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Call for Clearly Defining Disaster-Related Sequelae

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Abstract

Recent advances in disaster countermeasures have reduced the number of direct deaths; however, population aging and medical progress have resulted in an increase in the number of individuals with chronic diseases and disabilities, rendering them vulnerable to secondary health effects caused by disrupted care and environmental changes during disasters. Public support systems for disaster-related health impacts are systematically established only in Japan and the USA. Although compensation schemes for disaster-related deaths have been progressively expanded, comprehensive support for survivors who require long-term medical and social care owing to indirect, post-disaster health effects remains insufficiently developed. After the Great East Japan earthquake, increases in stroke hospitalizations, depression, and cognitive decline were observed, while international cases, such as the post-earthquake cancer incidence in Nepal, highlight global relevance. Thus, the definition of "disaster-related sequelae" and the establishment of comprehensive medical and social support systems, including compensation, continuity of care, and preventive education, are urgently needed.

Addressing secondary health effects in vulnerable populations during disasters is gaining importance. In recent years, the frequency and severity of disasters have increased globally. Each occurrence prompted improvements in disaster response measures, resulting in a gradual decline in direct deaths. Advances in medical care have contributed to increased survival rates and thus population aging, leading to an increase in the number of individuals with chronic illnesses and disabilities. These health-vulnerable populations are particularly susceptible to secondary health effects during disasters, triggered by environmental changes or limited access to medical services. In this context, addressing and mitigating such secondary health effects during disasters has become a critical issue.

Among individuals whose health is affected by disasters, those who require mid-term to long-term care due to indirect health impacts continue to have fragile support systems. Only a limited number of countries have systematically established public support frameworks for individuals experiencing disaster-related health effects; at present, such systems have been identified only in Japan and the USA. An overview of these support systems is presented in Table 1. With regard to support for individuals who die due to disasters, the USA provides a funeral expense assistance program, while Japan offers benefit schemes such as disaster condolence payments. In the USA, Disaster Funeral Assistance is a program that provides financial support for unreimbursed funeral expenses attributable to disaster-related deaths and requires application within 60 days following a disaster declaration. Eligible deaths include not only those caused by the direct forces of a disaster or their immediate consequences—such as building collapse, flying debris, or radiation exposure—but also disaster-related indirect deaths, as defined in the program guidelines.[1] Indirect death refers to a death attributable to unsafe or unhealthy conditions or to the loss or disruption of routine services (e.g., power outages) that occurred at any phase of a disaster—including the pre-impact or preparedness phase, the impact phase, or the post-disaster recovery and cleanup phase—and that contributed to the fatal outcome.[2] In contrast, in Japan, *disaster-related deaths* (*saigai kanren-shi*) are defined as deaths resulting from the exacerbation of disaster-related injuries or from diseases caused by physical burdens associated with evacuation or prolonged displacement and are officially recognized as disaster-caused deaths under the Act on the Provision of Disaster Condolence Grants. The certification of disaster-related deaths is conducted at the municipal level, where formal recognition frameworks have been established. Notably, following the 2004 Niigata Chuetsu Earthquake, the *Nagaoka Criteria* were developed as the first standardized recognition criteria for disaster-related deaths in Japan.[3] However, following the 2011 Great East Japan Earthquake, indirect deaths were observed to occur more

Table 1. Support systems for individuals affected by disaster-related health impacts

Disaster victim support	Vital status of the affected individuals	Direct or indirect health impact	Eligible population	Maximum benefit amount	Application deadline	Compensating authority
Funeral Assistance (USA)	Deceased	Both	Funeral expense payers for disaster-related deaths (*1)	Amounts set by state, tribal, and territorial governments (*2)	Within 60 days of presidential emergency or major disaster declaration	Federal Emergency Management Agency (FEMA), USA
Medical and Dental Assistance (USA)	Surviving	Direct only	All persons with disaster-related medical or dental expenses	Amounts set by state, tribal, and territorial governments (*2)	Within 60 days of presidential emergency or major disaster declaration	FEMA (USA)
Disaster Condolence Grant System (Japan)	Deceased	Both	Surviving family members of disaster-related decedents	Up to JPY 5 million or JPY 2.5 million (*3)	No application deadline	National (50%), prefectural (25%), municipal (25%) [16]
Disaster Disability Condolence Grant System (Japan)	Surviving	Direct only	Persons with severe mental or physical disabilities from disaster-related injury or illness (*4)	Up to JPY 2.5 million or JPY 1.25 million (*5)	Determined by each municipality, generally within 90 days of disaster onset	National (50%), prefectural (25%), municipal (25%) [16]
Premium and cost-sharing reductions under medical and long-term care insurance (Japan)	Surviving	Both	Individuals unable to pay premiums or co-payments due to disaster-related income loss (*6)	Partial or full coverage (varies by disaster)	Varies by disaster (≤1 year) (*7)	Respective insurers under the medical and long-term care insurance schemes (*8)

Notes. *1: Individuals who incurred (or will incur) funeral expenses for persons whose deaths were determined to be directly or indirectly attributable to an emergency or disaster.
*2: Combined maximum amount of *Other Needs Assistance (ONA)*, including these forms of assistance as well as Personal Property Assistance, Transportation Assistance, Group Flood Insurance Policy, Childcare Assistance, Assistance for Miscellaneous Items, Moving and Storage Assistance, Critical Needs Assistance, and Clean and Sanitize Assistance, is capped at USD 42,500.
*3: An amount prescribed by municipal ordinance (up to JPY 5 million) is provided in cases where the primary income earner of the household has died.
An amount prescribed by municipal ordinance (up to JPY 2.5 million) is provided in cases where a non–primary income earner has died.
*4: For the purposes of this system, *disability* is defined as including individuals who have lost vision in both eyes; lost the functions of mastication and speech; sustained severe neurological or psychiatric impairments requiring continuous care; sustained severe dysfunction of thoracic or abdominal organs requiring continuous care; lost both upper limbs at or above the elbow; completely lost the use of both upper limbs; lost both lower limbs at or above the knee; completely lost the use of both lower limbs; or who are determined to have combined physical and/or mental disabilities of a severity equivalent to or greater than any of the aforementioned conditions.
*5: An amount prescribed by municipal ordinance (up to JPY 2.5 million) is provided in cases where the primary income earner of the household has sustained a severe disability.
An amount prescribed by municipal ordinance (up to JPY 1.25 million) is provided in cases where a non–primary income earner has sustained a severe disability.
*6: Individuals deemed unable to make payments are defined as those who have suffered total or partial destruction of their residence, complete or partial burning, flooding above floor level, or comparable disaster-related damage; those whose primary income earner has died or sustained a severe injury or illness; those whose primary income earner is missing; those whose primary income earner has ceased or suspended business operations; or those whose primary income earner has lost employment and currently has no income.
*7: Large-scale disasters include, but are not limited to, the Great Hanshin-Awaji earthquake and the Great East Japan earthquake.
*8: Administrative offices under the various medical and long-term care insurance schemes include the offices of health insurance societies, the Japan Health Insurance Association, municipalities (for National Health Insurance and long-term care insurance), National Health Insurance unions, the Wide-Area Union for the Medical Care System for the Elderly, and mutual aid associations, among other medical and long-term care insurers.

than 6 months after the disaster. Because such cases were not recognized as disaster-related deaths under the Nagaoka Criteria, the evaluation period was subsequently revised to more flexibly reflect real-world circumstances, leading to the development of the *Minamisoma Criteria*.[4] Thus, although compensation schemes for deceased individuals cannot be regarded as fully sufficient, an important characteristic is that they encompass both direct and indirect impacts of disasters. In contrast, support systems for individuals who survive despite experiencing disaster-related health effects include the USA's *Medical and Dental Assistance* program, Japan's Disaster Disability Condolence Grant system, and measures to reduce or exempt insurance premiums and out-of-pocket payments under the medical and long-term care insurance schemes. *Medical and Dental Assistance* is a program that provides financial assistance to individuals and households that incur medical or dental expenses as a result of a disaster and, similar to *Funeral Assistance*, requires application within 60 days following a disaster declaration. The program covers medical-related or dental-related injuries and expenses arising as a direct result of a disaster, including costs associated with newly incurred injuries or illnesses caused by the disaster, as well as those related to the exacerbation of pre-existing injuries, disabilities, or medical conditions attributable to the disaster.[1] In Japan, the *Disaster Disability Condolence Grant* system serves as a relief measure for individuals who sustain direct disaster-related health impacts or disabilities and generally requires application within 90 days of disaster onset. Eligible disabilities are limited to severe conditions, including the loss of vision in both eyes; complete loss of masticatory and speech functions; severe neurological or psychiatric impairments requiring continuous care; severe dysfunction of thoracic or abdominal organs requiring continuous care; amputation of both upper limbs at or above the elbow; complete loss of function in both upper limbs; amputation of both lower limbs at or above the knee; complete loss of function in both lower limbs; and cases in which combined physical and/or mental disabilities are determined to be of equal or greater severity to the aforementioned conditions.[5] In addition, reductions or exemptions of insurance premiums and out-of-pocket payments under the medical and long-term care insurance schemes are measures implemented for individuals who are deemed unable to meet such payments owing to special

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circumstances, such as disaster-related income loss, and, in the case of large-scale disasters, generally require application within 1 year of disaster onset.[5] Most of these systems primarily target direct disaster-related health injuries or severe disabilities. Among individuals affected by disaster-related health impacts, however, comprehensive mechanisms to support those who, owing to post-disaster changes in living conditions—including food, clothing, and housing—require mid-term to long-term medical and social care as a result of sequelae from disaster-associated illnesses or exacerbation of pre-existing conditions are largely lacking, with the exception of measures such as reductions or exemptions of out-of-pocket payments.

Based on past disaster experiences, cases in which long-term care was necessitated by the sequelae of diseases resulting from post-disaster environmental changes have been reported; however, care provision remains inadequate. In Minamisoma City, Fukushima Prefecture, for instance, the risk of stroke-related hospitalization was 1.62 times higher within the 2 years after the Great East Japan Earthquake compared to pre-disaster levels (95% confidence interval [CI]: 1.23-2.14).[6] Stroke-related hospitalizations are known contributors to the decline in activities of daily living.[7] Similarly, in Iwanuma City, Miyagi Prefecture, the incidence of newly diagnosed depression over a 5.5-year post-disaster period reached 13.6%.[8] A 9-year follow-up study (2013-2022) in the same city showed that cognitive decline progressed among disaster-affected individuals, necessitating specialized long-term care. The odds of cognitive deterioration were significantly higher in individuals who experienced housing destruction, worsened economic conditions, and interruption of access to medical services than in cognitively stable individuals: odds ratios of 2.52 (95% CI: 1.26-5.04), 1.83 (95% CI: 1.15-2.90), and 1.76 (95% CI: 1.03-2.99), respectively.[9] After the 2015 Nepal earthquake, the hospital admission rate for patients with cancer increased by 1.63 times (95% CI: 1.37-1.94) over 2 years compared to pre-earthquake levels.[10] Patients with cancer, as reported, experience an accelerated decline in activities of daily living compared with non-cancer patients.[11] As one way to resolve such situations, Japan waived medical co-payment fees in the affected areas from March 11, 2011, to February 29, 2012, after the Great East Japan Earthquake. However, repeated evacuations and deteriorating living conditions led to disrupted health care access and compromised care quality.[12,13]

There is an urgent need to establish a comprehensive support system for what has been proposed as "disaster-related sequelae." It is necessary to define this term medically and create a standardized assessment framework to identify individuals who require mid-to-long–term care because of the sequelae of diseases caused indirectly by disasters. In Japan, public awareness of the term "disaster-related deaths" has gradually increased through repeated experiences of large-scale disasters. This increasing recognition of indirect health effects forms a crucial foundation for the societal acceptance and institutionalization of the "disaster-related sequelae" concept. From a policy-making perspective, this conceptual clarification of "disaster-related sequelae" is essential for agenda setting, eligibility determination, and resource allocation within disaster-assistance frameworks, both nationally and internationally. To protect affected individuals and prevent sequelae, it is essential to establish both medical and social support systems while advocating the use of the term. Compensation and assistance schemes should be structured to address direct injuries as well as indirect and delayed health sequelae that necessitate mid-term to long-term care. In the medical context, systems must be developed to ensure the staffing of health care providers dedicated to caring for patients with sequelae, and education for health care workers on recognizing and preventing sequelae during and outside disaster periods must be improved. Routine health screening should also be institutionalized to prevent health deterioration during disasters. Increasing public awareness of "disaster-related sequelae" is crucial for fostering mutual aid within communities and enabling local governments to offer mental health and social support services. Immediate and robust establishment of these support systems is required to reduce the number of individuals experiencing such sequelae. The most pressing task at present is to raise awareness of the term "disaster-related sequelae" as a foundation for these efforts.

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