

## Hiroshima, Nagasaki, and Fukushima

In this issue of *The Lancet*, three Series<sup>1-3</sup> papers and a Viewpoint<sup>4</sup> commemorate 70 years of caring for survivors of the atomic bombings of Hiroshima and Nagasaki, as well as the more recent extension of that care to those affected by the Fukushima nuclear accident. As a result of this unwelcome triple legacy, Japan has become a uniquely important site for understanding radiation-related health effects<sup>1</sup> and the aftermath and effects of nuclear accidents.<sup>2,3</sup> As the From Hiroshima and Nagasaki to Fukushima Series makes clear, the three Japanese locations are linked by more than tragedy. The events of 1945 shaped institutions and research programmes that came to play a major part in Fukushima prefecture 66 years later.

70 years after the end of World War 2, the monitoring of Japanese atomic bomb survivors, known as *hibakusha*, for radiation-related health problems continues. The atomic bombings of Hiroshima and Nagasaki in 1945 were the beginnings of a long and deep engagement by Japanese people and institutions with radiation health. Ironically, the two rebuilt cities, and especially their universities, became global centres of research and expertise on radiation health with medical communities that have a unique responsibility towards survivors. Indeed, one of the first and most influential Japanese chroniclers of *hibakusha* and their sufferings, Takashi Nagai, was a radiologist and himself a survivor who succumbed to radiation poisoning.<sup>5</sup> Experts from both cities, some of them descendants of A-bomb survivors, have also been involved since 1986 in monitoring health in the former USSR after the Chernobyl nuclear disaster.

Given this legacy, medical personnel from Hiroshima and Nagasaki were among the first to arrive at the Fukushima disaster site, and many have stayed on to buttress expertise at the Fukushima Medical University, which is now a leading centre for health care after nuclear accidents. Experience from Hiroshima and Nagasaki, as well as Chernobyl, has had a direct bearing on the Fukushima Health Management Survey, a long-term monitoring plan of the affected population modelled on the treatment of post-war *hibakusha*. There are now at least 350 000 individuals to be followed over their lifespans for effects of low-dose radiation.<sup>6</sup>

The linkages between Hiroshima, Nagasaki, and Fukushima are thus more than just symbolic, having

shaped current health management practices and the institutions that run them, as well as public responses to these events. The contexts of 1945 and 2011 are clearly very different, and intervening events have also shaped current discourse about Fukushima. The post-war introduction of nuclear energy to Japan was initially distant from medical discussion, given Cold War concerns with nuclear weaponry. During this time attitudes were also influenced by the Lucky Dragon incident of 1954—when Japanese fishermen aboard the *Daigo Fukuryu Maru* (*Lucky Dragon*) were affected by a US hydrogen bomb test at Bikini Atoll—from which Japanese antinuclear activism can be dated.<sup>7</sup> A series of large industrial pollution incidents in the 1950s and 1960s, along with the subsequent occurrence of small nuclear plant accidents, have also kept the spectre of radiation-related public health crises before the Japanese public.<sup>8,9</sup> More recently, there has been growing controversy about the overuse of medical radiation technologies in Japan.<sup>10</sup> The legacy of Hiroshima and Nagasaki has nonetheless been a lens through which these and subsequent events have been filtered.

For the Japanese medical community, a clear difference between the legacy of Hiroshima and Nagasaki and that of Fukushima has been the crisis of communication and trust with the general population. At the local and clinical level, doctors and nurses in Fukushima were dedicated and heroic first-responders, but had little training for a radiation-related disaster.

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At the national level, experienced radiation experts had difficulty communicating risk to people in the affected areas. This situation partly arose from the difficulty in translating research-related terminology about the health effects of radiation to an anxious population, and partly from public conflation of government-appointed doctors with politicians, the nuclear industry, and other parties that the public and media deemed responsible for the disaster. Public anxiety and anger, some of it directed against the medical community and individual physicians, was high in the aftermath of the Fukushima accident. Moreover, the response to Fukushima was also shaped by the effects of the disaster on the evacuees. The evacuated population is at increased risk for mental health problems and other social and psychological problems that accompany refugee status.<sup>11</sup> In addition, some of the Fukushima evacuees who live with the identity of radiation disaster survivors have been shunned because of supposed contamination and self-stigma is also a problem among some evacuees,<sup>2</sup> which echoes the experiences of some *hibakusha* from Hiroshima and Nagasaki.

It was against this background that, beginning in 2012, the Division of Human Health of the International Atomic Energy Agency (IAEA) coordinated a series of expert meetings and conferences in Vienna and Fukushima at which physicians could share public health related lessons from the Fukushima nuclear accident. The overall theme of these IAEA meetings was Radiation, Health, and Society, and most Japanese authorities responsible for health in the affected area sent representatives, including Fukushima Medical University, the Radiation Effects Research Foundation of Hiroshima University, the Atomic Bomb Disease Institute of Nagasaki University, and the National Institute of Radiological Sciences. In addition to a core group of experts who are mostly physicians on the front line of post-disaster health care, other invited participants from around the world have helped shape the conversation drawing on experiences as diverse as Chernobyl, the 2004 Indian Ocean tsunami, and the 9/11 attack in New York, USA.

At these meetings it emerged that the clinical effects of radiation are not the most central issue. It was determined from the first meeting to situate the

continuing Fukushima crisis in a science, technology, and society (STS) framework, and involve social scientists to help think through the broader implications of what Japanese doctors had faced and are still experiencing. The group has identified four major problems to be addressed: trust, communication, and engagement between physicians and the general public; mental health and psychosocial problems in the affected population; non-radiological health problems related to the evacuation of people and their continuing status as evacuees; and the need for reforms in medical education related to the above. These issues extend beyond traditional public health concerns, and our discussions about their character and solution present something of a model for future interactions between physicians and social scientists trying to make sense of medical crises.

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