operation Grapple veterans, conceived after their parent’s service.

As another outcome, Veterans' Affairs sought expressions of interest for a review of all available international research on the health of children of Vietnam & Operation Grapple veterans. Wellington School of Medicine won the tender (see McLeod Report below).

Reeves Report [PDF, 12 MB] (https://www.veteransaffairs.mil.nz/assets/Research/3c289fd60c/Inquiry-into-health-of-children-of-Vietnam-and-Operation-Grapple-veterans.pdf)

Cabinet Minute approving additional health services for Operation Grapple children, April 2001 [PDF, 113 KB] (https://www.veteransaffairs.mil.nz/assets/Research/2f1ec8df6a/Cabinet-minute-on-improvie-services-to-veterans.pdf)

Family history protocol study (2000)

The Family History Protocol Study (2000) was:

- commissioned by the NZNTVA, using $30,000 granted by the War Pensions Medical Research Trust Fund Board
- carried out by the University of Dundee Medical School.

Family History Protocol Study [PDF, 3.1 MB] (https://www.veteransaffairs.mil.nz/assets/Research/b4aa21a8b0/Family-History-Protocol-Study-Report.pdf)

It was a self-reported morbidity study of about 20% (all NZNTVA members) of the original Operation Grapple contingent. It included data on the health of their children and grandchildren. It found high rates of cancer and non-cancerous conditions in veterans and their children. It has flaws calling into doubt the validity of its findings:

- selection bias—as only members of the NZNTVA and their family members participated in the research and those who had health conditions were likely to be more motivated to participate in the study than those who were healthy
- no control group or comparison to a cohort that shared similar characteristics e.g. age, smoking habits
- no analysis of the statistical significance of the results. This is important given the relatively small size of the sample and the rarity of some of the conditions identified in the study.

IoM report: mortality of military participants in US nuclear-weapon tests (2000)

The Mortality of Military Participants in US Nuclear-Weapon Tests (Five Series Study) found the test participants and comparable non-participants had similar risks of death, including from cancer. Test participants had a 14% higher risk of death from leukaemia, although this difference was not statistically significant. The findings were broadly consistent with exposure to radiation being a cause of increased rates of leukaemia, but not conclusive. The study concluded test

participates did not experience widespread early death, even for leukaemia.

Mortality of Military Participants in US Nuclear-Weapon Tests Five Series Study (http://www.nap.edu/catalog/9697/the-five-series-study-mortality-of-military-participants-in-us)

McLeod report (2001)

The McLeod Report was a comprehensive review, by Wellington School of Medicine, of all available international research on the health of children of Vietnam and Operation Grapple veterans.

It found available scientific evidence did not generally support veteran's perceptions that their exposure had harmed their children's health.

The McLeod Report [PDF, 1.5 MB] (https://www.veteransaffairs.mil.nz/assets/Research/4e756b16f1/Critical-Appraisal-of-research-on-OP-Grapple-and-Vietnam-veterans-children.pdf)

Massey University studies (2005-2007)

Sister chromatid exchange study

The War Pensions Medical Trust Fund Board commissioned a study from Molecular Bioscience Institute (Massey University), headed by Dr Rowland. The purpose was to determine if there was evidence of genetic damage to Operation Grapple veterans from ionising-radiation exposure. The report was presented in 2005.

The study assessed exchange of identically-joined pairs of a single chromosome (sister chromatids) in exposed veterans compared to a control group. It found elevated chromosomal disturbances in peripheral blood lymphocytes in Operation Grapple veterans. The effect size was weak but observable, and was deemed significant.

The peer reviewers agreed that the result was statistically significant. But they were not satisfied, to varying degrees, that smoking could not be ruled out as a confounding factor.

The study [PDF, 10 MB] (https://www.veteransaffairs.mil.nz/assets/Research/2aa33bdc71/NZ-nuclear-Test-Veterans-Study.pdf)

Dr Bryant's review of the study [PDF, 251 KB] (https://www.veteransaffairs.mil.nz/assets/Research/a843ba7a88/Comments-on-Report-of-Professor-A-Rowlands-on-SCE-studies-of-Nuclear-Test-Veterans.pdf)

Dr Robertson's review of the study [PDF, 439 KB] (https://www.veteransaffairs.mil.nz/assets/Research/c81d5c0460/Review-of-study-New-Zealand-Nuclear-Test-Veterans.pdf)

Dr McEwan's review of the study [PDF, 2.9 MB] (https://www.veteransaffairs.mil.nz/assets/Research/5292ee0445/Comments-by-Andrew-McEwan-on-NZ-nuclear-test-veterans-study.pdf)

Advice from Secretary for War Pensions to Minister of Veterans' Affairs about the study [PDF, 243 KB] (https://www.veteransaffairs.mil.nz/assets/Research/5bffd4b824/VANZ-notes-on-Research-Project-Sister-Chromatid-Exchange-in-NZ-nuclear-test-veterans.pdf)

Government grant to NZTVA

In 2000 the government gave the NZNTVA $200,000 grant, to further the aims and objectives in its charitable trust deed. NZNTVA used $100,000 of this, and funding from other sources, to contract from Massey University a clinical-assessment programme of NZ Operation Grapple veterans. Two studies were conducted under the programme:

- NZ Nuclear Test Veterans' Study - Pilot Project (Psychological Impact)
- NZ Nuclear Test Veterans' Study - Cytogenic Analysis.

Psychological impact study

A pilot project (psychological impact) was completed October 2005. The purpose was to generate a psychological profile of Operation Grapple veterans, to determine whether they were suffering chronic stress from involvement in nuclear tests. The study found that many were suffering chronic stress and that this was compromising the quality of life of some veterans.

Pilot Project – Psychological Impact NZ Nuclear Test Veterans Study [PDF, 6.5 MB] (https://www.veteransaffairs.mil.nz/assets/Research/e164ed3941/NZ-Nuclear-Test-Veterans-Study-Psychological-Impact.pdf)

Cytogenetic analysis study

A cytogenetic analysis was completed in 2007. It used 3 tests to assess genetic damage. Only the multicolour fluorescent in situ hybridisation (mFish) assay showed an increase in the rate of rearrangement of chromosomal material within stable cells between the veterans and the control group. The result was statistically significant. The researchers concluded this indicates Operation Grapple veterans suffered long term genetic damage from radiation exposure.

Cytogenetic Analysis NZ Nuclear Test Veterans Study [PDF, 645 KB] (https://www.veteransaffairs.mil.nz/assets/Research/0839d05f5d/NZ-Nuclear-Test-Veterans-Study-a-Cytogenetic-Analysis.pdf)

Report of Ministerial Advisory Group on Veterans' Health

In June 2009 the Minister of Veterans' Affairs asked the Ministerial Advisory Group on Veterans' Health (the Advisory Group) to assess the research commissioned by NZNTVA and how it might be used. The Advisory Group arranged for external experts to evaluate the research.

Advisory Group report back to Minister, December 2010 [PDF, 3.2 MB] (https://www.veteransaffairs.mil.nz/assets/Research/7cfba66f09/Ministerial-Advisory-Group-on-Veterans-Health-to-Minister-of-Veterans-Affairs.pdf)

They advised the Minister:

- flaws in selection of the veterans and the control group for the Psychological Impact Study meant it wasn't possible to determine if the psychological differences between the groups were due to veterans' participation in Operation Grapple or other factors
- results of the mFish assay in Cytogenetic Analysis Study provided evidence Operation Grapple veterans were exposed to ionising radiation. The clinical consequences of this, if any, is unknown. The only way of determining if the health of Operation Grapple veterans has been affected by their exposure would be to undertake a morbidity and mortality study. (In July 2010 the NZNTVA, which represents some veterans of Operation Grapple, had rejected an invitation to participate in such a study)
- they found no reason to believe that the changes in veterans' chromosomes will have adverse health consequences for their children and grandchildren. The Advisory Group also found no evidence in the literature that children of nuclear veterans were at increased risk of inherited disorders
- they found no evidence supporting the addition of conditions to the list of conditions presumptively accepted for nuclear veterans.

The Advisory Group recommended:

- there should be no change to the list of conditions presumptively accepted for nuclear veterans
- a critical review of the literature should be written for lay readership
- the Government should acknowledge that nuclear test veterans were put at risk though exposure to nuclear radiation, and that we have been slow to address the concerns of veterans.

Minister's response to Advisory Group's recommendations

The Minister responded to the recommendations accepting the recommendations that:

- no change be made to the list of presumptively accepted conditions for nuclear veterans
- a critical review of the literature be written for a lay audience.

The Minister did not accept the Advisory Group's remaining recommendation. The Minister pointed out the:

- number of measures already taken by NZ governments to acknowledge & recognise Operation Grapple veterans
- range of support available to NZ nuclear veterans, and how it compared to support for nuclear veterans in Australia, the UK and the US.

Minister's response by letter of 24 February 2011 to the recommendations [PDF, 577 KB] (https://www.veteransaffairs.mil.nz/assets/Research/6438b4ecd5/Minister-of-Veterans-Affairs-to-Ministeral-Advisory-Group-on-Veterans-Health.pdf)

Summary of 3 Massey University studies

The NZ Nuclear Test Veterans Summary of Expert Reviews was released July 2014. This was commissioned by Veterans' Affairs, at the request of the Minister of Veterans' Affairs. It covers:

- Sister Chromatid Exchange Study
- Psychological Impact Study
- Cytogenetic Analysis Study
- reviews of those studies.

NZ Nuclear Test Veterans Summary of Expert Reviews [PDF, 2.8 MB] (https://www.veteransaffairs.mil.nz/assets/Research/00e7983c57/NZ-nuclear-tests-veterans-a-summary-of-expert-reviews-of-three-studies.pdf)

Response to Summary of 3 Massey University studies

In November 2019, the lead author of the Massey cytogenic study, Dr R E (Al) Rowland, provided the following response to the summary of reviews of the study.

Response to the document entitled "New Zealand nuclear test veterans: a summary of expert reviews" [PDF, 482 KB] (https://www.veteransaffairs.mil.nz/assets/Research/7c91f1031b/Response-to-the-Document-Entitled-New-Zealand-Nuclear-Test-Veterans-A-Summary-of-Expert-Reviews.pdf)

Study of Australian participants in British nuclear tests (2006)

The study

On 1 June 2001 the Australian Government released a study into Australian Participants in British Atmospheric Nuclear Tests in 2 volumes:

Volume one (Australian Study) reported on a radiation dosimetry study estimating radiation-exposure levels of test-participants [PDF, 1.2 MB] (https://www.veteransaffairs.mil.nz/assets/Research/fb4c7fa2c6/Australian-pers-in-British-nuclear-tests-in-Australia-vol-1.pdf)
Volume two (Australian Study) reported on the mortality & cancer incidence [PDF, 981 KB] (https://www.veteransaffairs.mil.nz/assets/Research/7f316619f8/Australian-pers-in-British-nuclear-tests-in-Australia-vol-2.pdf)

The study:

- found rates of some cancers were higher in nuclear-test population than general Australian population; but
- didn't demonstrate a link between the increase in cancer rates and exposure to radiation.

The response

The Australian Minister for Veterans' Affairs announced on 28 June 2006 all British Atmospheric nuclear-test programme personnel could access treatment for all malignant cancers, even cancers not linked to exposure to radiation. The Minister said this was determined the appropriate action 'despite the lack of association between cancer rates and radiation exposure.'

Analysis & advice to Australian Parliament on the Australian Participants in British Nuclear Tests (Treatment) Bill 2006 [PDF, 254 KB] (https://www.veteransaffairs.mil.nz/assets/Research/72d424e6e7/Australian-Participants-in-British-Nuclear-Tests-Treatment-Bill-2006-bills-digest.pdf)

War-pension and medal recognition (1998-2007)

Operation Grapple recognised as emergency

In March 1998 veterans who served at Operation Grapple had the status of their war pension coverage changed from routine to emergency. This meant claims made from that time forward would be considered using more relaxed evidence requirements. Claims declined prior to March 1998 can be reconsidered, if a veteran believes the condition is related to exposure to ionising radiation.

Mururoa recognised as emergency

In June 2002 the service period observing the French nuclear tests at Mururoa Atoll on 22 and 28 July 1973 was declared an emergency service. Any war pension claims from that time forward would be considered using more relaxed evidence requirements. Claims declined prior to June 2002 can be reconsidered if a veteran believes the condition is related to exposure to ionising radiation.

Medal recognition

In July 2002—in response to request for medallic recognition—Operation Grapple and Operation Mururoa service was recognised with the NZ Special Service Medal (Nuclear Testing).

Presumptive list for Jayforce, Operation Grapple & Mururoa

Veterans' Affairs introduced (August 2007) lists of presumptively-accepted injuries & illnesses, to help resolution of War Disablement Pension claims. One list, linked to potential exposure to ionising radiation, was for veterans with Qualifying Operational Service at Jayforce, Operation Grapple or Mururoa.

Under presumptive lists, a veteran's injury or illness is automatically deemed attributable to service if:

- the veteran served in a deployment for which there's a presumptive list; and
- the injury or illness is on the list.

The lists are based on the IoM categories where there is one of:

- causal relationship between military service and an injury or illness
- positive association between military service and an injury or illness
- limited or suggestive evidence of an association between military service an injury or illness.

New Zealand uses the IoM's work as being the most comprehensive information.

US list as model for NZ list

The NZ list of presumptively-accepted conditions for nuclear veterans is modelled on a US Department of Veterans Affairs list. The US Department has two lists from the US Radiation Exposure Compensation Act (1990).

NZ list of presumptively-accepted conditions for nuclear veterans (https://www.veteransaffairs.mil.nz/for-clients/how-

NZ list of presumptively accepted conditions for nuclear veterans (https://www.veteransaffairs.mil.nz/for-clients/how-we-make-decisions/conditions-we-cover/conclusively-presumed-injuries-or-illnesses/)

The first is a 'statutory list' of conditions presumptively-recognised as having a service-connection for veterans exposed to ionising radiation. This is the list Veterans' Affairs has used for its presumptive list.

The second is the 'regulatory list' of radiogenic diseases not automatically awarded. The conditions on this list are only awarded if the veteran meets a range of additional factors, including amount and duration of radiation exposure, and elapsed time between exposure and onset of the disease. These conditions haven't been added to the NZ presumptive list—they are not presumed service-related unless specific exposure-criteria are met. But NZ nuclear veterans can:

- make claims for any conditions on this list and
- have the claim considered under the applicable presumptions in favour of veterans with Qualifying Operational Service.

Radiological review of Mururoa deployment (2015)

The Radiological Review: Pilaster (Mururoa) Deployment was commissioned from ESR by Veterans' Affairs, and published 22 October 2015. It concluded the crews on deployment to Mururoa would have had no more radiation exposure than people in New Zealand, because of:

- lower natural background-radiation levels over the oceans
- lack of exposure to other radiation sources.

Radiological Review Pilaster Mururoa Deployment (http://www.esr.cri.nz/home/latest-news/operation-pilaster/)

'The Pilaster Deployment (Mururoa 1973): A Radiological Review' report [PDF, 2.5 MB] (https://www.veteransaffairs.mil.nz/assets/Research/3655729163/pilaster-deployment-radiological-review.pdf)*

> * On page 20 of the Radiological Review, the report incorrectly spells the name of a service person. The correct spelling is 'Bennetto', and that sentence should read: "(Two HMNZS CANTERBURY discs, worn by Robertson and Bennetto, recorded doses of 0.20 mSv, and McCahon concluded that these were probably accurate readings, with the dose delivered while assisting with the calibration source during checking of the SIRS.)"

Presentation on the report 'Pilaster Deployment (Mururoa 1973): A Radiological Review' [PDF, 930 KB] (https://www.veteransaffairs.mil.nz/assets/Research/a296caf008/pilaster-deployment-radiological-review-presentation.pdf)

Literature review on the health impacts of exposure to ionising radiation (2023)

For veterans and their families of J-Force, Operation Grapple, and Mururoa.

In April 2021 the Minister for Veterans asked the Veterans' Health Advisory Panel to review the most up-to-date information on the health impacts of exposure to nuclear radiation on veterans and their descendants.

The request also asked the Panel for their views on whether their findings would suggest a change to the approach that New Zealand currently takes to these veterans and their families.

The Panel engaged Allen and Clarke Consulting to undertake a systematic literature review. They began in May 2022.

Their initial focus was on military populations only, but later the project was re-scoped to include the significantly larger body of evidence from civilian exposures.

The purpose of this review was to establish whether the most up-to-date evidence indicates whether there are implications not previously identified for veterans who may have been exposed to ionising radiation and whether New Zealand should change its approach to these veterans and their families.

Acknowledged challenges

In the report, Allen and Clarke Consulting noted that there's not a simple relationship between exposure events and effects.
For example, determining levels of ionising radiation is complex — including what is measured, how it is measured, what units are used, what organs are studied, whether the dose received was low, medium or high, and whether exposure was chronic or acute.

Also, there are more studies available on mortality (death from radiation) than morbidity (having a disease or medical condition as a result of exposure) and the level of detail in reports varies.

The overall conclusions of the literature review

The review concluded:

- there is strong and well-documented evidence confirming the impact of radiation on non-solid cancers, and solid cancers, including a number of site-specific solid cancers
- there is considerable evidence of the psychological effects of exposure, and there are more diverse findings in relation to other non-cancer effects
- there is mixed evidence about health effects from genetic alterations in adults exposed to ionising radiation and none of the studies that were reviewed reported statistically significant findings about the effects on the descendants of people exposed to ionising radiation.

Summary of recommendations

The Panel recommends that:

- no new conditions need to be added to the current list of conclusively presumed conditions that apply to those exposed to nuclear radiation (the Presumptive List)
- consideration be given to extending the entitlements that are currently available only to the children of Operation Grapple veterans to the children of Jayforce and Mururoa veterans
- consideration is given to repeating a review on the health impacts of exposure to nuclear radiation every seven to ten years (unless a major new study provides grounds for earlier review).

Read the complete Literature Review on Health Impacts of Ionising Radiation [PDF, 1.6 MB] (https://www.veteransaffairs.mil.nz/assets/Research/Literature-Review-on-Health-Impacts-of-Ionising-Radiation.pdf)

Report of VHAP to the Minister for Veterans — March 2023 [PDF, 387 KB] (https://www.veteransaffairs.mil.nz/assets/Research/Report-of-VHAP-to-the-Minister-for-Veterans-March-2023.pdf)

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