

# The Great East Japan Earthquake

A story of a devastating natural disaster, A tale of human compassion

11 March 2011



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#### Foreword

11 March 2011 will always be remembered as the day when we were confronted by one of the worst disasters of our generation. For the global community, it was a day of disbelief, as we witnessed families and communities being swept away. For the Japanese people, it was a day of fear and uncertainty. For individuals and communities in the disaster areas, it was a day of great loss.

I had a surreal experience during my visit to the disaster area -- I have seen the extent of the damage to families and communities, but my mind could never understand how people could cope with such devastation. I only knew at that instant, that my heart was mourning with the Japanese people, and sharing their hope for recovery and rebuilding.

More than a story about the loss of lives, missing loved ones and uncertain futures, the 2011 Great East Japan Earthquake was a tale of a country rising above the challenge of a natural disaster, and an international community acting on the basis of its human compassion.

This publication was produced for the people of Japan, especially those whose lives have been affected by this disaster. This consolidation of the information was generated by a team of professionals based in the Western Pacific Regional Office of the World Health Organization (WHO). We hope this publication will serve as a useful reference when documenting lessons learnt from the Japan disaster, and will become a tool for both Japan and the international community for future disaster response efforts.

It is important to highlight that the main sources of information for this publication were the Situation Reports published by the

WHO Regional Office at that time, which were based not only on official information but also on media reports in Japanese. A team of dedicated volunteers assisted with data retrieval and translation, capturing the nuance of the culture and the information being reported.



The data collected were supplemented with first-hand information collected from the areas affected by the earthquake and tsunami during two field missions conducted by staff of the WHO Regional Office.

As the long-term recovery activities continue in Japan, WHO continues its health situation monitoring and the accumulation of knowledge and experiences in health system and service recovery following a massive disaster event. Hopefully, we will have more information to share as we continue to work with the Japanese people in the recovery stage.

On the first anniversary of the Great East Japan Earthquake, WHO dedicates this publication to the people of Japan, and those who have shared their time, resources and talents to turn a disaster into a story of a new beginning.

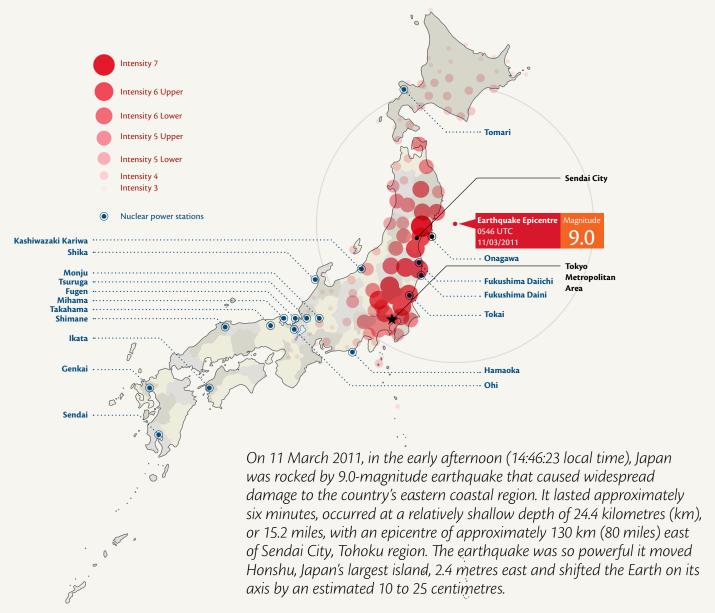
Shin Young-soo, M.D., Ph.D.

**Regional Director** 

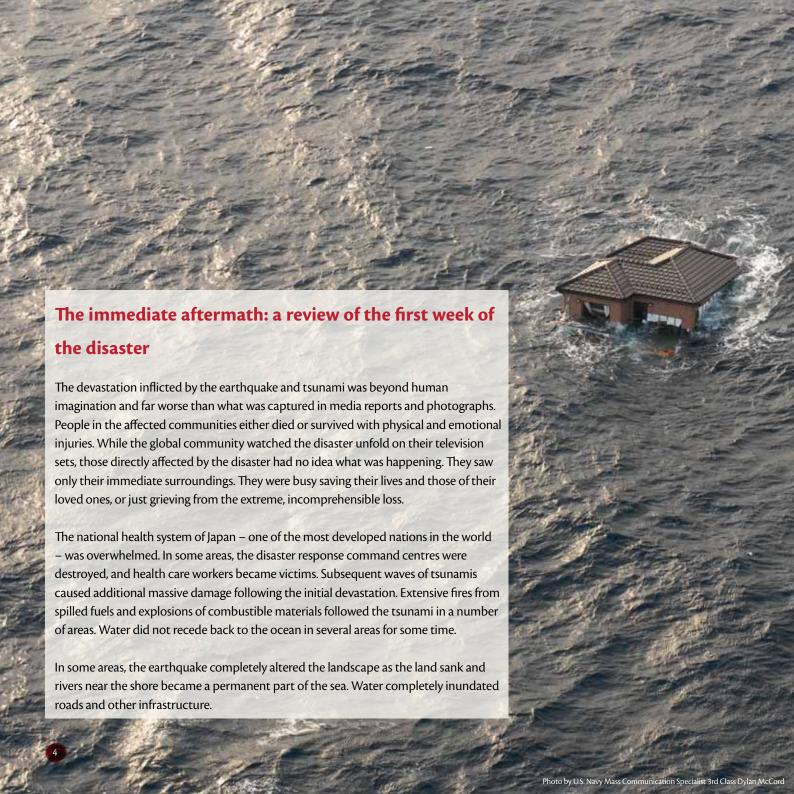
# SPECIAL NOTE ON THIS PUBLICATION The information contained in this publication is primarily based on Japan Earthquake and Tsunami Situation Reports No. 1–35, issued from 11 March to 6 July 2011, by the WHO Western Pacific Regional Office. The information presented in the Situation Reports was provided by Japanese and international official sources, interviews during the field missions, media identified in Annex 1 as well as other informal sources. However, it should be noted that the Situation Reports were based on available information collected during the period of reporting, and some information in the document might be incomplete and not current given that the event has been evolving over the past year. The contents of this publication were developed based on the most up-to-date information available at the time of reporting. Efforts have been taken to verify the timeliness of the information when possible.



### The Great East Japan Earthquake: a disaster beyond imagination









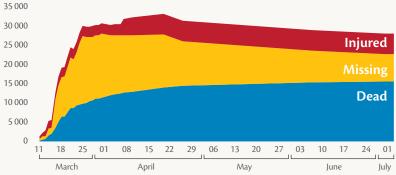
#### Loss of lives and loved ones

Miyagi, Iwate and Fukushima Prefectures were the worst affected areas and reported the majority of deaths and missing persons. The final Situation Report of 6 July reported the disaster claimed 15 534 lives (Table 1). Updated numbers of deaths and missing, as of 10 February 2012, are provided in Table 2.

The number of missing persons continued to rise for two weeks after the event, peaking at 17 541 on 25 March 2011 (Figure 1). Subsequently, more than 10 000 bodies were recovered, reducing the number of missing to 7092 (as of 6 July 2011). It was observed that the outcome of the Tohoku earthquake and tsunami was black or white, in that people either died or survived with few physical injuries. More than 90% of deaths were due to drowning, and the majority of deaths were among the elderly.

FIGURE 1.

Dead, injured and missing persons, 11 March to 1 July 2011



Source: WHO Situation Report, 6 July

TABLE 1.

Confirmed number of deaths and missing persons by prefecture, as of 6 July 2011

TABLE 2.
Updated number of deaths and missing persons by prefecture, as of 10 February 2012

Prefecture	Deaths	Missing	Prefecture	Deaths	Missing
Hokkaido	1	,	Hokkaido	1	
Aomori	3	1	Aomori	3	1
lwate	4 575	2 169	lwate	4 669	1 316
Miyagi	9 293	4 617	Miyagi	9 508	1 769
Yamagata	2	-	Yamagata	2	_
Fukushima	1 600	302	Fukushima	1 605	216
Tokyo	7	-	Tokyo	7	_
Ibaraki	24	1	Ibaraki	24	1
Tochigi	4	-	Tochigi	4	-
Gunma	1	-	Gunma	1	-
Chiba	20	2	Chiba	20	2
Kanagawa	4	-	Kanagawa	4	-
Total	15 534	7 092	Total	15 848	3 305

Source: National Police Agency

Source: National Police Agency

#### Loss of support for human survival

This catastrophic event had a devastating effect not only on human lives and health, but also on the basic infrastructure necessary for human survival and for disaster response, thereby limiting response capacities.

The impact of the disaster on medical care and health services was beyond what had been anticipated despite the country's experience with and preparedness for earthquakes and tsunamis. Two weeks after the event, local medical associations reported limited health facility capacity; in the worst affected prefectures of lwate, Fukushima and Miyagi, 52% of health facilities were unable to accept new patients, and 14% were unable to accept any patients due to lack of

resources, including staff. In addition, a lack of electricity and water paralysed hospitals located further inland. Public health workers were also affected by the tsunami, with many losing their lives, losing loved ones or forced to live in evacuation shelters. For the survivors, their capacity to respond was limited as they were dealing with their own losses.

The disaster also affected transportation, communications and other logistical support for response. Disruption of the fuel supply was also a crucial limiting factor for all response activities. Without these basic response tools, local governments were paralysed or severely limited in their ability to carry out initial assessments and to report on the extent of the disaster.



#### Fire

Fires occurred in 11 prefectures, but extensively in Miyagi, Hokkaido and lwate. Gas pipeline fires occurred in Ichihara City, Chiba and were controlled by 13 March. Fires from aftershocks were reported on 12 March. In total, 269 fires were recorded, 250 were controlled, and 8 were still burning as of 17 March 2011.

#### Landslides

Sixty landslides were reported from Miyagi, Yamagata, Tokyo, Tochigi, Gunma and Chiba. An avalanche in Niigata was reported on 12 March.

COMMUNICATIONS

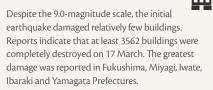
#### **Telecommunications**



Telephone services remained variable with disaster messaging services in operation through mobile phone providers the first week post event. A total of 831 736 telephone lines remained out of service on 17 March. A reported 6468 base stations of NTT, Soft Bank, KDDI, Emobile and Wilcom mobile companies were not functioning.

INFRASTRUCTURE

#### **Buildings**



- <sup>1</sup> Reconstruction Agency
- <sup>2</sup> Ministry of Health, Labour and Welfare

#### Damage caused by the disaster: a review of the first week

**TRANSPORTATION** 

#### **Airports**



International: Haneda Airport was closed temporarily and reopened at 03:37 on 12 March. Narita International Airport reopened at 06:00 on 12 March.

Domestic: Misawa, Ibaraki, Hanamaki, Oodatenoshiro, Sado airports were reported as operational on 14 March. Sendai, Fukushima, Tokunoshima and Amami-Kikai airports were closed. Sendai airport, which was completely inundated with water, commenced rescue flights on 16 March and commercial flights on 13 April. Yamagata airport was operational and used as a transport hub, while Hamamaki airport was closed on 11 March but became operational 24/7 for rescue operations on 14 March.

#### **Ports**



All of Japan's ports were closed briefly after the earthquake. Fourteen major seaports in Tohoku region became non-operational.

As of 31 January 2012, restoration of the seaports were in progress, with 72% of the public quays between Hachinohe and Kashima Ports accessible with certain restrictions.

#### **Roads**



By 17 March 2011, 1233 roads were reported as damaged in Aomori, Miyagi, Yamagata, Akita, Tokyo, Ibaraki, Tochigi, Saitama, Gunma, Chiba and Iwate. In total, 540 sections of toll roads, national highways and prefectural highways were closed.

As of 31 January 2012, 72 sections of the national and prefectural highways were still closed.  $^{\rm 1}$ 

#### **Trains**

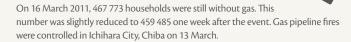


East Japan Railway's bullet train and train services in the Tohoku region remained halted by the end of the first week post event. Tokyo Metro train services were also halted, but restarted with limited services on 12 March. Seven days after the event, East Japan Railway established a new route for the transportation of fuel. This freight train operated from Kanagawa and Hokkaido to Morioka via Aomori.

As of 31 January 2012, nine regional lines of East Japan Railway in the Tohoku region remained out of service.  $^{\rm 1}$ 

#### **SERVICES**

#### Gas



#### Water



It was reported that 1 794 964 households from 12 prefectures were without running water on 16 March (compared to estimates of 1 671 570 households from 12 prefectures on 16 March and 1.4 million from 13 prefectures on 15 March). The number of households without running water was 960 828 from 12 prefectures one week after the event. The most affected prefectures in the first week were Miyagi, Fukushima, Yamagata, Iwate (limited information), Ibaraki, Tochigi, Chiba, Akita and Aomori.

As of 25 January 2012, the total number of house connections restored in affected prefectures was 2.26 million. In Miyagi, Iwate and Fukushima Prefectures, water supply is still cut off to at least 45 000 households (the number is cumulative from 11 March 2011 and due to subsequent aftershocks in April and July 2011). All water supplies have been restored, except for those located in areas where houses were swept away by the tsunami.<sup>2</sup>

#### **Electricity**



4.6 million households in north-eastern Japan under Tohoku Electric Power and 4 million in the Kanto area under TEPCO were left without electricity on 11 March.

Scheduled limited power outages started on 15 March and continued in the Kanto area, including Tokyo, until 17 March. One week after the event, 353 358 households across the Kanto and Tohoku regions remained without power.

#### **Petrol**



Collectively, 1 300 00 litres of petrol were provided to Miyagi, Iwate, Fukushima and Ibaraki by 17 March (compared to 760 000 litres of petrol provided by 16 March).

#### Oil



Six of the nine oil refineries in Tohoku and around Tokyo were shut down on 11 March, and two of them were ablaze north-east of Tokyo.





#### Displacement of people and communities

Disasters have a long-lasting impact on people and the communities in which they live. Survivors have to cope with the enduring impact of the disaster, while grieving for those they have lost.

#### **EVACUATION CENTRES**

On 15 March, within four days of the disaster, preliminary reports indicated that there were 440 000 evacuees. One week after the disaster, on 18 March, the official number of evacuated and stranded persons was 402 069 (Table 3). Among these survivors, 16 560, possibly more, were reported as stranded.

The 385 919 evacuees were reported to be located in more than 2398 evacuation centres. The majority of evacuation centres were located in Miyagi Prefecture (1063) followed by Fukushima Prefecture (556) and Iwate Prefecture (386).

By 20 March, evacuee numbers were declining; however, the number of evacuees being accepted at prefectures that were relatively unaffected was increasing (e.g. Yamagata, Saitama and Niigata). Evacuees had also started being accepted in Nagano (N=101) and Yamanashi (N=180). The livelihoods of these evacuees at other prefectures would later become a concern.

On 5 April, 163 607 evacuees were reported to be staying in shelters in 17 different prefectures – a vast reduction from 270 000 from three weeks earlier. Many of the prefectures were accommodating people from other prefectures; for example, evacuees from Fukushima were distributed among 15 different prefectures. On 6 April, there were 137 772 evacuees in 1141 centres.

By 11 May, 79 776 evacuees were living in 901 evacuation centres.



#### **TEMPORARY HOUSING**

The establishment of temporary housing units in Miyagi and lwate Prefectures greatly assisted in reducing the number of people in evacuation centres; their relocation represented an important transition from a response to a recovery situation. These transitional, temporary housing units were designed to shelter displaced persons for two or more years.

By 4 July, approximately 14 000 temporary housing units had been built in Miyagi, reducing the evacuation centre population each week by 5%–10% as the residents relocated to temporary housing and other more permanent communities. Of the 13 824 temporary housing units planned in Iwate, approximately 75% (10 305) were built. On average, two weeks lapsed from the completion of a housing unit to someone taking up residence. It was assumed that by the end of July 2011, the majority of the units would be filled.

While the situation had vastly improved for the evacuees, new challenges were emerging. For example, in Iwate, as temporary housing communities were relatively small, it had been difficult to recreate the pre-disaster community environment that could readily provide basic social and community services.



Table 4 provides a summary of the number of evacuation centres and evacuees in each of the three main prefectures as of 6 April 2011, 11 May 2011 and 13 February 2012.

On 16 June, more than three months after the disaster, 112 405 persons remained displaced:

- 31 297 in evacuation centres:
- 27 427 in hotels:
- 25 612 in homes of friends or relatives: and
- 28 069 in temporary housing units.

TABLE 3.

Number of stranded and evacuated persons by prefecture one week after the event

Prefecture	Stranded	Evacuees	Evacuation centres		Estimated age: 15–65 <sup>b</sup>	Estimated age: >65 <sup>b</sup>
Aomori	-	367	32	48	235	84
lwate	~10 000	48 439	386	6 346	31 001	11 093
Miyagi	>6 050	191 467	1 063	25 082	122 539	43 846
Yamagataa	-	2 712	28	355	1 736	621
Fukushima	98	131 665	556	17 248	84 266	30 151
Ibaragia	-	7 567	185	991	4 843	1 733
Tochigi	-	1 028	148	135	658	235
Niigataa	-	2 674	51	350	1 711	612
Total	>16 150	385 919	2398	50 555	246 988	88 375

a These numbers include evacuees from Fukushima and/or Miyagi.

TABLE 4.

Breakdown of evacuation centres and evacuees in the worst affected prefectures

11 May 2011

6 April 2011

	(Situation	1 Report 25, 6 April)	(Situation Re	eport 33, 11 May)		
Prefecture	市	<b>†</b> Ťŕ	市	ŤŤi	市	ŤŤi
Miyagi	497	63 901ª	402	33 207 <sup>d</sup>	$0^{f}$	0
Iwate	353	49 020 <sup>b</sup>	357	37 482 <sup>e</sup>	Og	0
Fukushima	291	24 851°	142	8 085 <sup>d</sup>	1	1
Total	1141	137 772	901	79 776	1	1

a Figure from 5 April 2011

g The last evacuation centre in lwate Prefecture was closed on 7 October 2011. Sources: Miyagi: http://www.pref.miyagi.jp/kohou/ej\_earthquake.htm; hwate: http://sv032.office.pref.iwate.jp/~bousai/; and Fukushima: http://www.cms.pref.fukushima.jp/.



13 February 2012

b These figures should be interpreted with caution as the age groups listed are those of the prefectural population and may not reflect those at the evacuation centres.

Source: WHO Situation Report, 18 March

b Figure from 3 April 2011

c Figure from 4 April 2011

d Figure from 10 May 2011

e Figure from 5 May 2011

f The last evacuation centre in Miyagi Prefecture was closed on 30 December 2011.

#### Support and care for the elderly and the disabled



Care for the elderly was severely impacted by the disaster. Unofficial sources reported that across 12 municipalities in Iwate Prefecture, care facilities were damaged in 11 municipalities, and at least 30 nursing facilities for the elderly were destroyed. In Miyagi Prefecture, 291 of the 697 nursing facilities for the elderly were damaged to some extent. In these two prefectures, about 74 000 elderly persons were in need of nursing care or support after the disaster.

By 25 April, 1782 elderly and disabled persons had been transferred to other prefectures: 227 from elderly care facilities in Iwate, 952 from Miyagi, 111 from Fukushima and 492 persons with disabilities from Fukushima. By 6 May, the situation had stabilized, with only one new person transferred from Miyagi Prefecture.

On 30 April, Iwate and Miyagi Prefectures reported that 52 nursing facilities located in coastal areas had been non-operational since the disaster. It was also reported that 15 elderly died within one week after evacuation.

## Hampered efforts to help one another

Disruption of health services and infrastructure was significant, severely hampering relief efforts.

According to initial reports, 145 out of 170 hospitals designated for acute disaster response in Tokyo and Tohoku region were operational within the first day (11 March) of the disaster. By 13 March, 27 of the 145 fully operational hospitals were at capacity. Additionally, only one of the seven hospitals in Sendai City was operational.

By the end of the first week (18 March), with the arrival of more official data, it was confirmed that 123 of 141 hospitals designated for acute disaster response in Tokyo and Tohoku region were fully operational. In two of the worst affected prefectures, 8 of the 14 designated disaster response hospitals in Miyagi were operational, and 4 of the 8 hospitals designated for disaster response in Fukushima were operational. Of the 150 hospitals in the Kanto and Tohoku regions designated for disaster response, 22 were unable to accept additional patients one week after the event. See Table 5 for a breakdown of disaster-designated hospitals by prefecture in the two regions.

In Fukushima, 8 of the 142 hospitals were disaster-designated hospitals. Stockpiles of disaster emergency medical equipment for early response were on hand at six health centres, and a team of health professionals were trained to be part of a Disaster Medical Assistant Team (DMAT) of the Government.

In Miyagi, 14 of the 147 hospitals were established as disaster-designated hospitals.

In Iwate, 11 of the 96 hospitals were identified as disaster-designated hospitals, according to the Ministry of Health, Labour and Welfare. The Iwate Emergency Medical Information System was also established in order to collect and disseminate information, including availability of receiving patients and situation of essential lifeline infrastructure in the event of a disaster.

By 25 March, local medical associations were reporting on the limited capacity of the health facilities. Out of 231 hospitals and clinics in the worst affected prefectures of Iwate, Fukushima and Miyagi, 121 (52%) were unable to accept new patients, while 33 (14%) were unable to accept any patients due to lack of resources. Difficulties in supplying dialysis treatment in the affected areas were also reported.

TABLE 5.

Disaster-designated hospitals by prefecture in the Kanto and Tohoku regions one week after the disaster

Number of disaster-designated

Prefecture	Number of disaster- designated hospitals	hospitals unable to accept additional patients
Aomori	8	1
lwate	11	2
Miyagi	14	8
Akita	12	1
Yamagata	7	0
Fukushima	8	4
Ibaraki	11	3
Tochigi	9	3
Tokyo	69	0
Total	149	22

Source: WHO Situation Report, 18 March

#### Building on from past earthquake experiences

Based on the lessons learnt from the Hanshin-Awaji Earthquake in 1995, the Ministry of Health, Labour and Welfare strategically facilitated each prefecture to set up disaster-designated hospitals according to the medical service division in each prefecture. The disaster-designated hospitals play a key role in accepting injured persons and/or supporting other hospitals during disasters in order to maintain an appropriate level of medical service for the affected population. A manual for disaster medical assistance activities was prepared to guide these hospitals in the event of a disaster.

In case of a disaster, these hospitals are in charge of deploying medical assistance teams; public health teams based in health care centres are in charge of public health activities, including consultation with affected people, health surveillance and mental health care. When medical institutions are affected by a disaster, a system to provide medical goods reciprocally among medical assistant teams is activated.

By 5 April, 25 days after the event, 27 of 33 (82%) designated hospitals in Miyagi, Fukushima and Iwate were capable of accepting inpatients and 26 (79%) were accepting outpatients (Table 6).

More than five weeks after the disaster, 20% of all hospitals in the affected coastal areas were still closed. In Iwate Prefecture, 2 out of 15 hospitals and 40 out of approximately 120 clinics that were closed on 11 March remained closed until 6 May. In Fukushima Prefecture, 8 out of 16 closed hospitals remained closed.

By 6 May, almost two months after the disaster, 29 of 33 (88%) disaster-designated

hospitals in Miyagi, Fukushima and Iwate were accepting inpatients and 29 (88%) were accepting outpatients.

Two months following the earthquake, many health care facilities were fully operational. However, some hospitals and clinics, particularly in the coastal areas of Miyagi, Iwate and Fukushima, were still unable to provide medical care and needed staff to reduce their working hours. While there were only a few patients on day one of the event, the number of patients increased over time, in some instances with a large volume of patients. For example, the Ishinomaki Red Cross Hospital, which received an

average of 60 patients per day before the earthquake, received approximately 10 000 patients in the first 30 days after the earthquake.

By 16 June, 30 of the 33 (91%) designated disaster hospitals in Miyagi, Fukushima and Iwate were accepting outpatients: 13 of 14 in Miyagi, 7 of 8 in Fukushima and 10 of 11 in Iwate.

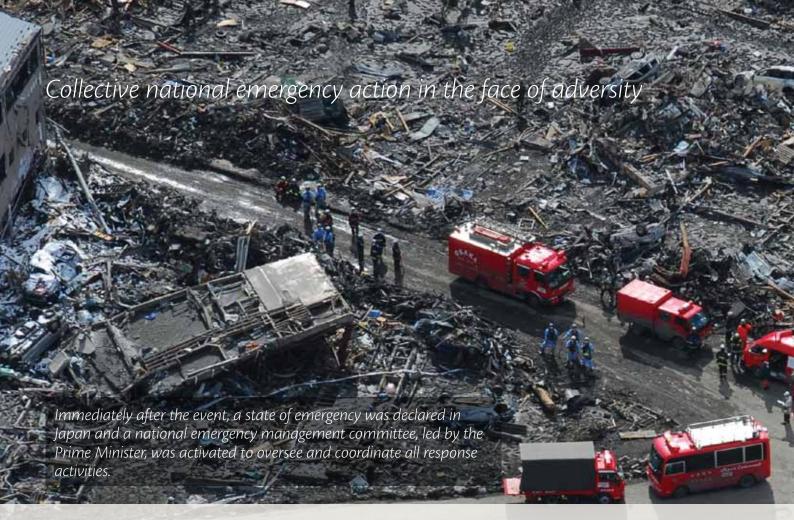
While restoration of information systems and the loss of medical charts and records were ongoing challenges, much of the medical care system and its infrastructure (including laboratory diagnostic capacity) recovered.

TABLE 6.
Status of disaster-designated hospitals in worst affected prefectures

			5 April		14 April		6 May
Prefecture	Number of disaster- designated hospitals	Accepting inpatients	Accepting outpatients	Accepting inpatients	Accepting outpatients	Accepting inpatients	Accepting outpatients
Miyagi	14	12	11	13	11	13	12
Fukushima	8	7	7	7	7	7	7
lwate	11	8	8	10	10	9	10
Total	33	27	26	30	28	29	29

Source: Ministry of Health, Labour and Welfare





Multiple government ministries and agencies were involved in the national response, including: Ministry of Health, Labour and Welfare; Ministry of Land, Infrastructure, Transport and Tourism; Ministry of Foreign Affairs; Ministry of Agriculture, Forestry and Fisheries; and Ministry of Finance. In addition, all prefectures activated their local government response systems.

As part of a massive rescue and relief effort, naval vessels and other ships sailed to devastated areas of Honshu Island, air force fighter jets flew reconnaissance missions and army helicopters rescued the stranded. Within two days of the event, at least 3000 people had been rescued.

In addition, police and fire departments sent response teams to Miyagi and Iwate via helicopter and ship. Transportation site assessments throughout the Tohoku and Kanto regions were carried out. The coast guard coordinated evacuation and alert services, including alerts surrounding potential radiation exposure in Fukushima Daiichi nuclear plant.

The Ministry of Agriculture, Forestry and Fisheries and the Ministry of Finance assisted in the provision of rice, food, water,



portable latrines, blankets, radios, gasoline, flashlights, dry ice and other essential supplies.

The Ministry of Health, Labour and Welfare coordinated the national health response to the disaster, including the deployment of DMATs and the provision of public health services. DMATs are teams of trained medical and support personnel who provide

emergency medical care during a disaster.

DMATs were deployed within two days of the disaster. In addition, the Iwate prefectural government successfully dispatched a medical response team to the coastal area by land and helicopter. Table 7 shows the number of DMATs that were active one, two and three days after the disaster.

TABLE 7.

Number of DMATs responding, deployed and on standby on the first three days after the event

Date	Responding	Deployed	Standby
12 March	8 teams	139 teams	170 teams
13 March	193 teams	46 teams	124 teams
14 March	120 teams	23 teams	119 teams

Source: WHO Situation Reports, 12–14 March 2011

One week after the disaster, active deployment of DMAT rescue operations was scaled back as it was no longer the active response phase. Eighteen teams were responding, 13 teams were mobilized and 107 teams were on standby.

The Japan Self-Defense Forces (SDF) cleared the roads by day three in many areas, greatly improving the ability of emergency response operations (Figure 2). The following response actions were coordinated by the Ministry of Health, Labour and Welfare:

- deployment of staff to Sendai City
   Office and Tohoku Regional Office;
- coordination of logistics for medical supplies and equipment;
- support for local government for collection of deceased, including dry ice collection and redistribution for preservation of deceased prior to funeral services; and

 provision of advice to local governments regarding food poisoning, infectious diseases and deep vein thrombosis.

Medical assistant teams dispatched from all over Japan undertook major roles in helping the affected people. Table 8 shows the number of teams dispatched and active on three post-event dates.

By early July 2011, in Miyagi, medical team assistance from other prefectures had ended, and most medical facilities were managing on their own. All of the hospitals that were not destroyed had returned to their normal operations. Public health systems had also returned to baseline levels, with clinics re-established in many areas.

By 6 July, in Iwate, many of the external medical care providers had left the affected sites, major hospitals were on track towards recovery, and new clinics were being set up. The municipal government took the lead to provide both medical care and public health services. However, medical assistance from other parts of the prefecture and other prefectures was still being used in some severely affected locations, and some external assistance was expected to continue through the summer and possibly for a longer period (e.g. mental health and psychosocial support).

For some hospitals and clinics in the coastal areas of Miyagi and Iwate, full recovery will take several years, as some of those areas were completely destroyed.

For missing persons, an international Internet system was established and WHO Member States set up hotline services for their own nationals. Domestically, a hotline was established through the Miyagi Police.

FIGURE 2.

Timeline for main response activities after the earthquake

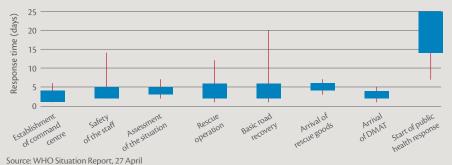


TABLE 8.

Number of medical assistant teams dispatched and active

	17 April	25 April	6 May
Dispatched	1 166	1 359	1 667
Active	153	138	119

Source: WHO Situation Reports, 20 April, 27 April and 11 May

#### Taro: the spirit of preparedness and resilience

Taro is a small coastal town, famous throughout Japan and to earthquake researchers for its giant sea wall, 10 m high and almost 1.5 km long (long enough that residents used to go jogging on it). This massive wall was the product of many lessons learnt from a long history of tsunami disasters that devastated this town. Since its completion, this wall had protected the town and its residents from other tsunamis, becoming a hallmark of the town's preparedness. Tragically, however, it was unable to save Taro's residents from the devastating tsunami that attacked the



town on 11 March 2011. Indeed, the tallest tsunami wave—approximately 38 m—was recorded just near Taro.

However, the spirit of preparedness and resilience, ingrained in the residents and community of Taro, was unwavering and alive. Although the Taro health clinic, the only health facility in town, was destroyed by the succession of massive tsunami waves that pounded the town, all five inpatients survived. Thanks to well-prepared and dedicated doctor and nurses, a timely tsunami alert and advanced knowledge of evacuation routes to higher ground, all inpatients were successfully evacuated. Moreover, despite limited external assistance due to the vast scale of destruction, the town doctor and other survivors relied on each other to stay alive, at times salvaging medicines from the rubble.

A temporary clinic was set up at an unaffected location on a hill, and there, the doctor continued to provide medical services to the affected, himself living in a temporary housing unit on site along with the rest of the displaced population. As the recovery and reconstruction efforts continue in the town of Taro, a long-term vision for the community and its health care system will be important. It is hoped that the town and its residents will rise up again, just as it had done from countless tsunami disasters in the past.

#### **Public health response**

The main public health response occurred approximately two weeks after the event, after initial rescue operations and distribution of essential items. Given the magnitude of the event, public health could not be prioritized during the immediate response phase. For example, during the first week, motor vehicles in Miyagi Prefecture were reserved for first responders (e.g. fire fighters, emergency medical services and SDF). The public health response was challenged by the loss of pre-existing command posts, and most local governments took four to seven days to confirm the safety of their staff.



Public health nurse teams were sent to evacuation centres. By 19 March, 60 nurse teams had responded, nine teams were mobilizing and a further 31 teams were on standby. Between weeks one and two after the event, public health activity increased considerably. By 2 April, 113 public health nurse teams had been deployed to evacuation centres and public health centres in Fukushima, Iwate, Miyagi and Sendai City (Table 9).

In addition, by 20 March, 22 of the planned 144 mental health care teams had been deployed; this number increased to 33 by 25 March (Table 10).

The following response actions were also coordinated:

- The National Centre for Child Health and Development and Japanese Society of Emergency Paediatrics deployed a team to Miyagi Prefectural Paediatric Hospital for assessing the paediatric medical needs.
- Ninety-six teams, consisting of 514 members, responded to Iwate, Miyagi and Fukushima from the National Hospital Institution, Japan Red Cross Society (JRCS), Japan Medical Association and other organizations.
- On 24 March, the Japanese Nursing Association dispatched 67 nurses to Iwate.
- The Japan Pharmaceutical Association and the Japanese Society of Hospital Pharmacists deployed pharmacists to Miyagi, Fukushima, Iwate and Ibaraki.

TABLE 9.

Public health nurse teams deployed to evacuation centres and public health centres

25 March

2 April

274971		23 ///0// 0//		
Location	Number of teams	Location	Number of teams	Status
lwate (39) Miyagi (49) Sendai City (20) Fukushima (5)	113	Iwate (27) Miyagi (39) Sendai City (27) Fukushima (2)	95	Responding
Miyagi (2) Fukushima (1)	3	Iwate (2) Miyagi (2)	4	Mobilizing
lwate (1) Fukushima (6)	7	lwate (4) Miyagi (2)	6	Standby
lwate (40) Miyagi (51) Sendai City (20) Fukushima (12)	123	Iwate (33) Miyagi (43) Sendai City (27) Fukushima (2)	105	Total

Source: WHO Situation Reports, 25 March and 6 April

TABLE 10.

Mental health care teams deployed, as of 20 March 2011

	Number of teams	Location
Responding	23	Iwate (7) Miyagi (12) Sendai City (3) Fukushima (1)
Mobilizing	3	Iwate (2) Sendai City (1)
Standby	7	lwate (1) Miyagi (5) Fukushima (1)
Total	33	Iwate (10) Miyagi (18) Sendai City (4) Fukushima (2)

Source: WHO Situation Report, 25 March

Four months after the disaster, the public health system had largely been restored in areas that were not severely affected, as lifelines and infrastructure recovered. Due to an increase in workloads (i.e. baseline routine activities plus recovery activities) in the public health sector, routine activities such as maternal and child health care. basic mental health and psychosocial support (MHPSS) and cancer prevention activities were prioritized based on current needs. The lack of sufficient infrastructure for transportation continued to be a challenge. Iwate in particular remained highly dependent on automobiles for transportation, and good transportation access was still a challenge in some remote coastal areas.

In response to the needs of the elderly and people with disabilities:

• The Japan Care Manager Association

- dispatched eight care managers to Ishinomaki City, Miyagi.
- The Japan National Council of Social Welfare sent another eight managers to conduct needs assessments and provide support in Iwate.
- Some 280 caregivers (home helpers) for the elderly and people with disabilities responded in Iwate (89), Miyagi (98) and Fukushima (93). A further 8126 caregivers were on standby by 31 March.
- Beds in special facilities were prepared for standby: 35 557 beds for elderly people, 8756 beds for adults with disabilities, 7148 beds for children with disabilities. Additionally, by 30 March, 919 beds were prepared in evacuation shelters.

According to unofficial information, as of 3 April, more than 40 welfare evacuation

centres serving people who require specific care and support were set up by six local governments in Iwate and Miyagi Prefectures. Since immediately after the event, Sendai City accepted more than 250 people to welfare evacuation centres. In order to avoid losing mental and physical function, evacuees were encouraged to engage in activities, such as drawing and origami. People received assistance from care workers and nurses on a 24-hour basis.

From 18 March, the Ministry of Health, Labour and Welfare requested each prefecture to dispatch care workers and collect information on the number of care workers available. As of 20 April, the situation was as below:

- Total number of care workers available:
   8180 workers
- Total number of care workers dispatched:
   617 workers (699 as of 25 April).



#### Tono's preparedness and response to the disaster

Tono is a city in Iwate Prefecture located inland away from the coast. While several buildings in Tono were damaged due to the earthquake, the city was not affected by the tsunami.

Tono's preparedness for disaster response was unique. Led by Mayor Toshiaki Honda, Tono developed a disaster response plan in 2007, focusing on how Tono could provide swift support to coastal cities and towns if they were affected by a tsunami. Annual functional exercises have been conducted since 2007 to test the city's response plan with participants of multiple agencies.

On 11 March 2011, despite damage to several buildings including the City Hall, Mayor Honda successfully activated the response plan to support severely affected coastal areas. On 12 March, based on a rapid needs assessment, life-saving supplies were provided to several tsunami-affected cities. Through mid-April, the city continued to organize dispatches of supplies, such as 140 000 ready-to-eat rice balls, 125 000 blankets and clothes, 38 000 kilograms of rice and 63 000 litres of fuel. A total of 4106 city employees and citizens and 2649 volunteers were mobilized to provide support.

Tono's experience revealed the importance and value of preparedness. "It would be impossible for me to command and make decisions to provide such swift support to our neighbouring cities if there were no response plan in place and practice through exercises," Mayor Honda said. In addition, emergency response requires some flexibility in applying existing rules and mechanisms, depending on real situations. Inter-city or even inter-prefectural collaboration is essential in response to disasters that go beyond imagination.







# Solidarity with the Japanese people

The Great East Japan Earthquake was the first real-world disaster that tested the ability and role of the newly established Division of Health Security and Emergencies in the WHO Western Pacific Regional Office.

# Connecting the world for a unified support

WHO used its global network system to communicate and coordinate information collection, public health risk assessments and provision of public health advice since the start of the Japan emergency (Figure 3). The WHO Regional Office for the Western Pacific undertook their emergency response activities in coordination with the Japanese Government, through the Ministry of Health, Labour and Welfare.

In addition to collecting information from Japanese and English sources and conducting regular situation reporting, the new Division of Health Security and Emergencies served as a common operational platform for communication, health needs, risk assessment and decision-making to provide public health advice to the public and the international community in coordination with various WHO offices.

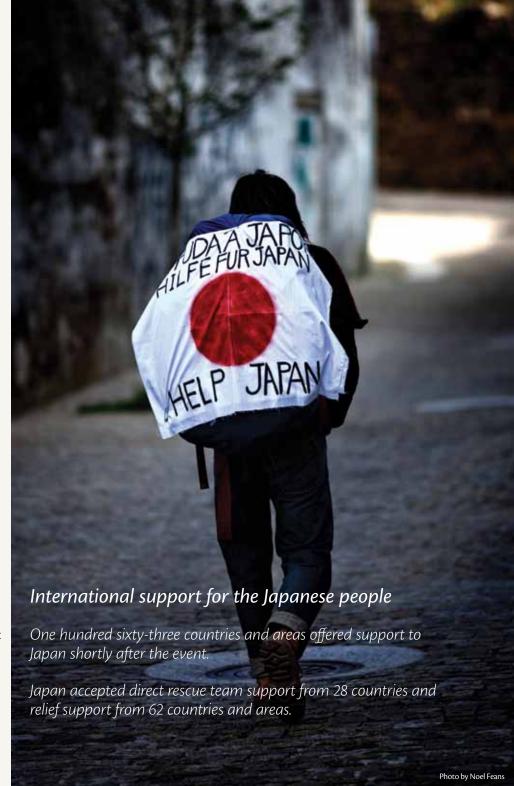
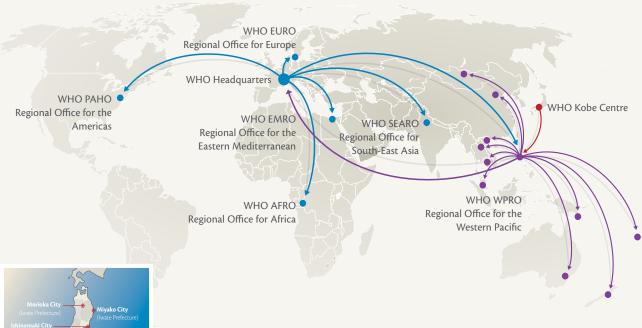


FIGURE 3.

Communication and dissemination of information through the WHO global system







# The first hour: Emergency Operation Centre activated

Immediately following the earthquake, the WHO Regional Office activated its Emergency Operation Centre (EOC) to monitor the evolving situation 24 hours a day, 7 days a week during the early stage of the event.

The Event Management Team comprised all three technical units within the Health Security and Emergencies Division, namely: Emerging Disease Surveillance and Response, Emergency and Humanitarian Action and Food Safety. Relevant technical units from other divisions including Environmental Health, Mental Health, Noncommunicable Diseases (NCDs) and the Public Information Office also joined the team.

#### WHO's key responses for the first two weeks following the disaster

Activated an Emergency Operations Centre (EOC) in the Regional Office and activated an Emergency Management Team with two groups in place for situation monitoring (one for Japanese and the other for English sources of information).

Engaged senior management in decision-making for WHO response.

Set up teleconferences within WHO at the different levels.

Communicated with the WHO Country Offices that might be affected by the tsunami.

Identified the National IHR Focal Point in Japan as the main contact point for communication with WHO.

Informed Member States of the event through the National IHR Focal Points.

Issued Internal Situation Reports No. 1–4.

Issued first external Situation Report.



Put global radiation experts on standby.

Issued Internal Situation Report No. 7.

Conducted event monitoring and information collection.

Issued Internal Situation Report No. 9.

## March

11

-42

13

14

15

16

Developed initial response plan.

Japan National IHR Focal Point notified WHO of the explosion event at Fukushima Daiichi Power Plant.

Communicated with WHO Country Offices, Headquarters and others to monitor the situation and conducted public health risk assessments. /

Environmental Health Unit joined the Event Management Team in the Regional Office.

WHO Regional Office put on standby to provide necessary support to affected countries.

Issued Internal Situation Reports No. 5-6.

Compiled technical guidelines related to nuclear issues both in English and Japanese.

Issued Internal Situation Report No. 8.



Coordinated with WHO Kobe Centre to jointly monitor the situation.

Forward planning for assessment of status, risk and planning for response for potential nuclear and human health needs.

Issued Internal Situation Report No. 10.



Warned the public against indiscriminate use of potassium iodide as a response to radiation.

Issued Internal Situation
Report No. 11.

Advised residents of Pacific island countries on radiation risk.

Published frequently asked questions on food safety at: http://www.who.int/hac/ crises/jpn/faqs/en/index6.html.

Issued Internal Situation Report No. 13.

WHO websites (Headquarters and Regional Office) advised travellers without essential reasons to travel to Japan to consider deferring travel to any areas where there has been considerable disruption to the normal infrastructure and where authorities are responding to urgent humanitarian needs.

Issued Internal Situation Report No. 15.

ICAO, on behalf of IAEA, the
International Maritime Organization,
WHO and the World Meteorological
Organization, issued a joint statement
on the continued safety of air transport
operations in Japan. These five
organizations confirmed that there were
no restrictions to normal air transport
operations at Japan's major airports,
including Haneda and Narita.

The ICAO statement further confirmed that there were no health reasons that would require the screening of passengers emanating from Japan and no health risks associated with increased levels of radiation that have been detected at some airports.

Issued Internal Situation Report No. 17.

Issued Internal Situation Report No. 12.

Team leader of
Environmental Health,
WHO Regional Office,
arrived in Tokyo to support
WHO Kobe Centre and to
coordinate with the United
Nations Disaster and
Assessment Coordination
(UNDAC) team.

International Civil Aviation Organization
(ICAO) announced that there was
no need to restrict flights or maritime
operations to and from Japan or to
screen for radiation of international
passengers from Japan at this time.

ICAO stated that based on statements by WHO and the International Atomic Energy Agency (IAEA) there was no scientific evidence for restricting flights or maritime operations to areas in Japan not affected by the tsunami.

Issued Internal Situation Report No. 14.

Conducted event monitoring and information collection.

Issued Internal Situation Report No. 16.

Forward planning for assessment of status, risk and planning for response for potential nuclear and human health needs continued.

Issued Internal Situation Report No. 18.

#### **International Health Regulations at work**

In accordance with its Constitution and the International Health Regulations, or IHR (2005), WHO is mandated to assess public health risks and provide technical consultation and assistance relating to public health events. Following the Great East Japan Earthquake and Tsunami, the WHO Regional Office worked closely with the IHR National Focal Point of Japan and WHO Headquarters to facilitate sharing of information through the IHR Event Information Site, which is open to all WHO Member States.

Timely dissemination of information and situation reporting was made possible by streamlined communication and information sharing between WHO and the Japan Ministry of Health, Labour and Welfare, through its National IHR Focal Point.

#### Risk assessments of public health impact

The Event Management Team conducted a comprehensive risk assessment to determine the potential public health impact of the earthquake and tsunami. As a result of the assessment, health advice was provided to address specific issues related to radio-nuclear exposure, food safety and drinking-water quality. Concerns related to communicable diseases, noncommunicable diseases and mental health were also identified.

In coordination with WHO Headquarters, question-and-answer fact sheets and technical guidelines were developed.







#### Fact-finding on the ground: field missions to affected areas in Japan



Immediately after the earthquake, WHO joined the United Nations Disaster and Assessment Coordination (UNDAC) team on standby. WHO also undertook three missions to Japan for fact-finding, information collection and public health risk assessment.

The first mission in April 2011 was organized with a focus on communicable diseases, noncommunicable diseases and mental health. The second and

third missions in August 2011 aimed to further understand and document progress with health system recovery. Through these follow-up visits, WHO achieved collaborative agreements with local institutions in the affected regions, establishing an effective mechanism for sharing findings and the important contributions made by these institutions with the international community. In addition, WHO collected initial baseline

information to assess the progress of planned recovery activities in the affected areas, covering both the public health and medical care sectors and the surveillance system for communicable diseases. These ongoing activities resulted in the timely sharing of information through a special edition of the online open-access journal, Western Pacific Surveillance and Response (http://www.wpro.who.int/wpsar/) on the Great East Japan Earthquake.



# Addressing evolving health concerns: assessment and response

As part of data collection and information sharing, WHO gathered information from various official documents and the Japanese media and conducted dynamic assessments of post-disaster health concerns. In addition, WHO conducted field missions to Japan in April and August 2011. Some of the public health issues that were documented and distilled from the field missions and from the Situation Reports are summarized in this section.

### Week 1

Within the first week, media reports indicated that some shelters had not received relief supplies such as water and food due to a shortage of gasoline for delivery vehicles. There were also reports that people were facing cold temperatures in shelters such as in the Minami-soma evacuation shelter. While there was an abundance of blankets, there were no heaters. Basic supplies such as oil/gas, blankets, diapers and toilet paper were also running low.

The need for pharmaceutical supplies was realized early as many of the elderly had lost their daily medications during the evacuation (e.g. medications for hypertension, diabetes, epilepsy and asthma).

By 17 March, a small number of cases of influenza-like illness (ILI) and gastrointestinal infection were being reported from shelters. Control measures were put in place, including encouraging people with respiratory illness to wear masks, using alcohol disinfectants and encouraging additional fluid intake. However, the availability of masks and alcohol disinfectant was limited.





### Weeks 2 and 3

As a preventive measure, the Government issued an order to make influenza medications (antivirals) available to those who had been affected. Also, the public was instructed on the proper use of heating instruments indoors to prevent carbon monoxide poisoning.

Sporadic cases of gastrointestinal infection continued to be reported from evacuation centres such as Kesennuma, and a gastroenteritis epidemic was detected in Shiogama. On 31 March, media reported acute gastroenteritis (50 patients with diarrhoea and 20 patients with vomiting) among evacuees. A survey on the sanitary situation in the evacuation centres in Ishinomaki, Higashi Matsushima and Onagawa showed approximately 40% (107/272) of toilets had sanitation problems.

On 21 March, Sendai City, Miyagi Prefecture reported testing for influenza by polymerase chain reaction from several clinics in the surrounding area. Results of 24 samples tested from ILI cases, had 8 samples (33%) positive for seasonal influenza A. One emergency centre tested 211 people for influenza with an influenza rapid test kit. Results for the period 12 March to 20 March showed 75 (36%) positive for influenza A and 3 positive for influenza B.

An Internet-based ad hoc surveillance system was set up by the Infectious Disease Surveillance Center, National Institute of Infectious Diseases (NIID) on 22 March. Data were made available from this site after 27 March.

The Japan Society for Traumatic Stress Studies reported that a mental health team from Hyogo Prefecture had been active in the field since 18 March. Mental health workers from a number of other prefectures had also initiated activities in the field by 22 March. The Ministry of Health, Labour and Welfare took the lead in the coordination of mental health workers.

Advice to increase fluid intake was reiterated after findings of deep vein thrombosis and pulmonary embolism investigation in high-risk groups.

The Infectious Disease Surveillance Center released risk assessment results for communicable diseases in the affected sites on 14 March with continuous updates

throughout the response. According to their assessments, acute diarrhoea, influenza and other respiratory infections and measles and other vaccine-preventable diseases (e.g. pertussis and tetanus) were considered to have high public health importance and were monitored accordingly in both evacuation centres and affected areas.

Management of health risks among the evacuees and of communicable disease control and prevention was effective during the first month, with no large outbreaks of disease. The acute aggravation of noncommunicable diseases and conditions was also avoided due to immediate interventions. In the absence of an organized public health emergency response, the existing level of awareness of infection control practices among the evacuees was a great advantage. The situation in evacuation centres, however, varied widely and information about their situations was insufficient.

While stronger coordination of public health efforts as well as an establishment of systematic surveillance would have been ideal, local governments were overwhelmed in the first month by the extent of the damage and logistical challenges.



### Evaluation of emergency shelters

Five key factors were identified to be associated with well-functioning (low public health risk) evacuation shelters and better health conditions for residents:

- Availability of clean water for both drinking and washing and a sewage system – water and sanitation are basic conditions for good public health.
- Strong leadership within the evacuee group to provide order and maintain morale. These individuals were typically leaders within the community before the disaster. Better leadership helps maintain order and cohesiveness, which benefits the level of sanitation and general health in the centre (e.g. keeping the toilet area clean by respecting public space and organizing rotating cleaning groups).
- Strong existing relationships, a community base and familiarity among the evacuees. This promotes mutual support, and together with strong leadership is a key factor that contributes to the level of functionality of evacuation centres, which were still largely dependent on self-governance even a month after the event.
- Smaller evacuation centres seemed to function better, perhaps due to better interpersonal relationships, increased privacy and an environment that enabled the emergence of strong leadership.
- The role of the public health nurse was also essential to maintain good public health practices and conditions in the shelters.

# Confronting the mental health and psychosocial impact of disaster

The mental health and psychosocial impact of the 11 March event was unique in that multiple disasters occurred successively with extensive and potentially unknown consequences (i.e. earthquake with ongoing aftershocks, tsunami and the nuclear situation). Due to the massive loss of lives, property and other damage caused by the multiple disasters, MHPSS was identified as a priority need for various affected population groups including those with missing family members. In such unpredictable situations, MHPSS needs are likely to be complex and dynamic.

An unofficial report based on a survey of MHPSS issues in Iwate Prefecture found that 60% of the 73 shelters investigated had people who needed immediate psychosocial support. Preliminary key mental health areas identified included paediatric mental health and survivor's guilt. It was also reported that many evacuees were complaining of symptoms related to acute stress such as insomnia, flashbacks, survivors' guilt and digestive symptoms such as diarrhoea and constipation two weeks after the event. Fortunately, based on needs assessments and situation monitoring, adequate

human resources and technical guidance were available for MHPSS in Japan.

While Japan has a reliable suicide surveillance system, monitoring suicide data soon after the current event appeared to be challenging. Sporadic cases of suicides reported from media and field reports indicated MHPSS concerns, such as the loss of family members, loss of all possessions, an uncertain future and loss of livelihood due to radiation (for a farmer). In one city it was informally reported that there were significantly higher numbers of suicides since the event compared to baseline. Importantly, suicides were mostly among

mostly among persons in their 40s and 50s living outside the evacuation centres (although suicides were also reported from shelter populations). Given this situation, it was recognized that strategies to meet MHPSS needs of all victims of the disaster needed to be carefully implemented.

Nearly four months after the disaster, sporadic reports of possible post-traumatic stress disorder (PTSD) were being reported.

Given the adequate resources available for MHPSS in Japan, there appeared to be minimal direct psychosocial care by international organizations.

Additionally, the provision of psychiatric medications for people with pre-existing mental health conditions was an initial challenge, but these needs were met promptly in the most affected areas. In April, in a number of evacuation centres

### Kokoro no kea

Kokoro no kea means care of the mind and heart. The Government recognized the importance of mental health care for those affected by the earthquake and tsunami in the early stage of response.

As of 25 January 2012, more than 3 400 staff in 57 mental health care teams (kokoro no kea teams) had been dispatched to the evacuation centres and homes of those affected.

The Government has plans for continued provision of kokoro no kea in the medium to long term.

### Mental health in the Tohoku region

Compared to the rest of Japan, the Tohoku region has historically had a higher prevalence of mental health conditions. For example, prior to the disaster on 11 March, Iwate and Miyagi Prefectures had higher suicide rates (34 and 28 per 100 000 population, respectively) compared to Japan (25 per 100 000 population). Tohoku residents are also known throughout Japan as being characteristically reserved people who do not readily express their feelings. It has also been reported that there is a significant amount of stigma associated with mental health conditions, and limited mental health and psychosocial support is available in the rural coastal areas.

Japan has had experience with responding to MHPSS issues resulting from earthquakes in the past, including the Hanshin-Awaji Earthquake in 1995 and the Chuetsu Earthquake in 2004. Compared to the Hanshin-Awaji disaster, the MHPSS response to the March 2011 disaster was better, with the rapid deployment of MHPSS providers.

The accident at the nuclear power plant also caused anxiety and other mental health concerns, particularly for people from the designated evacuation zones who were not directly affected by the tsunami. These people were not only anxious about their prospects of returning to their homes and regaining their livelihoods, but also faced possible discrimination in the future (i.e. due to their radiation exposure), causing further anxiety. It is important to reassure the evacuees and to provide scientific information on the situation at the nuclear power plant to continuously educate the public and avoid unnecessary discrimination.



### Gender issues

In Japan, in general, there are immense gender differences in adverse mental health outcomes. In 2010, the national male suicide rate was 36 per 100 000 compared to 14 per 100 000 for women, according to the Japanese National Police Agency. While suicide data subsequent to 11 March in the disaster-affected regions have not been collected, one affected city in Iwate Prefecture reported that a disproportionately lower number of men had received MHPSS relative to women. This could have been because men requested MHPSS less often in this area; however, some men who wanted MHPSS may not have had access to such services. For instance, many working-age men returned to their homes during the day to clear up debris (and other, more fortunate men returned to work), thereby missing out on MHPSS provided at evacuation centres during the day. As the affected population has now relocated to temporary housing communities, follow-up and sustaining care is important, keeping equitable access to such care in mind for both genders.

TABLE 11.

Number of kokoro no kea or mental health teams deployed over time

Dete	Number of teams	Total	Number o	Number of teams by prefectureIwateMiyagiFukushima9151			
Date	responding	workers	lwate	Miyagi	Fukushima		
25 Mar	25	-	9	15	1		
29 Mar	21	106	7	13	1		
5 Apr	22	110	9	12	1		
25 Apr	25	123	9	12	4		
9 May	25	115	53ª	38ª	24ª		
1 July	18	71	43 <sup>a</sup>	21ª	7 <sup>a</sup>		

 $a\ \ Where \ data \ on \ number \ of \ teams \ by \ prefecture \ were \ not \ available, \ number \ of \ workers \ by \ prefecture \ was \ provided.$ 

Source: Official government report by the Cabinet



in Miyagi, health care providers reported that evacuees who were initially lacking their psychiatric medications had later received them. In Iwate Prefecture, many evacuation centres received the required medications within a week of the disaster. The mental health care teams were coordinated through the Ministry of Health, Labour and Welfare. Table 11 shows the number of *kokoro no kea* or mental health teams deployed after the event.

Initially, MHPSS teams deployed to the affected areas planned to provide their services for three months (e.g. provision of drugs, transfer, psychiatric emergency treatment and psychotherapy); prefectures would provide normal care thereafter.

Almost four months after the disaster, external support from unaffected prefectures was still being used in areas lacking MHPSS expertise. According to an official government report by the Ministry of Health, Labour and Welfare on 1 July, there were 18 kokoro no kea or mental health teams; 10 of these teams with 43 members were active in lwate.

While many evacuation centres reported that a mental health specialist visited on a regular basis, the frequency of visits by MHPSS providers appeared to vary between evacuation centres. It was also noted by one specialist that it would have been better for the patients if MHPSS providers joined other medical care providers (i.e. doctors, nurses and

pharmacists) to create a multidisciplinary team, creating a single unit to provide comprehensive health care and reducing stigma associated with mental health care.

The Internet played a major role in information gathering and coordination for MHPSS. By 6 April, the situation of MHPSS hospitals operating in the Tohoku region was being monitored with an online map (http://assertivecommunitytreatment.jp/ph/). The National Centre of Neurology and Psychiatry also regularly updated its website (http://www.ncnp.go.jp/mental\_info/index.html) to provide guidance and access to manuals and checklists to address issues for different populations including children and

people with disabilities. The Department of Neuropsychiatry at Sapporo Medical University helped coordinate the assessment of the psychiatric impact of this disaster with particular attention given to the consequences for elderly people. Various mailing lists served as important communication channels among MHPSS service providers and recipients.

As of 31 March, 17 paediatric mental health care providers had been dispatched by the Ministry of Health, Labour and Welfare to Iwate, and 396 paediatric psychological care providers were on standby. Given the 1995 Hanshin-Awaji Earthquake experience, paediatric MHPSS was identified as a major, ongoing concern that would require long-term care and vigilant attention. For instance, even 10 years after

the disaster, 1337 students affected by the Hanshin-Awaji Earthquake were diagnosed as requiring special observation.

While acute stress is a normal response to major trauma, the concern is a progression to PTSD. There were 1120 officially confirmed orphans in 2011, and long-term MHPSS was deemed important for these children. In addition, among children who lost both or either parent, a large proportion was very young: 43% were elementary school students or younger. Fortunately, MHPSS is being provided to orphans, and the Iwate Board of Education decided to increase the number of school-based counsellors to support affected students and to send counsellors to elementary and middle schools located in the most affected areas. Miyagi and

Fukushima Prefectures are going to maintain their larger counsellor workforces for a long period of time.

Foreigners are a vulnerable group who need MHPSS because they are prone to becoming isolated, suffering from a lack of information in their mother tongue, becoming confused by rumours and suffering from anxiety. For their citizens, the Philippine Government deployed MHPSS experts to evacuation centres to provide mental health care to approximately 200 Filipina women who married Japanese men and their children.

It was also reported that Japan's Defence Ministry would provide mental health checks for SDF personnel involved in the recovery of bodies and general clean-up



of the affected areas. Check-ups were planned to occur one month, six months and one year after their mission, with appropriate care as necessary.

MHPSS for the local medical and public health care providers themselves was reported as limited. Many of these health care workers lost family, friends, coworkers and/or their homes. Similarly, many worked long hours to meet public health needs and faced numerous stressful situations. Given the reserved nature of the Tohoku people, they may have been reluctant to voice their hardship, especially given the immediate and continuous requests for their work. Thus, it was recommended that health care workers also be monitored and provided with appropriate MHPSS.





### **CULTURAL SENSITIVITY**

Given the reserved nature of the Tohoku population, certain sensitivities were necessary to provide MHPSS for the affected population. Furthermore, since the Tohoku people are reluctant to express their emotions, the presentation and recognition of PTSD may be delayed. This was a major concern. While some victims reported symptoms of PTSD such as insomnia, flashbacks and nightmares (i.e. re-experiencing the original trauma), others were slow to vocalize the presence of symptoms and recognize the need for professional care. In addition, some physical symptoms such as insomnia, high blood pressure and gastrointestinal symptoms may have been due to somatization (i.e. a physical presentation of a mental health issue). Such somatization may mask the mental health states of both the evacuees and the medical care providers and delay identification and appropriate treatment.

Connecting back to the community is essential for MHPSS in the affected regions. It was noted by some public health nurses that, although the affected were reluctant to open up to health care providers from other prefectures, they were in fact quite open with their usual care providers. Such challenges can be opportunities for local public health workers as they are familiar with the community and are well aware of how to provide culturally appropriate and sensitive care. Others noted the need for longer-term assignments for MHPSS workers coming from outside prefectures so that rapport can be established with the victims to provide meaningful support.

### **MAIN ISSUFS**

There is wide acceptance of the need for long-term monitoring and care. It is important that provision of care continue along with preventive care for potential future adverse mental health and psychosocial outcomes. Broader discussions at the municipal-prefectural-national levels on MHPSS approaches from a facility-based to a community-based model (including community-wide screening programmes and provision of MHPSS at schools and work settings) commenced and will be reflected in future recovery plans.

Mental health and psychosocial issues cover a broad spectrum such as dementia in the elderly, acute stress disorder, PTSD, depression and suicide. Thus, different populations require different types of MHPSS. While some of the more resilient segments of the population have passed the acute stress stage and have begun to return to a more normalized state, others may continue to experience mental health and psychosocial issues, having no clear future direction and facing a loss of livelihood. The broad needs of the affected population caused by this massive disaster pose a considerable challenge for service providers under the current MHPSS system. Given the overlap in the definitions and service providers for some of these conditions, there appears to be challenges in coordinating provision of care, in terms of health systems, legal regulations, insurance and funding (e.g. who is responsible for which disorder, and the existing payment scheme).

In order to better understand the magnitude and trend of the problem, long-term surveillance of mental health and psychosocial health-associated morbidity and mortality also need to be considered. Indeed, the need for sustained, long-term MHPSS for both children and adults is recognized by local, prefectural and national-level counterparts. Plans on how to maintain such delivery, coordination with other sectors and matching the services to the needs are actively being discussed.



### Prevalence of communicable diseases after the disaster

The five most common notifiable infectious diseases reported in Japan before the disaster (in 2008) were tuberculosis, enterohaemorrhagic E. coli, scrub typhus, measles and legionellosis. Risk assessments with the support of NIID were ongoing throughout the post-event months based on routine surveillance data, immunization status and environmental condition of affected sites. According to these assessments, acute diarrhoea, influenza and other respiratory infections (e.g. RS virus infection), measles and other vaccine-preventable diseases (e.g. pertussis, tetanus and wound infection) were considered to have high public health importance. Given the large elderly population, pneumonia was another concern.

Some infectious diseases that are often of concern after natural disasters were not as relevant in this event as those that occurred in previous disasters in Japan. For instance, as indicated by NIID, while the bacteria *Vibrio* exists in most regions of Japan, *V. cholerae* is very rare and not likely to be present in the region affected. Typhoid and leptospirosis occur rarely, and mainly in southern Japan. Plague is not endemic in the country. Even with an increase in mosquitoes with warmer

weather, it is unlikely that these will directly lead to increases in vectorborne disease incidence, as dengue and malaria are not endemic in Japan.

### INFECTIOUS DISEASE SURVEILLANCE IN AFFECTED AREAS

Communicable disease surveillance systems in affected areas were initially suboptimal, but significant effort and progress were made to carry out systematic surveillance. Each local government and some universities collected information on events (mainly by phone and facsimile) from evacuation centres, hospitals and mobile medical teams as the situation developed. In some local government health centres, staff walked around evacuation centres to collect information because of disruption of telecommunication methods. Media were also reporting on clusters discovered by mobile medical teams or through their own interviews. Over time, several local governments and universities successfully set up systematic syndromic surveillance at evacuation centres and started to forward them to the Infectious Disease Surveillance Center, where data analysis and situation assessment occurred.

By 11 May, nationally, routine sentinel surveillance was 90% recovered. However, the number of sentinel sites reporting from the affected areas was still low, with some sites continuing to rely on event-based or syndromic systems.

In Miyagi, where a web-based surveillance systems had been implemented, approximately 10 000 persons were still included under a syndromic system in early July, and establishing additional sentinel sites to capture temporary housing communities was mostly still in the planning phase. Similarly, in Iwate, the use of PDA-based syndromic reporting systems at shelters was expected to continue until the end of July. Visits to evacuation centres by public health workers were still being performed on 6 July.

Based on post-disaster surveillance information, no major acute public health events or communicable disease outbreaks were reported from the affected prefectures, including the evacuation centres. Most communicable diseases were sporadic cases or small clusters (e.g. legionella-associated pneumonia, tuberculosis, tetanus, chicken pox).

# INFECTIOUS DISEASES AT AFFECTED SITES

A number of communicable diseases were detected following the 11 March disaster. ILI with laboratory-confirmed influenza A(H3N2) and pandemic influenza A(H1N1) cases, gastroenteritis, tetanus and legionellosis cases were reported after the event.

Limited data on gastroenteritis, ILI and confirmed influenza were available from 16 of approximately 1000 evacuation centres between 23 March and 10 April. These centres ranged in size from approximately 44 to 680 people. Eight of the 16 centres reported cases of gastroenteritis with case numbers ranging from 1 to 42 cases. No infectious agents were identified and case numbers declined. Ten of the 16 evacuation centres reported ILI or confirmed influenza cases.

The case numbers were low for nine of the 10 evacuation centres, ranging from one to six cases during the report period. However, one evacuation centre housing on average 582 evacuees reported a total of 154 cases of ILI, with 39% of cases positive for influenza A.

Iwate and Miyagi Prefectures reported more cases of tetanus than expected,

based on historical baseline levels. Tetanus was an expected disease risk from the initial risk assessment by NIID, as infection occurs when the bacteria enters the skin through open wounds. Soil is a common source of the bacterial exposure. By 5 April 2011, there were seven cases of tetanus reported in Iwate and Miyagi in 2011, compared to two cases in Iwate and one case in Miyagi in 2008.

Legionella-associated pneumonia was an early concern with four legionella cases reported from Miyagi and Iwate Prefectures between 17 March and 31 March. This was thought to be sporadic and there were no further cases after 5 April. NIID experts noted that the mode of transmission for legionellosis is much more common from concentrated sources, such as hot spas, rather than direct aerosol exposure from environmental sources.

As the vaccination rate of the 23-valent pneumococcal polysaccharide vaccine is relatively low in Japan (10% or less of the elderly vaccinated), continued vigilance for pneumonia was warranted. Pneumonia cases increased five-fold following the earthquake with approximately 150 cases of pneumonia hospitalized at Sendai Hospital and 11 deaths since 11 March. Higher incidence was also reported at lwate Medical and Ishinomaki Red Cross

Hospital. A large number of cases were due to inhalation of contaminated water associated with the tsunami. Further cases were reported at the evacuation centres among the elderly, thought to be due to poor oral hygiene and cold weather conditions, and not due to person-to-person transmission. Coughing without fever due to cleaning activities in dusty environments was also observed; it is unlikely that these illnesses were due to pathogenic infections.

A confirmed tuberculosis case, an 80-year-old woman, was also reported on 22 April 2011 from an evacuation centre; however, there was no increase in tuberculosis incidence relative to historic levels. In Miyagi Prefecture, there were only nine cases (including suspected cases) of tuberculosis hospitalized in the first month after the disaster.

With increased movement of people into and out of Japan, imported measles was an ongoing risk for Japan in the post-disaster situation. The Infectious Disease Surveillance Center reported 13 measles cases in Tokyo from 11 to 15 April, bringing the total number of cases for Tokyo in 2011 to 38, and 99 for all of Japan. The majority of these cases were thought to be associated with recent travel to other countries. Due to its high transmissibility and severity, NIID

recommended that volunteers heading to evacuation centres be confirmed for measles vaccination.

# RESPONSE TO INFECTIOUS DISEASES AT AFFECTED SITES

Low levels of communicable diseases after the event might be attributed to the efficient and prompt provision of safe drinking water and food during the initial stages of the disaster combined with very strong infection control education at some evacuation centres. These included early response to ILI with oseltamivir (Tamiflu) prophylaxis for vulnerable persons and family members of cases in addition to the use of designated isolation rooms for suspected cases. Tamiflu was shipped to the sites from the pandemic preparedness programme according to the request from local governments, and influenza rapid diagnostic kits were shipped to support early diagnosis. Urinary antigen test kits (pneumococcus and Legionaire) were also distributed to hospitals and evacuation centres. By 25 March, some 100 vials of tetanus toxoid were shipped to Miyagi.

In addition to comprehensive infection control education, other public health measures were also taken. The importance of good ventilation in evacuation centres was recognized early, and despite the cold

weather, air circulation was incorporated wherever possible.

The rigorous hygiene and sanitation protocols were initially limited but improved with time. As previously indicated, control measures included encouraging the use of face masks for persons with respiratory illness and also making these masks and alcohol disinfectants available at the entrance of shelters and in dining areas. Chlorine-based cleaners for bathrooms were also observed at many evacuation centres. Posters, handouts and other educational materials were available at most evacuation centres to communicate preventive measures for infectious diseases such as influenza and gastroenteritis.

Strong awareness, education and responses by the medical staff involved in the initial response, combined with the fortunate timing of the disaster at the end of the influenza season and cold conditions for food storage and transport, seemed to have reduced infectious disease threats.

### **MAIN ISSUES**

From event-based and syndromic approaches, surveillance slowly transitioned into a more permanent

sentinel-based system that existed prior to the disaster. With continuing relocation of the affected populations from shelters to more permanent communities and baseline medical and laboratory infrastructure returning, a disease-specific approach becomes more meaningful. A concern is that traditional catchment areas are generally not sensitive enough to capture the smaller and rural coastal populations that were affected; monitoring the moving population is another issue. The specific details to address such issues (e.g. the number of sentinel sites, the location of sentinel sites) were being actively discussed by local governments who planned to adapt to their local situation, needs and capacities at the time of the final WHO Situation Report on 6 July.

With the need for high numbers of people to remain in evacuation centres over a

According to some experts, Japan's unique cultural norm not to burden neighbours (e.g. using face masks to protect others from your illness rather than to protect you from them) may have also assisted in preventing widespread infectious disease outbreaks; however, such mentality may have caused additional stress.

longer period of time, there was concern for reduced vigilance and poorer practice of good hygiene over time, which could increase the risk of infectious diseases. Over the summer months and as evacuees started cooking for themselves on a rotational basis, food safety was noted as an important communicable disease concern. Incidence of gastrointestinal outbreaks can be reduced by educating groups in evacuation centres on safe food handling for large communities in order to prevent foodborne diseases.

Overall, the relative concern for large communicable disease outbreaks continued to decrease with time. According to the risk assessment results prepared by NIID on 20 June, acute watery diarrhoea, acute respiratory infections, measles and tetanus remained as ongoing or current public health concerns.



### Noncommunicable diseases and quality of life

Patients with major noncommunicable diseases are particularly vulnerable to exacerbations of their conditions during disasters. Factors contributing to this vulnerability include the interruption of regular medical treatment, severe stress and anxiety, overcrowding and reduced living standards in shelters, shortages of water and regular food supplies, degraded environmental conditions and physical injuries. The Tohoku area has a large proportion of elderly people and has one of the highest salt intake levels in Japan; therefore, high blood pressure and chronic diseases were already priority concerns before the disaster occurred.

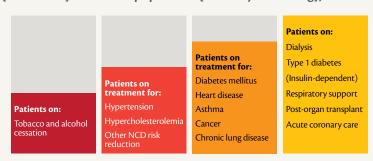
Using the management priority for NCDs in emergency situations as an overall framework, and considering the urgency and severity of anticipated outcomes and health risks related to this disaster, NCDs were categorized into the following groups:

- Group 1: Patients with dialysis, type-1 (insulin-dependent) diabetes mellitus (DM), respiratory support, post-organ transplant and acute coronary care
- Group 2: Type-2 (non-insulin-dependent) DM, heart disease, asthma, cancer and chronic lung disease
- Group 3: Hypertension, hypercholesterolemia and other NCD risks.

Figure 4 represents the management priority for NCDs in emergency situations.

### FIGURE 4.

NCD management priority conditions for interventions in emergencies (by level of risk [size of box] and size of population [intensity of shading])



Source: WHO Situation Report, 6 July



TABLE 12.

Pre-existing NCD health conditions in worst affected prefectures

		lwate	Miyagi	Fukushima
	Dialysis	2 872	4 753	4 705
Group 1	Type-1 diabetes mellitus	*	*	*
	Respiratory support	-	-	-
	Post-organ plant	5	36	17
	Acute coronary care	-	-	-
	Type-2 DM (no data separated between Type1			
	and 2)*	34 000	39 000	46 000
Group 2	Heart disease	15 000	25 000	32 000
	Asthma	1 100	2 100	1 700
	Cancer	17 000	24 000	25 000
	Chronic lung disease	3 000	4 000	4 000
Croup 2	Hypertension	109 000	167 000	187 000
Group 3	Hypercholesterolemia	18 000	24 000	19 000

Source: Japanese Association of Dialysis Physicians, Ministry of Health, Labour and Welfare, Japan Organ Transplant Network Basic background information on the number of people with NCDs in Iwate, Miyagi and Fukushima Prefectures before the event is outlined in Table 12.

# Situation of noncommunicable diseases in the disaster area

Soon after the disaster, the media reported that at least 101 people, mostly the elderly, had died due to the degradation of existing NCDs. Deaths in the three worst affected prefectures were associated with existing respiratory disorders, cardiovascular disease and cerebrovascular diseases.

Initially, there were concerns of a large increase in the incidence of NCDs due to interruption of regular medical care including provision of prescription medicines. The medical system that existed before the disaster was severely limited by the loss of essential lifelines and availability of people to work. There were also concerns that living in evacuation centres would increase the risk of NCDs since multiple factors for NCDs exist in this environment (e.g. higher stress levels, dietary imbalances and reduced physical activity).

The acute aggravation of NCDs was, however, avoided due to immediate and sustained interventions. Appropriate and rapid response early in the acute phase to transport patients requiring specialty care and provide necessary medicines proved to be effective. While systematic assessment and detailed analysis were lacking, no large-scale NCD events were reported.

### Main noncommunicable disease concerns and response

#### **HYPERTENSION**

High blood pressure manifested in a number of shelters due to prolonged residence at the shelters, continued exposure to relatively low physical activity levels, stress and unbalanced diets. For instance, some of the evacuation centres reported no special menu for those with high blood pressure or high cholesterol, which was a concern given the population demographics of the affected region. In response, public health nutritionists and nurses created nutritionally well-balanced menu schedules, and subsequent food supply requests were based on these planned menus (at Miyako evacuation centres). Additionally, to improve the provision of nutritional and fresh food items, it was reported by Iwate public health nurses that refrigerators were being distributed, made possible with improvements in electricity supply and vehicle access.

#### **CHRONIC DISEASES**

There was a concern that the lack of physical activity, in combination with other factors, would contribute to increases and aggravation of chronic diseases among evacuees living in shelters. To address this concern, evacuees were encouraged to engage in routine exercises, such as "radio taiso" (stretching exercise broadcast by a radio programme) and light chores (e.g. cooking, cleaning). In addition to lack of exercise, lack of sleep due to stress, lack of privacy and fear were also reported. Earlier, when there were many aftershocks, there were cases of insomnia for fear of more earthquakes.

#### **DEEP VEIN THROMBOSIS**

A number of cases of deep vein thrombosis were initially reported. Some 194 people in 20 evacuation centres in Miyagi were examined and blood clots were identified in 44 (23%) according to a media report on 3 April. The occurrence of deep vein thrombosis was associated with a limited supply of food (two meals per day); difficulty in securing individual space in a crowded evacuation shelter; and cold weather, which result in low intake of water.

#### RESPIRATORY PROBLEMS

A unique adverse respiratory health outcome of this event was associated with working in the dusty and polluted sites of damaged buildings. Many people who returned to their homes to search through rubble reported bad coughs, likely due to inhalation of dust and fine particles from the debris. Provision of and continuous reminders to wear masks were therefore important not only for communicable disease control, but also for such NCD concerns. Further, environmental monitoring was undertaken at some sites in order to address the potential health risk of exposure to asbestos from the damaged buildings.

#### **DIABETES MELLITUS**

Insulin procurement was critical for insulin-dependent DM patients and a rapid response was coordinated soon after the earthquake. The Japan Medical Association however experienced difficulties in transferring insulin to affected sites because of poor road conditions and lack of petrol. Information was provided by the Japan Diabetes Mellitus Association's website on where insulin was available and which clinics could accept DM patients.

### OTHER CONCERNS

Due to the extreme cold in the early weeks after the disaster (some of which led to cases of hypothermia), some people tried to keep warm by bringing outdoor heating stoves indoors and suffered carbon monoxide poisoning. These infrequent but notable cases received rapid medical attention and the majority were treated successfully.

Fortunately, due to regular exercise routines, more nutritionally well-balanced meals and various stress reduction methods, no notable increase in NCDs occurred.

### Other issues and response

The provision of prescribed medicines to control chronic diseases and transport of patients requiring specialty care were the initial priority, and these needs were met quickly by the DMATs and other medical missions, a direct lesson learnt from the Hanshin-Awaji earthquake. Most necessary medications (e.g. those needed to control diabetes, high blood pressure, high cholesterol and other cardiovascular conditions) reached the evacuation sites within one week. DMATs, with the assistance of SDF and others, transported patients requiring special medical care to appropriate locations. Pharmacists were also deployed as part of the medical teams or stationed in most evacuation sites.

Various governmental and nongovernmental organizations (NGOs) contributed to the delivery of medical products to the affected areas immediately after the event.

### Reducing administrative barriers

Measures were taken to reduce administrative barriers for access to medical services. The Ministry of Health, Labour and Welfare announced to each prefecture that

### **Dialysis**

Shortly after the earthquake, the Ministry of Health, Labour and Welfare requested each prefecture to cooperate with the Japanese Association of Dialysis Physicians (JADP) to establish and arrange systems to receive dialysis patients. JADP immediately set up an information-sharing website to provide the following information through the Saigai Joho Network (disaster information network):

- availability of dialysis;
- whether hospitals/clinics were affected;
- number of beds available to be rented; and
- availability to accept patients.

JADP estimated that about 3000 dialysis patients (25% of total dialysis patients in Iwate, Miyagi and Fukushima Prefectures) were already transferred to other prefectures as of 23 March. Further arrangements were made to transfer patients to areas not affected by power outages. According to official data, 270 bags of dialysis liquid and 2000 dialyzers were delivered to Miyagi Prefecture by 25 March.

The number of institutions able to provide dialysis after the event was severely limited. There were multiple challenges for many dialysis patients in terms of receiving consistent care and transportation. Table 13 shows the number of institutions that were able to provide dialysis as of 10 May.

TABLE 13. Number of institutions providing haemodialysis in affected prefectures, as of 10 May 2011

	lwate	Miyagi	Fukushima
Pre-disaster	36	52	63
Post-disaster	17 (excluding 1 unconfirmed)	21	40 (excluding 2 unconfirmed)
% of all institutions currently available	47.2%	40.4%	63.5%

Source: JADP (Japanese Association of Dialysis Physicians)

affected people could undertake necessary treatments without needing to present their health insurance card. This also applied to those receiving treatment by public funds, where treatment can occur without providing physical disability certificates, etc. It also became possible to obtain medicines without prescriptions; for elderly and disabled people, it was possible to receive services and obtain medicines by providing their name, date of birth and address. Health insurance cards or medical certificates were not required.

# Communication and information system restoration

Means of communication, both for clinics and patients, were quite limited and problematic due to the loss of medical charts and records during the tsunami. This caused problems for active follow-up of cases by the clinics. Restoration of the information system and the loss of medical charts and past records were ongoing challenges. For instance, according to the media, maintaining chemotherapy for cancer patients was difficult if the patient did not have reference letters showing the details of their therapy and clinical course. Maintaining care for cancer patients was an ongoing concern.

The government and NGOs responded quickly to establish systems to share the information related to NCDs, including

the availability of hospitals and clinics and current needs. Examples included the Disaster Information Network by JADP and telephone consultation by the National Cerebral and Cardiovascular Center.

### Best use of limited resources

A shortage of medical supplies also meant a concerted effort was needed to make the best use of available resources. For instance, the Ministry of Health, Labour and Welfare allowed the use of industrial oxygen gas cylinders for medical purposes, as medical oxygen gas was in short supply. Oxygen supplies were one of the primary needs soon after the large-scale blackout after the disaster, and hospitals had to initially cope with a surge in elderly patients who required oxygen on a routine basis. The Ministry of Health, Labour and Welfare also announced instructions to refrain from prescribing medicines for

long-term use in preference of short-term prescriptions. This was to avoid available medicines being consumed by only a limited number of people and encouraging more effective and equal use of currently available stocks.

### Medical care referral system

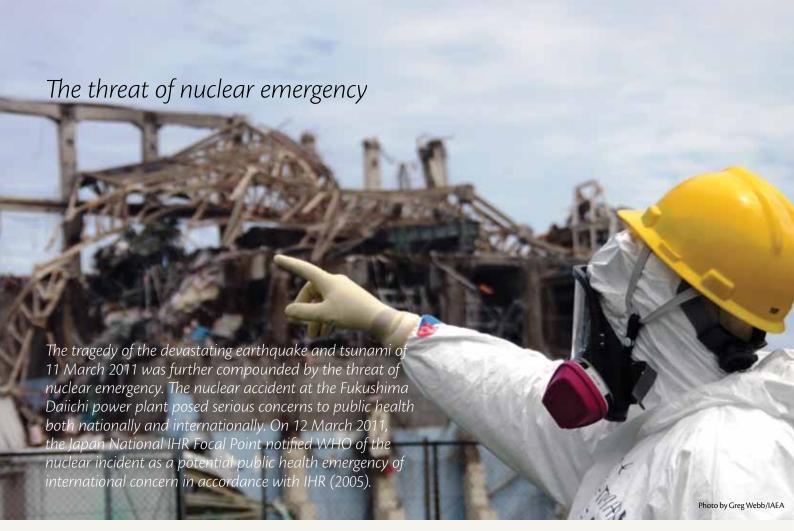
Prior to the disaster, formal and informal referral systems existed for the medical care of NCD patients in hospitals. These systems assisted patient transfers to hospitals with the most appropriate facilities. After the disaster, the function of these systems was largely broken and restoring the medical care referral systems was an ongoing issue.

By 6 July, medical and pharmaceutical systems had either fully or nearly fully recovered in most areas, and the affected populations residing in evacuation centres continued to relocate to

more permanent and well-furnished environments, thus the earlier concerns for NCDs was reduced. It was, however, recognized that the NCD situation among the elderly, who are remaining in evacuation centres, needed continued monitoring, assessment and reporting on a periodic basis, with appropriate response as necessary.

While there were earlier reports of hypertension and concerns for associated NCDs, fortunately, no notable increase in NCDs attributable to hypertension or other risk factors occurred. Earlier, it was widely reported that prolonged residence at the shelters, continued exposure to relatively low physical activity levels, stress and unbalanced diets might result in an increased incidence of diabetes and heart disease among the elderly. Many sites quickly provided exercise routines, well-balanced meals and various methods to reduce stress.





The earthquake caused 10 nuclear reactors in three nuclear power plants in the affected region to shut down automatically. The power plants affected were Fukushima Daiichi and Fukushima Daini (11.5 km apart) and Onagawa (Miyagi, 100 km from the Fukushima plants). The tsunami that struck the Fukushima facilities damaged onsite emergency diesel generators that provide

power for the emergency core cooling systems. At the Fukushima Daiichi power plant, the ability to cool the reactors of Units 1, 2 and 3 was significantly degraded. A state of emergency was announced by the Government of Japan. A second state of emergency was declared on 13 March at the Onagawa nuclear power plant where higher-than-permitted levels of radioactivity were measured.

By 15 March, due to potential radiation exposure, the majority of the 270 000 persons within the evacuation zone (20 km for the Fukushima Daiichi power plant and 10 km from the Fukushima Daini power plant) were evacuated. While the situation at the Onagawa and Fukushima Daini power plants was contained, the Fukushima Daiichi power plant, approximately 250 km from Tokyo, continued to experience

FIGURE 5.

Examples illustrating INES criteria for rating events at nuclear facilities

	People and environment	Radiological barriers and controls	Defence in depth
Major accident	Chernobyl, 1986. Widespread health and environmental effects. External release of a significant fraction of reactor core inventory.		
Serious accident  Level 6	Kyshtym, Russia, 1957. Significant release of radioactive material to the environment from explosion of a high active waste tank.		
Accident with wider consequences Level 5	Windscale Pile, UK, 1957. Release of radioactive material to the environment following a fire in a reactor core.	Three Mile Island, USA, 1979. Severe damage to the reactor core.	
Accident with local consequences Level 4	Tokaimura, Japan, 1999. Fatal exposures of workers following a criticality event at a nuclear facility.	Saint Laurent des Eaux, France, 1980. Melting of one channel of fuel in the reactor with no release outside the site.	
Serious incident	No examples available	Sellafield, UK, 2005. Release of large quantity of radioactive material contained within the installation.	Vandellos, Spain, 1989. Near accident caused by fire, resulting in loss of safety systems at the nuclear power station.
Incident  Level 2	Atucha, Argentina, 2005. Overexposure of a worker at a power reactor exceeding the annual limit.	Cadarache, France, 1993. Spread of contamination to an area not expected by design.	Forsmark, Sweden. 2006. Degraded safety functions with additional factors for common cause failure in emergency power supply system at nuclear power plant.
Anomaly Level 1	_		Breach of operating limits at a nuclear facility.

Source: INES The International Nuclear and Radiological Event Scale User's Manual, 2008 Edition. Vienna, International Atomic Energy Agency, 2009.



insufficient cooling problems with reports of higher-than-normal radiation levels on site. Cooling operations via helicopter water spraying, water injection via fire trucks and connection to extra power supplies started on 18 March. The national Government raised the event in Fukushima Daiichi plant's Units 1, 2 and 3 to Level 5 on the International Nuclear and Radiological Event Scale (INES).

The situation remained serious with regard to cooling capacity of the Fukushima Daiichi power plant. On 12 April, the national Government upgraded its provisional INES rating of the accident from Level 5 to Level 7 based on the significant releases of radioactive material from the site (Figure 5).

In accordance with the plan, Roadmap towards Restoration from the Accident at Fukushima Daiichi Nuclear Power Station, issued by the Tokyo Electric Power Company (TEPCO) on 17 April 2011, activities have been continued to bring the nuclear reactors and the spent fuel pools at the Fukushima Daiichi power plant to a stable cooling state and to mitigate radioactive release. This continuing struggle, however, has resulted in prolonged recovery and response efforts.

# National response to the nuclear emergency

A number of guidelines and supplementary measures were established by the national Government to protect its citizens and the international community from potential radiation exposure.

On 22 April 2011, the area within the 20 km radius zone of the Fukushima Daiichi nuclear power plant was officially declared a No-entry Zone. In addition, areas within the 20 km to 30 km radius zone were officially established as Planned Evacuation Zones and Emergency Evacuation Preparation Zones based on estimated annual radiation exposure. The Planned Evacuation Zones (areas with estimated annual radiation exposure of 20 mSv included the villages of Katsurao,

Namie and litate, part of Kawamata Town and part of Minamisoma City. Evacuation was implemented a month later to provide enough time for the residents to evacuate.

The Japanese Ministry of Land, Infrastructure, Transport and Tourism issued guidelines for radiation measurements in Japan's ports to provide information for foreign port authorities (e.g. measurements of export shipping containers, decontamination criteria, reporting).

On 30 April, the Chief Cabinet Secretary announced that the Government had adopted an "Interim policy regarding decisions on whether to utilize school buildings and outdoor areas within Fukushima Prefecture." This policy set a limit of annual radiation exposure level of 20 mSv for the use of elementary school grounds in Fukushima, a level consistent with the recommendation of the International Commission on Radiological Protection. If a child spends eight hours a day for 365 days in a schoolyard with a dose rate of 3.8 µSv/h and stays indoors for 16 hours where the dose rate does not exceed 1.52 µSv/h, the annual dose received would reach 20 mSv. Consequently, it was decided that the use of elementary school grounds should be

restricted if the outdoor radiation dose rate exceeded 3.8  $\mu$ Sv/h.

The Ministry of Education also considered exchanging soil layers as a method to lower radiation levels in the affected areas. On 27 May, the Ministry of Education announced that all schools in Fukushima would receive radiation measurement devices. Later, on 25 June, it was reported that 20 000 pregnant women would receive such measurement devices. Instead of the earlier announcement of the 3.8  $\mu$ Sv/h limit, the Ministry also announced that they would aim to minimize radiation exposure to children so that cumulative exposure would be 1 mSv/year or less.

On 16 June, the national Government established guidelines to deal with hot spots that were located outside the Planned Evacuation Zone but with an estimated annual radiation exposure level of 20 mSv, based on detailed environmental investigations. These sites were located mostly in an area north-west of the Fukushima Daiichi nuclear power plant. Radiation measurements were to be conducted at these sites on a monthly basis, and if confirmed that the cumulative annual measures did not exceed 20 mSv, the hot spot designation would be removed.

# Lessons learnt from the Japan nuclear emergency

IAEA conducted an international factfinding mission in late May 2011 to identify lessons learnt from the accident in order to improve nuclear safety globally.

Preliminary findings and lessons learnt include the following: Japan's initial response to the accident was exemplary and dedicated under exceptional circumstances; Japan's long-term response, including evacuation of the area, was well organized; periodic assessments of measures against natural hazards are recommended; and the value of Emergency Response Centres, including communication roles, was iterated.



### Food safety concerns

When the severity of the damages to the Fukushima Daiichi nuclear power plant began to be acknowledged, concerns were directed towards the radioactive contamination of food. Food can be contaminated directly through radioactive material deposited by air, rain or snow, or indirectly through contaminated water and soil. Once radionuclides are in the environment, they can be incorporated into food if absorbed by plants, deposited on fish or seafood or ingested by animals. The first case of radioactive contaminants in food was reported on 19 March 2011. The Government of Japan announced that radiation levels exceeding government safety limits had been detected in milk from Fukushima Prefecture and spinach from Ibaraki Prefecture.

All local food safety inspection authorities were directed to monitor and investigate radionuclide levels in foods for the identification and prevention of potential food safety risks associated with radioactive nuclide contamination. The government notice indicated the provisional regulation values for radionuclide in different types of foods.

Foods that exceeded the radiation levels prescribed by the Government were regulated under the Food Sanitation Act. Actions to prevent consumption of contaminated foods were taken. In addition to these measures, restrictions on the distribution of foods produced in a geographical area where provisional levels have been found to be exceeded, were put in place following Article 20.3 of the Act on Special Measures Concerning Nuclear Emergency Preparedness (Act No. 156, 1999). A summary of the food restrictions issued since the disaster is available on the Ministry of Health, Labour and Welfare's website (http://www.mhlw.go.jp/english/topics/2011eq/index.html).

On 4 April, the Nuclear Disaster Response Headquarters updated information on how the restriction policy would be applied:

- Geographical areas with food restrictions would be managed at the prefecture level; management at the city, town or village level would also be allowed if it were possible to manage by prefectures and municipalities.
- Restrictions on food items should be done on a case-by-case basis.
- Decisions on banning food items would be made once a week. Supplementary testing would be ordered, if necessary. The geographical area for banning could be

decided using results of samples from surrounding areas. If an extremely high contamination level was detected for a particular item, urgent banning of consumption will be issued regardless of number of sampling.

Additionally, the following information was provided regarding the lifting of restrictions by the national Government:

- A request from the relevant local government is needed for the consideration of lifting of restrictions on food items.
- Restrictions could be lifted from a smaller geographical area than a prefecture.
- If a food item from several villages and/or cities has three lots of samples that are lower than the provisional regulation values (with one-week interval), the restriction for the item in the area would be lifted.
- Decisions on lifting restrictions should consider the nuclear power plant situation.

By early July 2011, tests results for 6516 food samples originating from Aichi, Aomori, Chiba, Ehime, Fukushima, Gifu, Gunma, Hokkaido, Hyogo, Ibaraki, Iwate, Kanagawa, Kyoto, Miyagi, Nagano, Niigata, Saitama, Shizuoka, Tochigi, Tokyo, Yamagata and Yamanashi Prefectures had been received by WHO from the Ministry of Health, Labour and Welfare. Samples had been tested for radioactive iodine (I), caesium (Cs) or both. Data on levels of radioactive contaminants in foods tested are available on the Ministry of Health, Labour and Welfare's website (http://www.mhlw.go.jp/english/topics/2011eq/index.html).

# Sharing food safety information globally

Throughout the course of the event, food safety information was provided to Member States through the WHO Situation Reports and the International Food Safety Authorities Network

(INFOSAN). Through INFOSAN, information provided by Japan was rapidly shared to food safety authorities around the world, allowing them to put in place management actions reflective of their national needs and to provide information to their consumers.

The INFOSAN Emergency Contact Point in Japan relayed food analysis results, passed along updates on control measures put in place, shared information on the international distribution of food and answered other food safety questions.

Through INFOSAN, food safety authorities outside of Japan were requested to report import control measures put in place and results of analysis undertaken on food imported from Japan. Japan was informed of these findings through INFOSAN and the WHO Regional Office for the Western Pacific.

Two documents, INFOSAN Information on nuclear accidents and radioactive contamination of foods and Impact on seafood safety of the nuclear accident in Japan, were provided to food safety authorities through the INFOSAN network.

# **Drinking-water quality**

The Ministry of Education, Culture, Sport, Science and Technology monitored the quality of drinking water at a selected sampling location in each prefecture, while the Ministry of Health, Labour and Welfare collected drinking-water quality data from local water districts operating in a prefecture. Both ministries collect data on I-131, Cs-134 and Cs-137 in drinking water.

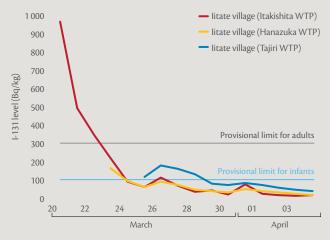
The Ministry of Health, Labour and Welfare issued a notice on the provisional regulation values for drinking water (300 Bq/kg for iodine; 200 Bq/kg for caesium) and announced a restriction on

the use of drinking water by the general public on 19 March. The Ministry issued an additional notice on 21 March on the provisional regulation value of 100 Bq/kg for Iodine for infants drinking tap water.

A restriction on the consumption of tap water by the general public in litate Village was lifted on 1 April. On 10 May, the remaining restriction on drinking water for infants in lidate Village, Fukushima Prefecture was lifted after regular monitoring showed levels of I-131, Cs-134 and Cs-137 below the maximum permissible limits. Table 14 presents a summary of drinking-water restriction for infants.

Figure 6 presents trends in radioactivity levels (I-131) in drinking water sampled from the three water treatment plants (WTP) in litate Village, Fukushima Prefecture. Provisional guideline limits for adults and infants are indicated.

FIGURE 6.
Radioactivity levels (I-131) in drinking water in litate
Village, Fukushima Prefecture



Source: WHO Situation Report, 8 April

TABLE 14.

Drinking-water intake restriction for infants

Prefecture	Water supply utility	Date o	of restriction
		Started	Lifted
	Tsukitate Small Scale (Date-shi)	22 March	26 March
	Tsukitate Small Scale (Date-shi) 2nd time	27 March	1 April
	Kawamata (Kawamata-cho)	22 March	25 March
Fukushima	Koriyama (Koriyama-shi)	22 March	25 March
	Tamura (Tamura-shi)	22 March	23 March
	Tamura (Tamura-shi) 2nd time	26 March	28 March
	Iwaki (Iwaki-shi)	23 March	31 March
	litate Small Scale (litate-mura)	21 March	10 May <sup>a</sup>
	Tokai (Tokai-mura)	23 March	26 March
	Mizufu North Small Scale (Hitachiota-shi)	23 March	26 March
	Kitaibaraki (Kitaibaraki-shi)	24 March	27 March
Ibaraki	Hitachi (Hitachi-shi)	24 March	26 March
	Kasama (Kasama-shi)	24 March	27 March
	Ibaraki Prefecture South (Toride-shi)	25 March	26 March
	Furukawa (Furukawa-shi)	25 March	25 March
Tochigi	Utsunomiya (Utsunomiya-shi)	25 March	25 March
	Nogi (Nogi-cho)	25 March	26 March
	Chiba Prefecture (Chiba Nogikunosato; Kuriyama treatment		
	plants)	23 March	25 March
Chiba	Kitachiba Region	23 March	25 March
	Chiba Prefecture (Kashiwai treatment plant)	26 March	27 March
	Inba-gun Region	26 March	27 March
Tokyo	Tokyo Metropolitan Region (23 districts and 5 cities)	23 March	24 March

a Information updated based on WHO Situation Report, 6 July Source: WHO Situation Report, 4 April

Based on monitoring reports in 47 prefectures from 1 May to 29 June 2011, I-131 was detected only in Tochigi Prefecture on 1 May. Cs-134 was detectable only in Saitama City on 10, 20, 22, 24 and 27 May, 24 June and 2 July; the Cs-134 values were all below the provisional regulation limit.

In almost all the prefecture monitoring stations, the concentration of Cs-137 was non-detectable. Cs-137 was recorded in only five prefecture sampling stations, namely, Utsunomiya City (Tochigi),

Saitama City (Saitama), Ichihara City (Chiba), Maebashi City (Gunma) and Shinjuku Ward (Tokyo). Cs-137 was detected in Saitama Prefecture on 9, 20, 23 May; in Tochigi Prefecture on 16 May; in Chiba Prefecture on 23 May; in Gunma Prefecture on 3 June; and in Tokyo Prefecture on 2 July. The detected levels of Cs-137 were below the drinking-water provisional regulation limit, with values ranging from 0.11 Bq/kg to 0.39 Bq/kg.

Monitoring data from local water districts showed that a total of four local water

districts in Ibaraki, Tochigi and Saitama detected I-131, ranging from 0.3 Bq/kg to 8.1 Bq/kg from 10 May to 15 June. Cs-137 was detected in 10 water districts in Ibaraki, Tochigi, Gunma and Saitama Prefectures. The detected levels of Cs-137 were below the drinking-water provisional regulation limit with values ranging from 0.13 Bq/kg to 16 Bq/kg. Cs-137 was detected in eight water districts in Tochigi, Gunma, Saitama and Miyagi Prefectures. The detected levels of Cs-137 were below the drinking-water provisional regulation limit, with values ranging from 0.1 Bq/kg to 17 Bq/kg.



Joint monitoring by the Ministry of Education, Culture, Sport, Science and Technology and the United States Department of Energy

The two government agencies conducted joint aerial monitoring starting in March 2011 to assess soil contamination. Aerial measuring systems and ground detectors were used to determine caesium deposition from aerial and ground-based measurements in areas within 80 km to 100 km of the Fukushima Daiichi nuclear power plant and 120 km south of the power plant. About 136 in situ ground samples were taken for laboratory analysis in the United States, while 115 soil samples were received and processed in Japan. The initial results were published on 6 May 2011, and follow-up airborne monitoring results were published by both agencies on 16 June 2011. It was reported that the measurements continued to show decreasing radiation levels and that there was no measurable radiological material since 19 March.

# **Environmental monitoring**

Following the event at the Fukushima Daiichi nuclear power plant, close monitoring of radiation levels in seawater, soil and air were performed in nearby areas and prefectures. Test results have been periodically updated and made available on the following websites to be widely shared with the public:

- Fukushima Prefecture: http://www.cms.pref.fukushima.jp/ (in Japanese)
- Ministry of Education, Culture, Sport, Science and Technology: http://www.mext.go.jp/english/incident/1303959.htm.

### Seawater

The Ministry of Education, Culture, Sport, Science and Technology performed seawater monitoring at offshore seawater sampling stations, while TEPCO conducted sampling near the discharge areas of Fukushima Daiichi nuclear power plant. On 23 March, the Ministry began surveillance of offshore coastal waters near the Fukushima Daiichi power plant. Seawater samples were collected from coastal waters along transects that are separated by 10 km intervals. Sampling was performed along each transect to a distance of about 30 km offshore. Measurements of ambient dose rates in air above sea, ambient dust above the sea, surface samples of seawater, seawater collected at 10 m above the sea floor and in mid-layer were performed. The Ministry added offshore sampling stations in Ibaraki Prefecture on 25 April.

On 23 March, TEPCO began surveillance at the discharge canals of the Fukushima Daiichi plant and the Fukushima Daini plant (10 km south of Daiichi) and near seashore sites including Iwasawa shore, located 6 km south of the Fukushima Daini plant. More monitoring stations were added by TEPCO, and as of 6 June, there were three sampling points at 3 km offshore, two points at 8 km offshore and six points at 15 km offshore of the power station; four points near the north and south of the discharge channels were also monitored.

### Soil

The Ministry of Education, Culture, Sport, Science and Technology began publishing the results of the radioactivity levels in soil on 18 March. Soil sampling had been done at a total of 36 points ranging from 20 km to 55 km from the Fukushima Daiichi power plant.

### Air

Radiation levels in the air have been monitored in a radius of 20 km to 60 km from the Fukushima nuclear power plant as well as in nearby prefectures.

In early July 2011, radiation levels between 20 km and 60 km from the Fukushima power plant site remained stable, with higher levels continuing to be clustered around the area north-west of the plant. Radiation levels in nearby prefectures continued to decline. While a few prefectures still reported radiation above background levels, the levels were low in terms of human health risk.



### Long-term assessments of the affected populations in Fukushima

Many long-term assessments and studies were planned and initiated to assess the health effects of the Fukushima accident. Long-term epidemiologic studies are important because there are limited epidemiologic data and understanding of the health outcomes of long-term exposure to radiation at very low levels.

On 23 May 2011, the United Nations Scientific Committee on the Effects of Atomic Radiation reported that experts on atomic radiation agreed to start an assessment of the radiological impact of the events at the Fukushima Daiichi plant. The aim was to calculate the magnitude of the releases of radiation into the atmosphere and in the ocean and the

range of radiation doses received by the public and workers.

WHO's International Agency for Research on Cancer (IARC) offered its cooperation in developing a long-term epidemiologic follow-up study; IARC also called for long-term support for research to fully evaluate the health consequences of the Chernobyl accident.

Fukushima Prefecture initiated activities for a long-term health study of all its residents. The study was planned to include surveys on demographics, health conditions and geographic location to estimate the cumulative radiation dose exposure and make predictions for several decades.

Academic collaboration has also been planned. Fukushima Medical University will carry out long-term epidemiologic studies with Hiroshima and Nagasaki Universities because of their knowledge and experience in the field. Long-term studies are needed as the current radiation exposure (low level, long period) differs from that of the atomic bomb experience (high level, short period).

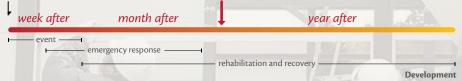
The Fukushima Prefecture has conducted screening of its residents for radiation exposure. The Sasakawa Foundation has set up a special fund and is accepting grant applications for proposals on relief efforts to address the long-term rebuilding of the lives of those affected both physically and mentally.





### FIGURE 7.

Timeline of post-disaster response stages<sup>a</sup>



a Adapted from Assessing the Impact on Health Systems: A Toolkit for Needs Assessment and Recovery Planning, WHO, 2009. The red arrow coincides with the final WHO Situation Report and the transitional period between the response and recovery phases.

Source: WHO Situation Report, 6 July

The final Situation Report generated by the WHO Regional Office on 6 July 2011 was in line with the transition from the response phase to the early recovery phase (Figure 7). Within four months of the disaster, lifeline services had been recovered and the number of persons residing in evacuation centres had declined from 440 000 in mid-March to approximately 30 000 in early July. Temporary housing facilities will serve as residences for the majority of people displaced for at least two years.

Each of the phases, from the emergency response, rehabilitation and recovery phases to the development phase, has its own specific set of conditions that affect the risks related to mental health, NCDs and communicable diseases. As the response phase changes, it is likely that new sets of exposures and hazards will arise and existing exposures and hazards will cease to exist.

However, some earlier exposures and hazards may continue to be important even if the exposure is no longer present.

Photo by WHO/WPRO

Mental health and psychosocial concerns, for example, may remain for several years due to long-term effects from the initial exposures (e.g. memories of seeing people being washed away by the tsunami). Concerns for NCDs, on the other hand, may likely decline with the progression of phases as conditions continue to improve (i.e. improvements in living conditions, diet, physical activity levels). Lastly, communicable disease concerns may also decline from the emergency response to the recovery phase as large numbers of evacuees leave shelters that have several factors that increase communicable disease risk (e.g. high population density, challenges in sanitation and hygiene, higher stress levels).

### Kizuna

**Empowering local communities** and mobilizing the potential power of the affected communities became important components of the recovery effort. Restoring existing relationships in the affected areas, both local community ties and individual ties (kizuna), was recognized as a priority from the early recovery period. As these social relationships and ties are integral to the wellbeing of the communities in this region, communication with community leaders and other local stakeholders will continue to be imperative as the recovery process continues.

Public health workers, particularly public health nurses who are familiar with the community, are envisioned to play an important role in the long-term recovery of the region. Such long-term planning has also been active at the prefectural and local levels, with development of prefectural master plans and discussions on the recovery vision plans by municipal governments.

# **Recovery plans and actions**

The national recovery plan published on 25 June 2011 represented an important post-disaster point, as affected communities transitioned from a primarily response phase to a primarily recovery phase. In the plan, large-scale societal changes were proposed to improve tsunami preparedness and the overall makeup of the city/town structure (e.g. relocating the city/village/town to a safer area). The blueprint envisions that the March 2011 event will be taken as a unique opportunity to revive the affected communities and to go beyond basic recovery activities.

Importantly, the national recovery plan proposed an integrated, regional approach for health and its relevant sectors. Sustaining an adequate medical workforce was already a long-standing concern prior to the disaster in the rural Tohoku region. The new, holistic approach called for plans to enhance the coordination among the systems of medical care, public health and welfare (including disability services and pharmaceutical services); and provide sustainable MHPSS, including counselling services at schools.





# WHO's continuing commitment for collaboration

While the post-disaster situation has shifted to recovery-focused activities, WHO remains committed to monitoring, assessing and reporting on these recovery activities.

As the long-term recovery activities take place in Japan, WHO continues to monitor the health situation and accumulate knowledge and experience in health system and service recovery following a massive disaster event. To mark the two-year anniversary of the event, WHO plans to hold a global forum to share the important lessons learnt from the Great East Japan Earthquake.



# Acknowledgements

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We would also like to thank the government agencies, technical institutions and individuals who provided kind assistance, invaluable information and accounts from the field during our missions to Japan in April and August 2011 (Annex 2).

The valuable contributions of WHO technical staff, experts and consultants who devoted their time and expertise during and after the event are gratefully acknowledged. Special thanks are extended to colleagues from WHO Headquarters, WHO Centre for Health Development (WHO Kobe Centre), WHO Country Offices and the WHO Regional Office for the Western Pacific (Environmental Health Unit, Mental Health and Injury Prevention Unit, Noncommunicable Diseases and Health Promotion Unit, Health Sector Development Unit).

Lastly, we would like to express our sincere gratitude to the Japanese volunteers who worked tirelessly for long hours to support WHO during the event, namely: Dr Raita Tamaki, Honami Furuki, Miki Osaki, Miyuki Oyagi, Noriko Miyachi, Reika Okajima and Sumire Usui. Special appreciation goes to the Embassy of Japan in the Philippines, Tokyo University and Tohoku University for their kind support and facilitation.

### **ANNEX 1: Resources**

Japan Earthquake and Tsunami Situation Reports, WHO, No. 1 - 35, 11 March - 6 July 2011.

Prime Minister of Japan and his cabinet Ministry of Agriculture, Forestry and Fisheries Ministry of Economy, Trade and Industry

Ministry of Education, Culture, Sport, Science and Technology

Ministry of Finance Japan

Ministry of Foreign Affairs of Japan Ministry of Health, Labour and Welfare Ministry of Internal Affairs and Communications Ministry of Land, Infrastructure, Transport and Tourism

National Police Agency Japan Meteorological Agency Reconstruction Agency

Fukushima Prefecture Iwate Prefecture Miyagi Prefecture

Tohoku University
Sapporo Medical University
Earthquake Research Institute, the University of Tokyo
National Institute of Infectious Diseases

NHK (Japan Broadcasting Corporation) News

Nikkei Medical The Asahi Shimbun The Japan Times The Mainichi Shimbun The Ryukyu Shimpo The Yomiuri Shimbun

Ashinaga Ikueikai

Federation of Inochi No Denwa Inc. International Medical Corps Japan Labour Health and Welfare Organization Japan Organ Transplant Network Japan Red Cross Society Japanese Association of Dialysis Physicians

International Atomic Energy Agency
International Food Safety Authorities Network
The United Nations Office for the Coordination of Humanitarian
Affairs

Embassy of Japan in the Philippines Tokyo University of Foreign Studies

### ANNEX 2: List of the informants and stakeholders during the WHO missions to Japan

### Japan earthquake and tsunami disaster fact-finding mission: April 2011

Department of Critical Care Medicine, Iwate Medical University

Department of Emergency and Critical Care Medicine, Iwate Medical University Department of Infection Control and Laboratory Diagnostics, Tohoku University

Graduate School of Medicine

Hyogo Prefectural Government

Ishinomaki Japan Red Cross Hospital

Iwate Prefectural Coastal Region Development Bureau

Iwate Prefectural Disaster Response Command Centre

Iwate Prefectural Government

Iwate Prefectural Kamaishi Hospital

Japan Chamber of Commerce and Industry

Kobe City

Medical Office of the Ministry of Foreign Affairs of Japan, Iwate Medical University

Ministry of Health, Labour and Welfare headquarters in Miyagi

Ministry of Health, Labour and Welfare

Miyagi Prefectural Department of Public Health and Social Welfare

Miyako City, Iwate Prefecture

Miyako Health Centre

National Institute of Infectious Diseases

Otsuchi-cho, Iwate Prefecture

WHO Centre for Health Development (WHO Kobe Centre: WKC)

WKC Cooperating Committee

Yamada-cho, Iwate Prefecture

### WHO baseline information collection and fact-finding missions for the documentation of post-disaster recovery efforts: August 2011

Center for Community Health, Tohoku University Graduate School of Medicine

General Branch Office of Ogatsu-cho in Ishinomaki City

General Branch Office of Ojika in Ishinomaki City

Graduate School of Pharmaceutical Sciences, University of Tokyo

Iwate Medical University School of Medicine

Iwate Prefectural Government

Miyako City, Iwate Prefecture

National Institute of Infectious Diseases

Otsuchi-cho Social Welfare Council

Save the Children Japan

Taro-cho, Iwate Prefecture

Tohoku University Graduate School of Medicine

Tohoku University School of Medicine

Tokyo Metropolitan Geriatric Hospital and Institute of Gerontology

Tono City, Iwate Prefecture

Tono Magokoro Network

### ANNEX 3: Pre-disaster health service provision and disease burden in affected prefectures

A review of pre-disaster health services is vital for a health needs assessment during a disaster. The review conducted by WHO revealed that all three affected prefectures were facing problems in providing adequate level of medical services before the disaster because of shortages of doctors working full time (below the national average) and shortages of medical institutions (Table 1).

As shown in Table 2, of the three affected prefectures, Miyagi Prefecture suffered the most from shortages of beds for some specific diseases.

The number of people with major diseases and disorders in the three main prefectures affected by the earthquake and tsunami are listed in Table 3.

The combined population of the affected north-east coastline prefectures of Miyagi, Iwate and Fukushima is 5 720 000. A review of the population distribution by age for each prefecture shows a high proportion of the population over the age of 65 years. The elderly, older than 80 years (women proportionately higher than men), form a large group in these prefectures. There are a high number of aged care facilities in each of the affected prefectures (Table 4).

TABLE 1.

Number of medical institutions, clinics and full-time doctors in each of the main affected prefectures

		lwate		Fukushima		Miyagi
	Hospitals	Clinics	Hospitals	Clinics	Hospitals	Clinics
Number of medical						
institutions	96	927	142	1476	147	1578
National total	8739	99 635	8739	99 635	8739	99 635
Number of						
institutions*	7.2	69.2	7.0	72.4	6.3	67.6
National total	6.9	78.1	6.9	78.1	6.9	78.1
Number of full- time doctors		139.9		125.4		132.4
National total		149.9		149.9		149.9

<sup>\*</sup> per 100 000 population

Source: Ministry of Health, Labour and Welfare

TABLE 2.

Number of beds available per 100 000 population, by disease groups

# Beds for specific disease groups

	General Hospital beds	Mental Health	Tuberculosis	Communicable Disease	Chronic Care	Total
Miyagi	717.0	277.4	5.3	1.2	138.2	1139.0
lwate	824.7	347.1	12.5	2.7	213.6	1400.5
Fukushima	806.6	362.4	9.1	1.8	219.9	1399.7
National Average	710.8	273.0	7.0	1.4	263.7	1256.0

Source: Ministry of Health, Labour and Welfare

**TABLE 3.**Number of patients in affected prefectures, by disease groups, in 2008

	Miyagi	lwate	Fukushima
Communicable and parasitic disease	3 000	2 400	3 000
Neoplasm	6 100	4 100	5 900
Blood, hematopoietic and immune mechanism disorder	400	300	400
Internal secretion, nutrition and metabolism disorder	5 900	4 400	6 400
Mental and physical disorder	8 000	7 000	9 500
Nervous system disorder	3 400	3 700	3 700
Circulatory disease	20 600	13 900	22 200
Respiratory disease	10 700	7 200	12 500

Source: Ministry of Health, Labour and Welfare

**TABLE 4.**Number of medical institutions for public health services in affected prefectures

	Aged care facilities	Mental health institutions	Centres for disabled people
lwate	126	33	15
Fukushima	117	47	9
Miyagi	89	53	11

Source: Ministry of Health, Labour and Welfare



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