WEBINAR SUMMARY:

Radiation Exposure and Long-Term Health Effects: Japanese Atomic Bomb Survivors and British Veterans

With Dr Masao Tomonaga and Susie Boniface, moderated by Professor Barry Buzan

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Dr Masao Tomonaga's Talk:

This year marks the 80th anniversary of the atomic bombing of Hiroshima and Nagasaki. Today I would like to discuss the humanitarian impact of nuclear weapons. It will be a summary of the human consequences of the atomic bombings of Hiroshima and Nagasaki, and lessons for humans to end the nuclear weapon age.

As you may know, two different types of atomic bombs were used for the first and second detonations. The Hiroshima bomb was made of uranium, while the Nagasaki bomb was made of plutonium. Only ten percent of the nuclear materials were actually detonated in the case of the Hiroshima bomb: only 850 to 900 grams were detonated, which devastated Hiroshima City under a mushroom cloud. In the case of Nagasaki, only one kilogram out of ten kilograms was detonated.

This is a map of Nagasaki on the left hand side. These circles are five hundred meters consecutively, and three thousand kilometres is the maximum area of devastation. There were three main energies as a result of the detonation of the bomb. First, the blast wind reached 3.5 kilometres, destroying almost all Japanese-style wooden houses, but some concrete buildings remained. The second was heat rays; this was about fifteen to twenty percent of the energy. Lastly, radiation was only fifteen percent, but this had the most devastating effect on human beings.

In the one minute after detonation, the major radiation rays were gamma rays and neutrons. Gamma rays could hit humans inside wooden houses, but the roof considerably shielded them from radiation, so seventy percent passed through houses and hit human beings. Interestingly, neutrons directly hit the ground surface where metals, soils and stones are distributed, and these materials induce secondary gamma rays. So it is very difficult to calculate individual exposure to radiation. We must combine three types of rays: direct neutrons, gamma rays

and secondary neutrons. About eighty thousand hibakusha were asked: 'Where were you at the time of bombing? What part of the building were you in? Or were you walking?'

Another radioactive material came down from the mushroom cloud, which spread to the east in the case of Nagasaki by the strong west wind. This wind went further east to a nearby prefecture, Kumamoto. Radioactive fallout came down to the surface.

Recently, a doctor within our university group discovered that radioactive materials from the Nagasaki plutonium continued to exist inside the various kinds of organs of a dead body after the atomic bombing. Autopsies were performed fairly often. US military doctors collected organs to take to the US for research, but they didn't find any such distribution of Nagasaki plutonium deep inside the organs. In the blood, prostate, liver, bone, cartilage, kidney, lungs; in every organ, plutonium particles were observed. This is proved by the straight black line of X-ray film exposure of the electron. Electrons are plutonium's radiation type. So if you develop this X-ray film, you can find the exposed particles of electrons from the plutonium particles. So this doctor proved for the first time in the world the existence of atomic bomb material inside the dead body. The autopsied person may have inhaled plutonium particles that weren't detonated, but had just fallen down. This is proof of deep organ exposure, but the radiation dose from these particles was very minute. Thus, at the moment, we believe that deep organ exposure could not have induced disease, even if the person survived.

These are photos taken two days before the bombing. My house was in the central part of Nagasaki. This was the original target, which my house was less than one kilometre away from, but the bomb floated to the north by the strong west wind, and eventually detonated about 600 metres high. This is two days after the bombing. The northern part of Nagasaki City was devastated. You can see that around eighty to ninety percent of the mountain was previously covered in woods, and this was all burnt down.

These are photographs taken by army photographers on the second day. On the first day, no photos were taken at all. You can see the burning bodies in these pictures. This mother and her child have very severe burns. Here a woman has been completely burnt on her front, and her skin is hanging off.

This is not a photograph, but a painting drawn by hibakusha as a memory of that day. People escaped to a nearby bridge by a river. They felt such a strong thirst, that they jumped into the river. Most of them died there.

My house was in the yellow zone. This photograph shows the former buildings, with only a roof remaining. This area is clearly a devastated area, very close to the central station. This is another angle. This was my house here. The roof of the second largest cathedral also flew off. This area was a totally catholic area; in fact, my ancestors were catholic, but I'm a buddhist now.

This is another painting in memory of that day. It shows a mother trying to save her baby, but she is unsuccessful. In my case, my mother succeeded in taking me out of our house and running away to a nearby shrine.

This is a hell-like scene. It's painted in an old Japanese painting style from the Heian era. It depicts two completely burnt people.

This man spent a year and a half in this position because his back was so badly burnt. But he survived as a result, and lived till the age of eighty-four. He became an activist for nuclear abolition, and spoke at United Nations assemblies. His skin recovered fairly well, but not fully.

After two or three years of calm after the bombing, hibakusha encountered a sudden rise in leukemia cases. Children in particular started to develop it rapidly. There were at least one or two leukemia patients per class at school. There was a long fifteen-year period of mass leukemia cases. After that, leukemia cases began to cease gradually.

Moreover, the psychological damage was also massive. This is evident in the WHO general health questionnaire, utilising the GHQ scoring system, with twelve indicating maximum severe psychological damage. In the case of those survivors, many suffered depression, PTSD, etc. Most had a score of 11. These people have suffered long-lasting psychological damage.

The most common side effect of acute radiation sickness is hair loss. This slide shows the damage to bone marrow. Both organs are totally irradiated and damaged. The bone marrow cannot produce blood cells, and the colon cannot absorb water, nutrients and so on. Many people died of this acute radiation sickness.

This is a summary of seventy-eight years of observation by our university, looking at the first phase of leukemia, and now looking at MDS, the second leukemia phase. This is myelodysplasia syndrome, which developed after three or four years. This is very similar to leukemia. This targeted the older generation. Nowadays various solid cancers are developing. This plateau curve hasn't declined even after eighty years. Therefore, we concluded that the effect of radiation continues for one's whole life.

I reported these results thirteen years ago in Oslo, at the first United Nations conference on the inhumanity of atomic bombs. Then, at the Nobel Peace Prize ceremony, on the second day I attended the forum to discuss how to overcome the present ongoing nuclear risk, mainly by Russia threatening Ukraine and NATO nations.

This is more data on leukemia. The higher the radiation dose effect, the higher the leukemia cases. This is cancer data about those response curves. The first dot shows a statistically significant increase of leukemia. So leukemia is a very sensitive disease which is induced by atomic bomb radiation.

So why is it a life-long effect? Our hypothesis is called organ stem cell hit theory. Organ stem cells exist all over the organs. Hair-forming cells die due to high doses of radiation, and then the hair falls out. But there are stem cells that remain. Only ten of these cells remain, but they divide and spread and reproduce. There are also stem cells in the bone marrow. Stem cells are the mother cells of red and white blood cells. These stem cells are the target of radiation, and nowadays all types of human leukemia originate in these stem cells. We also partially

proved that these white stem cells carry abnormal chromosomes, and the red stem cells also have the same chromosome abnormality. So this means the former ancestor stem cells are the same target of atomic bombing.

Dr Nagai was a radiation professor. He developed leukemia half a month before the atomic bombing. He was already suffering from chronic myeloid leukemia. He only survived five years after the diagnosis and died. He wrote many reports and novels, and was a very famous doctor.

Ten years after the atomic bombing, the University of Pennsylvania discovered this tiny chromosome. This can be found in every case of CML worldwide. So this minute chromosome means there is a fundamental abnormality to this disease. Then, in 1985 the abnormal chromosome was discovered to be a fusion of two different genes. These genes become devil genes: malignant, disease-inducing genes. These genes are called BCR-ABL tyrosine kinase, a kind of enzyme, which can stimulate stem cells. Stem cells begin to divide eternally. So the white blood cell count is more than two hundred thousand. The STI is a new drug which can block the enzyme activity stem cell and division, and now this drug is widely used. The survival curve is now eighty-eight percent, even after ten years. So some of them were cured. This new drug was nominated as a candidate for the Nobel.

I must conclude my talk here today. Our research has proved that atomic bomb radiation is an inhumane weapon. We must eradicate these weapons in the future. So far, we have not been successful in eradicating such nuclear weapons, as you know very well. They are still very active in being used as a counter-attacking tool during enemy invasions. Nuclear weapon-possessing nations should carefully consider whether to continue this policy.

Susie Boniface's Talk:

Thank you very much. I'm going to apologize in advance, because I don't have the level of expertise of Dr Tomanaga, and I certainly can't do it in my second language. I am in awe that you managed to do that in yours.

The world could end tonight as we sit here. We depend on our governments and the people within them to be decent and to keep us safe. After all, they know what could happen, as we've just heard. In Ukraine, a stray Russian drone could set fire to the Zaporozhye nuclear plant. China could decide to park its nukes in the South China Sea and have a standoff with the Americans. North Korea could give some nuclear technology to Iran, which would launch them immediately against Israel. The advent of nuclear weapons eighty years ago, which no one has mentioned this week regarding victory in Europe, brought fear and peace, and to the people that had them, power. But it could theoretically be lost in an instant if just one of those governments and the people in them are not decent, and if they are not motivated to keep us safe.

There is probably nobody in Britain who, if you ask them which government is the worst in the world, would say their own. I hesitate to say that because it's my government too. But for nineteen years, I've been fortunate enough to know many of the veterans of Britain's Cold War nuclear weapons program. *The Mirror* began campaigning for recognition and justice for these veterans and their families in 1984, and they continued

through many editors and reporters until the baton was handed to me by accident in 2006. They told me about their illnesses, many of which are exactly the same as you experienced, their fears for their families, their sense of guilt and their suspicions about what had happened to them; they gave me their trust, which is something journalists very rarely receive, and in return I told them that they were mistaken.

I wrote about their high rates of cancer and blood disorders, the rate of miscarriage in their wives, which is three times the national average, and the rate of birth defects in their children, which is ten times what it normally is. I sat with them as they flicked through their photo albums and shared mementos of their service in Australia and the Pacific. I had great sympathy for them as people negligently put at risk by their country during a great enterprise and immorally abandoned when that was achieved on the backs of their labour. But when they told me that they were lab rats, the victims of human experiments, it seemed implausible. I said no. I had trawled the archives. I'd been through the documents. I told them it was clear they were throwing you at a problem, using you like a piece of laboratory equipment in a desperate bid to get the bomb, treating you like a Bunsen burner, but you were just nearby. You were too close. You were too uncared for. There is no evidence, I would tell them, that anything else worse than that happened.

This widow is pictured here, on my left. She took that photograph with us in Parliament. We were staying in Westminster Hall when we were campaigning with politicians a few years ago for a medal. Shirley used to tell me: 'We are the evidence.' I know that's what they all felt.

When Barry Smith, who had been the camp hairdresser at Christmas Island after the bombs had finished falling in 1959, contracted a radiogenic cancer, as often seen in Japan among the hibakusha, and was refused a war pension, I thought he had been extraordinarily mistreated. He was called off his deathbed to go to a war pension appeal hearing, where the MOD said: 'We haven't read the paperwork; can we have an adjournment, please?' Yet he died a few days later. But I could also see there was no evidence of anything else. In my last talk with Barry, which was a few days before he died, he said to me: 'Don't let them get away with it.' I promised him I wouldn't, because what else can you say? But I thought I was fighting the British Ministry of Defence to notice the collateral damage of its biggest weapon. That was also what lawyers who led repeated court cases thought, as well as the war pensions experts who were dealing with various claims. There were decades of complaints and investigations. That was the strongest case anyone had been able to come up with against the British state – that it had been appallingly, cruelly, avoidably thoughtless. But just thoughtless.

In 2022, I got a message which changed everything. The family of a veteran who had recently died was going through his papers and had found a document it thought I might be interested in. This is a memo from scientists at the Atomic Weapons Establishment on Christmas Island in the Pacific, back to AWRE physicists in Aldermaston in Berkshire, discussing the blood tests of squadron leader Terry Gledhill. He led a squadron of sniff planes through five separate mushroom clouds on sampling missions for those scientists. Here they're discussing the gross irregularity in his blood. When I saw this, I realized that at least one man had been subjected to a human experiment; he had been exposed, monitored and re-exposed, and continually monitored throughout, and that was all while physicists, not medics, not biologists, were looking at.

Now, the only means of measuring radiation doses, which the British Ministry of Defence has ever admitted to, are film badges: a piece of camera film, usually worn on the jacket, which, when developed, will show exposure to sources of gamma or beta radiation. These are imperfect. They're not very good. They don't show alpha radiation, which is the principal constituent of fallout, one of the most pernicious things which a lot of the veterans claim they may have been contaminated by. These badges were only given to twenty-three percent of the troops, so the vast majority didn't have one to start with. There's lots of evidence that they have been falsely recorded, underdeveloped, thrown away or otherwise rendered useless.

This is a paragraph from the government's own mortality study into the veterans, written in 1988, in which it states that some of the badges were falsified effectively. Up to four millisieverts was written down as a zero dose. It is not a zero dose. That would be equivalent to double your annual background in this country. They were writing it down as zero, which then went into the scientific studies. But the government said these were limits that were approved by medics, and they showed that the men's health was of paramount importance to the government throughout. Now, testing blood or urine, as happened to Terry, would be the only means of seeing whether radiation had actually entered the men's bodies. The badges were just what was on the outside.

They had measured Terry's blood seven times over fifteen months while he flew through these five different mushroom clouds, including that of the most powerful weapon Britain's ever fired, codenamed Grapple Y, in 1958. It was three megatons, which makes it 112 times more powerful in terms of explosive force than Hiroshima. Terry's blood showed a steady deterioration in the white blood cell count, which is similar to that if you were receiving radiotherapy today. He was pulled out of flying a sixth mission because the effects on his health were so bad. Yet his family told me he had never known these results and had spent years seeking answers for decades of subsequent ill health that were never, ever explained to him.

If someone is being repeatedly exposed to radiation while being monitored, that is a human experiment. Many veterans at the time would not have objected to that. They would have felt that was a reasonable thing to do, perhaps, when you are fearing invasion and worrying about the effects of fallout. In Terry's case, he was a healthy man. There was no reason for him to be blood tested beyond what he was doing in his day job. There were no therapeutic benefits to him being irradiated. If you have radiotherapy, you have the benefit of fixing your cancer. That wasn't the case for Terry. If it happened to the squadron leader, I reasoned, it was probably happening to the rest of the air crew as well.

That memo referred to an Air Ministry order, which I managed to dig out of the national archives. It set out the limits for blood counts, which Terry had subsequently fallen short of, and dictated that everyone the RAF believed likely to be exposed should be blood tested before, during and after their service at the tests. You establish a baseline to start with, and you monitor it throughout and see how things have changed. That order led to, at the last count, more than thirty other similar orders covering thousands of men serving in the army, the navy and the Royal Air Force at four different locations over more than a decade. Those orders were each duplicated for dozens of officers, from the task force commanders down to the stores' quartermaster.

That memo took me back over claims and evidence I had forgotten but heard many years earlier. There were many veterans who said their medical records were incomplete, which at the time just seemed like bits of old paper got lost. There was an incident found back in 2018, which became a dead end because we asked questions about it in Parliament, and the MOD said: 'We've got no information about blood testing.' Withholding medical records, I've recently come to realize, is both a civil and a criminal offense. It is precisely that sort of thing which blew open the infected blood scandal and Hillsborough – falsifying medical records.

After the Mirror's campaign, at this point we'd just spent four years fighting for a medal for the nuclear veterans. It's something that involved me in a lot of freedom of information requests to get under the bonnet of the British establishment and try and figure out how it was working, what its rules were and why it was denying any kind of recognition to these men. We won that fight, and a lot of them were very delighted we did. But as the MOD always suspected, and the reason they refused us for so long, it was the thin end of the wedge they were about to get battered with. The campaign was rebadged as the 'Nuked Blood Scandal' and finally I was able to get my teeth into what has been there all along.

The MOD is a vast organisation, and the Atomic Weapons Establishment, as it's now known, is an arm's-length agency, a PLC, which is technically run by someone else, but effectively works hand-in-glove with the government. Its predecessor was the organisation with the scientists that had monitored the men's blood, and it's the current AWE which holds the historic records of the nuclear weapons programme.

Terry's daughter asked the AWE and the MOD for any records they held on her father. The AWE provided a copy of the memo we already had, and I was able to establish that while it had been available in the national archives for a few years, only three members of the public had ever seen it, one of whom was the veteran who had never realized its significance before he died and whose daughter passed it on to me. The MOD refused point-blank to provide her with her father's medical records, even when she told them she was his legal executor with a legal right to do so. It went through appeals all the way to a defence minister with officials giving advice that they should protect public servants from public rebuke and should not even publish the advice that was given to the minister about withholding the records. Public servants say that they should never be exposed to public rebuke. Eventually, through an FOI tribunal, and with the help of a friendly barrister, Terry's daughter was able to prove this was all unlawful. A judge ordered the records be made available to her, and a legal precedent was set, which has changed how the MOD today deals with historic requests for medical records.

Terry's personal file shows further blood tests taken from him in relation to his service at Christmas Island in 1969, 11 years after he returned home. He was still suffering as a result at that time. He was also given repeated chest X-rays. His medical records show there is no clinical reason for this. Although he was later medically discharged from the RAF with a stroke induced by an infection of TB meningitis, his medical records show they could not prove that diagnosis. What we can say for certain is that his blood count would have left him extra vulnerable to infections, and that, according to the government mortality studies of the veterans, they have a higher rate of cerebrovascular disease. Now Terry will never know about this monitoring because he died in 2015. He could have given evidence, which would probably have led to his medical records being disclosed when

veterans took the government to court in 2007. But government lawyers told the judge he was dead already and therefore was not available to give evidence. He was actually claiming a war pension, so it should have been easy enough for them to find.

Terry's memo led us ultimately to a database at the Atomic Weapons Establishment, codenamed Merlin. It was created in 2007 to hold evidence of personal injury relevant to that court case. It was collated from various government archives. It was classified as an atomic secret, just like the recipe for building the bombs themselves. It was never made available to veterans' lawyers despite repeated legal claims. All they could do was to give a keyword and ask for it to be searched by the Atomic Weapons Establishment. Therefore, if you did not know what you were looking for, you would never find it by accident. At one point, the lawyers did ask about blood testing records. Government lawyers wrote back to say: 'The planning policy for the tests indicates the intention was to prevent intake rather than to allow it and monitor the results.' No personal records were made. The MOD had a policy not to take blood tests by July 1958. Umpteen of Terry Gledhill's tests took place after that date.

I managed to establish that Merlin held more than 150 documents about blood and urine testing, about four thousand pages. The AWE refused to publish any of them whatsoever. They were all highly classified and had proliferative risks. After a debate in Parliament, a minister personally reviewed them and then ordered them to be made public, stating as he did so that AWE held no medical records, and the MOD insisted there were no identifiable individuals in there. These are some of those records that apparently have proliferative risks and are too dangerous to be seen: information about blood counts before exposure to radiation, chest X-rays, tritium and urine. This is the result of an experiment in which men were told to walk up and down with and without respirators in a fallout zone at Montebello in northwestern Australia in 1958. Reports were made on the examination of natives, blood testing on indigenous people in Australia and more blood examinations of the grapple squadron.

All these papers contained evidence of more than a thousand blood tests that had taken place. They're being discussed in the past tense. Those thirty orders that we found and at least 550 named individuals called up for blood testing were told to present themselves at the medical tent. There were always experiments where people were ordered to march up and down and so on. That experiment proved that wearing a respirator did make a difference as to how many radionuclides were later found in excreted urine, but the MOD didn't order everyone to wear a respirator if they went into the forward area; they ignored the results of their own study.

They also contained copies from faxes in 2001. These were sent between AWE and MOD officials. They exchanged copies of the blood testing information and some of what had been done. Then they agreed on lines to take: 'with ministers and the public, insisting that while blood tests had been considered, they never took place.' They just weren't necessary. The AWE insisted it did not hold any more documents than the 150 that I'd found. Then I found a list of 370 and they said: 'Oh, those documents. They were just filed differently.' I have asked and I'm still awaiting their release under FOI legislation, but that would be many more thousands of pages.

When all this was revealed in a BBC documentary last November, the Secretary of State for Defence, John Healey, was very quick to announce a root and branch review of all the historic documentation that's been held. The Veterans Minister, Al Carns, met me and other campaigners and asked for six months to get to the bottom of it. We just met him for the six-month update, and he said there's no budget, no staff, no deadline and no findings that he felt like divulging to us.

It took almost a year, but after the ruling about the unlawful behavior over Terry Gledhill's medical records, I was able to get the advice that officials had given the minister about it. They show that while the minister wanted to try and publish this stuff, the officials boxed him in. They told him he didn't have the power to overrule them; they misled him, and they didn't tell him, as they should have done, that any executor has the right to a deceased person's medical record.

This has all led to a legal pincer movement against the Ministry of Defence. First, veterans and families are suing it in civil court to produce the medical records it says it does not have. They clearly should have been taken – there were orders for it – and we found some of the results. So perhaps those records have been lost, are simply missing, may have been withheld or destroyed, or perhaps the orders were ignored. Perhaps all the thousands of people on those orders for more than a decade committed a mass act of insubordination that nobody in London noticed and failed to take the blood tests; even if that happened, the Ministry of Defense still has to compensate and apologise for not having taken them or not being able to produce the blood tests now.

It was very interesting to hear about the psychological impact on the hibakusha. The harm done is both physical in terms of lost lives and illnesses, but also psychological because the veterans have shown a higher rate of suicide than their peers in every single decade since the tests, which I would suggest may be connected to the fact they've been gaslighted by their government for seventy years and been told that what they experienced is not what happened to them. The current estimated cost of the civil suit to the government would be about five billion, which is double that of the post office scandal. At just the time when the MOD wants to spend all its money on buying some new toys. The suit is supported by a crowd funder. If anybody here feels like putting a hand in their pocket to help them out, the link is on the screen, and I'll put it up again at the end as well.

Secondly, that 2001 fax, and the government lawyers telling courts that blood testing didn't take place and the misleading of ministers as recently as last year, has led to a criminal complaint to the Metropolitan Police, which we made last week. This is a criminal complaint over allegations of misconduct in public office. That's a very difficult bit of the law to try and pin anything on anybody because it's not written down anywhere as legislation. It's a common law offence, so it's the result of many years of custom. To satisfy a charge, it must be proved that a public official has performed their function unlawfully, either knowingly or recklessly, as to the risk of causing harm to a third party. Withholding medical records would appear to fall under that umbrella. That complaint was lodged last week with a suggested list of witnesses, which includes senior officials and ministers at the Ministry of Defense, the Government Legal Department and the Atomic Weapons Establishment. It is a strict liability offense, like speeding; you do not have to intend to do it. You just need to have done it and perhaps been

reckless or not checked that you weren't doing it. The maximum sentence is life imprisonment, depending on the harm done.

More recently, Parliament has heard that the Government Legal Department has now written to veterans' lawyers, stating that some information may have been recorded by scientists carrying out radiation monitoring rather than the medical professionals who would have been more concerned with the health of military personnel. As far as *The Mirror* and the veterans are concerned, it is the first time in seventy years that the MOD has admitted that weapons scientists were acting without medical supervision. It means that the UK government has potentially breached about seven of the ten rules of the Nuremberg Code: no informed consent, no right to withdraw from the experiment, no due medical supervision, no minimization of risk and so on and so forth. It is also very expensive. Even if, as the MOD might prefer, that sentence refers to the film badge monitoring, it still means there was no concern for the health of the people being exposed to what everybody already knew was the most deadly material known to man. There is a reason they made weapons out of it. It wasn't because it didn't hurt anybody. It's the opposite of what the MOD has claimed for seventy years, and it came about only after we found out about these blood tests.

A parade of ministers have insisted there is no cover-up. The last one said that to my face while I was holding the FOI request, the answer that he had read and which contained evidence of the cover-up. I've always shared the healthy, often accurate scepticism that cock-ups are far more likely and likely to last than any kind of a conspiracy. But a criminal conspiracy merely requires two people to agree to do something. In the case of misconduct, you don't even need to know that it is wrong. A conspiracy theory, I should point out, is a hypothesis that's been substantiated with evidence.

When they dropped the bombs on Hiroshima and Nagasaki, the scientists concerned knew there would be survivors who they wanted to monitor. They wanted to know what they could not test in the laboratory, what would happen to a population in the event of a nuclear attack. The only data that existed at that time on the effect of radiation on humans was from accidents in the lab by the scientists, perhaps early problems for the people who first discovered radiation at the end of the 19th century, and from the radiotherapy of cancer patients, which has been happening since the late 1800s. These scientists and the government needed to know what would happen on a population level and to people who were not already sick. That was the risk Britain faced, and it was a question to which they did not have an answer.

I assume anyone not immediately killed or rendered immobile in 1945 tried to flee. Those on the outskirts of the blast may have been able to get away before troops moved in and started the monitoring process. When other countries began racing for these weapons, they needed their own data on their own populations. Veterans of the US, Russia, Chinese and French nuclear weapons tests all say their medical records seem to be missing. Some countries have admitted conducting experiments and have offered some form of compensation for, in retrospect, what seems absolutely obvious. Britain in particular feared Soviet assault and invasion, and her troops were the only people who could be ordered into the fallout, ordered to stay there for an indefinite period, at risk of being court-martialed or labelled a traitor if they tried to flee. They were the only people who could be sworn to

secrecy, who could be threatened with jail or social disgrace, and the only people who could be experimented on without medics sticking their Hippocratic oar in and ordered to sail, fly, march, crawl and live amid the fallout, in many cases for up to a year. If that data was taken, I'm sure that it does still exist because it is simply too valuable, too vital for any government to ever destroy it.

It is that government, the one that did all this, to its healthiest and most loyal people, and to their families who have fretted for seven decades over the effects. It's that government which has lied for seventy years purely to deny them compensation and, perhaps more valuable to them, an apology. It's that government which today contains people prepared and able, perhaps unwittingly even, to cover up while saying there is no cover-up, who as we sit here hold our safety in its hands tonight. It is Britain alone among nuclear powers that has never admitted to any wrongdoing while it strove for those nuclear weapons. It's Britain alone that has never compensated its victims, and it's Britain alone that maintains that position even though its lawyers just made an admission that amounts to using troops in unethical human radiation experiments. It is Britain alone that has forced its own veterans to fight it, to the point that only ten percent of them are still alive. They have an average age of eighty-six, and they all suffer a lifetime's burden of grief, guilt and rage, which they should never have had to suffer. In many cases, their widows bear it for them.

I'll leave you with two questions, neither of which I can answer for you. First, is Britain going to tell the truth before or after the last nuclear veteran has died? Second, which government is the worst in the world? I still don't know. Thank you.

Q&A with Barry Buzan, Dr Tomonaga and Susie Boniface:

Barry Buzan: Well, we've had a fascinating presentation. My congratulations to Daiwa for having the idea of putting these two things together. I mean, they do fit together in a rather strange kind of way, but it's not the first thought that would come to mind. But nonetheless, they give interesting and contrasting angles to the same set of questions. It's a subject that covers a lot of different angles, and we might tour some of those angles in the Q&A. I mean, obviously there's a technical angle here. There's also a gigantic moral question here. One is about the morality of war. That's almost an oxymoron. If we're going to fight wars, then are there rules about how you fight wars? What should those rules look like?

There's also a moral question about science. I mean, there is a dark side to science in which the pursuit of inquiry is the highest value, and the pursuit of knowledge is the highest value. One can think of quite a few cases where scientists have overstepped the mark in search for that kind of knowledge. So this is not the only case in which that kind of thing has happened. Various kinds of experiments with diseases, and suchlike, have had the same effect.

There are also political questions about rights and about the competence of governments, which you have clearly dug very deeply into. There are strategic questions here as well. If you're going to fight wars, what are you going to fight them with? Some people have mentioned that some kinds of weapons are inhumane or

unacceptable, but that's actually a surprisingly difficult question. I may be morally defective, but I can't see too much difference between being blown up with a nuclear weapon and being shredded by plastic shrapnel. I mean, there's any number of particularly nasty weapons out there which you could easily describe as inhumane. The whole process of war is inhumane, as we know from looking at the news in Ukraine.

There are awkward questions here. There are questions about the practices of war, and if you're going to accept war as being something that human beings do, then weapons are part of that, and then how do you draw lines in that kind of territory? There's a lot of interesting terrain around these talks, and I think I will open the floor now. I'll take questions in groups of three.

Audience member: I've spent the last twenty years looking at the effects of radiation on the body. The dominant effect that I observe is that as well as the blast and fire that we've heard about, and the radiation, there's also the fear. Fear itself, as I think was alluded to in the first talk, fear itself can kill people. If you tell people that they have been cursed, they've been irradiated, and they don't understand what you mean, that will upset them very badly. I'm worried not only about the questions, but also the psychological side from the victim's point of view, and the force's point of view. I am unhappy with the way that Susie was looking at things and blaming people. There are a lot of incompetent people in this world on both sides of the fence. The fear of nuclear weapons is part of the benefit of nuclear weapons. If you get people to be afraid, maybe you don't have to drop it.

Audience member: It doesn't totally surprise me about this sort of suppression of information. As late as the mid-1980s, when Thatcher set up a factory in Baghdad, which involved VX nerve gas, which actually is, if enough and dropped from an aircraft, tantamount to a small nuclear weapon. This irresponsibility is still active today, and Saddam actively used various combinations of VX and nerve gas to devastating effect. I suppose today the big concern is that our nuclear arsenal is actually not in our own hands. It's actually got America's involvement. That's a very serious secondary threat, as well as the actual effect of the weapon. So I wonder what we can do to remedy that.

Audience member: Thank you for that presentation. It was great, very informative. I guess I wanted to ask if you've investigated the comparative effects. This question is directed to Dr Tomanaga. Have you ever investigated the comparative effects of a nuclear blast in Hiroshima and Nagasaki? For instance, did one experience higher rates of radiation? Was one blast worse than the other? Did one side experience higher levels of thermal heat, and what possible factors accounted for the differences between the two, assuming that there were any?

Dr Tomonaga: The Nagasaki bomb was larger than the Hiroshima bomb. That is a fact. But the outcome was not that different. For example, regarding the survival time after atomic bomb exposure, both cities' survival curves almost overlapped. So the size of the bomb did not make a big difference to the survival rate. Also, the number of those exposed to radiation was very similar in Hiroshima and Nagasaki: around 270,000 in Nagasaki and more than 300,000 in Hiroshima. So there was not much difference between those cities.

Susie Boniface: As a journalist and reporter for thirty years, it's my natural habit to just try to grab people by the throat and communicate very directly with them. It's not the first time that it's been suggested that journalists can sensationalise stuff. I would point out that when things are sensationalised, it's because it makes you feel something; it stirs your senses, and that is something I think every good journalist should try to do. The fact that I have known the veterans for so long, and seen so much of the psychological harm and fear that they do feel, is something that makes me always worry and question that what I'm doing might be making it worse, and I think it makes me a better journalist because I go back and triple-check. I am aware that the campaign in itself may have made some of their problems and fears worse. I do not want to exacerbate that.

I think the important thing about that blood testing data, if it exists, is that it will provide the answers to those questions. It would say, radiation did not enter your body; you're just unlucky. To some of the veterans that I've spoken to, that might be a relief and a weight off their chests. You can deal with life giving you an unlucky hand to some extent. If it is something where radiation has entered their bodies or has caused some problems, then they can have a different set of answers and a different way of dealing with it. I think when it's our servicemen or our own citizens – in many cases these were volunteers – I do think that they deserve those answers.

The beauty, in a way, of the legal suit that's begun is that it doesn't seek to say whether radiation has hurt them or not. It is the fear that hurt them. At the time of the weapons and after Hiroshima and Nagasaki, the media in this country and around the world was talking about the terrible, deadly toxic bombs and all the awful things that can happen. I had that growing up, even in this country in the eighties. I can remember the scares. But whether that is reasonable or whether it's unreasonable, those men and their families should have the answers. That scientific data, if it was gathered, should be passed to the scientists who are doing the government mortality studies, so they can better calculate doses and better calculate the effects. There should just be more knowledge and more communication about it. That's what I'm trying to do rather than to provoke anybody's fears. But it is something I'm aware that they have, and I try very hard not to make it worse. But I do think that the people who are most responsible for creating that fear are the people who want the weapons, and it's governments that want that fear because that's what makes the weapons effective as mutually assured destruction, in a way.

As for the issue with our nuclear arsenal, we do rent the missiles from the Americans; the warheads are ours. They do, in theory, have an ability to be fired by us and by us alone. In practice, it's probably not going to happen. Certainly not with Keir Starmer and Donald Trump. But I also think that there's an awful lot of checks and balances between the White House and wherever the red buttons are for anywhere around the world. There are enough sensible people, I hope, because despite what I said in my talk, I do genuinely trust most of the people in government.

Audience member: I'd like to know what research is being done on the children and the grandchildren of hibakusha and also of the British military.

Susie Boniface: I can answer that very quickly from my point of view. It has only been done by scientists who are not part of the government-funded studies; they're self-reported.

Dr Tomonaga: Second and third generation research was carried out five times. The population size was about 50,000 to 60,000. There were a very large number of second children of primary atomic bomb survivors. All statistical data showed negative, in terms of incidence of malformation, as well as leukemia occurrence and cancer occurrence. All the data was negative. That means that among those patients with a high radiation dose, the children born from this population, the incidence of malformation, leukemia and cancer was almost equal to those children born from very low dose exposure groups. So there was no dose effect between the two populations. So far, we have no evidence of genetic transmission of radiation.

Susie Boniface: I think there are some children in Chernobyl who've shown cancers, but they were exposed, it was not passed on. There was no attempt to do the same kind of study in the UK. It was kind of screwed up a bit by the fact that we didn't have a national register for birth deformities early enough. We also treated miscarriage very differently many decades ago. It was often down to the woman's word that she had had a miscarriage. For the Ministry of Defence, that wasn't good enough. But the self-reported surveys amongst test veterans and their families show that they have a high rate of miscarriage and birth defects, which aren't really explained. However, we do know that trauma gets passed down generations. If anyone in this room knows anyone who was a victim of the Holocaust, the whole family is affected for generations to come. Same if you've experienced extreme poverty, extreme hunger. Trauma gets passed down generations. Post-traumatic stress, whether people were involved at Hiroshima and Nagasaki or not, will infect entire families. That's what the case for the nuclear veterans is really based on.

Audience member: I'm an exiled activist from Hong Kong. I just wanted to know why you've been so determined to stand for what you believe in, and for justice. How do you keep going when you face a very cruel reality which is seemingly invincible or unbeatable? How are you so determined?

Dr Tomonaga: The actual reality of international politics is that nuclear weapons cannot be abolished. For example, the UK cannot abandon nuclear weapons at the moment. But the future direction should be aimed at abolishing nuclear weapons. I think it will take several decades from now. Maybe on the 100th anniversary of the atomic bombing, which will be 2045. Currently we cannot visualise a nuclear-free world. The problem is the procedure. I believe your generation will be a responsible generation to actually establish a nuclear-free world. However the way to go about this is difficult.

In Oslo at the Nobel Peace Prize ceremony, I insisted that the present youth generation will become responsible for this global necessity to abandon nuclear weapons. So we must start to think how to make our government leaders think more ethically, to reduce nuclear weapon numbers. All nuclear-related materials must be reduced. This gradual progression will hopefully reach a moment where nuclear weapon states' leaders decide finally to eradicate their nuclear stocks. That is my present idea. It will take maybe thirty, forty years from now. I believe the UK is the closest nation to becoming a non-nuclear state because the UK has shrunk its nuclear armaments.

Barry Buzan: I would like to thank both our speakers for their excellent presentations and thought-provoking analysis.