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Review of the Historical Trajectory of Health and Nutrition-related Research in Japan, the United States, and European countries: Focusing on the Universities

Report Overview

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The goal of this Discussion Paper is to promote discussion in our institution and solicit feedback from the people involved.
The contents of this Discussion Paper were organised according to the authors' personal opinions. Please note that these opinions do not necessarily reflect the official views of our institution.

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1 Aims of this research

According to the findings published in Discussion Paper No. 72 (DP 72), entitled, 'The Japanese Situation and Subjects of Health and Nutrition-related Research in the World: Country and Agency Rankings in Article Production' (December 2010, NISTEP), articles on human nutrition are produced mostly by the departments or divisions of nutrition within faculties of medicine or agriculture. In Japan, there are only two upper-ranked universities that have divisions of nutrition. Currently, in Japan, the resources for studying human nutrition in a research institution are severely lacking in both quantity and quality. The rankings in the above-mentioned paper suggest that historically, the study of nutrition has not been prioritised in Japan.

Thus, this study compares the historical trajectory of health and nutrition-related research conducted by universities in Japan, the United States, and European countries, which accounted for most of the countries in the upper ranking, in order to identify why this field of inquiry has not been well developed in Japan.

This study's findings contribute to the growth of the field of health and nutrition studies in Japan. It also provides a model for researchers in other emerging scientific fields who have been developing studies in identifying historical disincentives that may have impeded progress in their own disciplines.

2 Methods of this research

Using data gathered from a literature review, an interview-based survey and email communications, this study compares the historical development of health and nutrition-related research in Japan, the United States, and European countries in order to identify why Japan has not developed a strong tradition of this type of research. This research project was carried out in universities that participated in the 'Seven Countries Study', which was the first study of nutrition epidemiology conducted through international cooperation. Survey was conducted about nutrition-related qualifications and Information services to the public about health and nutrition research as a social system in relation to health nutrition research in Japan, the United States, and the United Kingdom.

3 The historical trajectory of health and nutrition-related research in Japan, the United States and the United Kingdom

During the 19th century, chemistry and physiology were integrated to create the discipline of biochemistry. First called physiological chemistry, this new field ushered in the age of the discovery of nutrition. One stream produced studies such as biotechnology, which microscopically analyzes food and was related to agricultural chemistry. Meanwhile, studies such as epidemiological nutrition arose from medicine and public health, and were related to health and nutrition-related research. When we looked at the universities and institutions producing articles on health and nutrition-related research at DP72, the historical development of these distinct streams became clear. It also became clear that the studies of nutrition were mostly conducted in the faculties of medicine and agriculture.

This survey compares the historical trajectory of health and nutrition-related research in Japan, the United States, and the United Kingdom, which were based on these streams of studies. The following three similarities were found:

1) In all the countries, scientific societies were reluctant to accept discoveries that did not reveal sufficient information about a disease's causes or mechanisms. For example, Dr. James Lind of the United Kingdom conducted the world's first clinical control study and discovered how to prevent scurvy in 1747. In 1882, naval surgeon in Japan, Dr. Takagi Kanehiro conducted the first epidemiological study in Japan and discovered the prevention for *beriberi*. Further, in 1915, Dr. Joseph GoldBerger of the United States discovered prevention for *pellagra*. However, despite these medical feats, many scientists doubted these results and they were rather criticized by the scientific society. What is similar about these studies is that correlations were proven but causalities were not.

2) Generally speaking, wars have had a large impact on health and nutrition-related research, although the type of influence has differed according to situations specific to each country. In the United States, military nutrition research was conducted before the Revolutionary War to ensure that soldiers could perform well. In the United Kingdom, problems relating to *scurvy* and studies corresponding to the nation's food shortages during wars had been conducted since the Age of Discovery, while studies of diseases in the Empire's colonies also had a long history. In Japan, during the Meiji and the Taisho eras, studies on *beriberi* were conducted owing to the problem of rations, which corresponded to food shortages. Thus, research was conducted in order to assess the nation's nutritional situation.

3) There has been a time lag particular to each country nevertheless; the pattern of discovery is similar. First, the idea that disease was caused by defect of nutrition swept across the scientific community. Then, the discovery of vitamins stimulated progress in treatments. Then studies between diet and health adapted to increases in new chronic diseases such as obesity, hypertension, heart disease, cancer, and diabetes, which signalled the conversion from a deficiency to a surplus of nutrition.

The following two dissimilarities were found in each country:

1) Dietary guidelines, national health and nutrition surveys, dietary reference intakes and the chemical composition of food materials, health and nutrition-related research, and government policies were reviewed. It was found that Japan had annually renewed and revised the latter three policies. In the United States and the United Kingdom, universities and scientific societies made significant contributions to the design and evaluation of health and nutrition policies. However, in Japan, universities did not contribute much to the national policies, although their contribution was seen in dietary reference intakes. Especially in the United Kingdom, a structure exists that links the government and universities such that academic findings contribute a great deal to policymaking. In the United States, the detailed data from national health and nutrition surveys were accessed and many papers were produced using these data.

2) Mapping the historical trajectory of health and nutrition-related research in universities in the United States began with scientists majoring in agricultural chemistry in Department of Nutrition, Harvard School of Public Health. In the United Kingdom, it began with scientists majoring in biochemistry and physiology at Kings College, London, in addition to a physiological scientist who established the Rowett Institute at the University of Aberdeen in Scotland. In Japan, it began with a biochemical scientist who was the first professor in the Division of Nutrition at the University of Tokyo. The similarity in each of these cases was that scientists majoring in nutrition were fostered from the field of biochemistry, physiology, and medicine or agricultural chemistry, although their trajectories began to diverge afterwards.

For example, scientists of agricultural chemistry created the Department of Nutrition, Harvard School of Public Health, and at first, the research team was built to bring together various scientists, such as those studying heart disease, and many scientists majoring in nutrition were trained there. Those scientists contributed greatly to establishing the Jean Mayer USDA Human Nutrition Research Center on Aging at Tufts University. Harvard's Department of Nutrition also produced scientists who played active roles in other universities and nutrition institutes all over the world.Similarly, research on how food intake influences health was conducted at Kings College, London, where a group of clinical physicians, molecule chemists, physiologists, and nutritionists worked together.In contrast, in Japan, biochemists and scientists from other disciplines did not contribute to the growth of health and nutrition-related research. The Division of Nutrition at the University of Tokyo was dissolved in 1997. Health and nutrition-related research was not conducted. Instead, the only Division of Nutrition—located in the Faculty of Medicine, University of Tokushima—placed great importance on micro-studies such as molecule nutrition.

4 The Seven Countries Study (SCS): nutrition and health in Japan, the United States, and European countries

Our survey also included data on the trajectory of the health and nutrition-related research's position of universities that participated in the 'Seven Countries Study' (SCS). The SCS is world-renowned as the cooperative research product of seven countries that shared data about the relationship between heart disease and diet. The data collection began during the latter part of the 1950s and continued for about 25 years. One of SCS's findings revealed that the United States, Finland, and the Netherlands had high death rates because of coronary heart disease, whereas Japan and Greece had very low ones. The difference in the death rate was revealed in a five-year study on the relationship between the intake of saturated fatty acid and coronary heart disease. Moreover, it showed that there were clearly differences between countries in the prevalence of certain types of diseases. While the United States, Finland, and the Netherlands had high death rates owing to coronary heart disease, Japan had a high death rate associated with strokes.

The University of Minnesota in the United States, the University of Kuopio (Now: University of Eastern Finland) in Finland, and the University of Wageningen in the Netherlands, which all recorded high death rates from heart disease, had established Departments or Divisions of Nutrition and conducted

health and nutrition-related research. In contrast, the Department of Medicine at the University of Kurume in Japan did not establish a Division of Nutrition. There were several reasons that the morbidity of heart disease and coronary heart disease was low and did not increase. Heart disease did not lead research and many researchers felt that it was enough to hire dieticians to conduct screenings. Meanwhile, the study determined that like Japan, Greece had a very low incidence of heart disease. It was suggested that their diet is very healthy, and thus the 'Mediterranean' diet received worldwide attention. This may have influenced the University of Crete's decision to establish the Department of Preventive Medicine and Nutrition in 1989.

5 Social systems relating to health and nutrition-related research

(1) Nutrition-related qualifications

The United States stipulates particular qualifications for a Registered Dietician (RD) and a Dietetic Technician, Registered (DTR). An RD must meet academic and professional requirements, which include earning a bachelor's degree with approved coursework, completing a practice program and passing a national examination. A DTR should complete a two-year Associate Degree granted by an accredited college, complete a dietetic technician program, and pass a national written examination. Both are required to complete continuing educational requirements in order to maintain their registration status. There are several advanced level credentials for specialists in Renal Nutrition, Paediatric Nutrition, Sports Dietician, Gerontological Nutrition, and Oncology Nutrition.

The United Kingdom stipulates particular qualifications for a Registered Dietician (RD) whose training usually consists of completion of a recognized university-based course leading to a BSc Honours degree in Dietetics, or Nutrition and Dietetics. Following successful completion of the degree, one should then be eligible for registration with the Health Professions Council (HPC). If one already holds an honours degree in a life science subject, one may be able to do a two-year postgraduate course in dietetics. However, the United Kingdom also stipulates particular qualifications for a Nutritionist, a profession currently organized by the Nutrition Society. The National Health Service (NHS) of the United Kingdom generates many nutrition expertise posts and employs a lot of Nutritionists as well as RDs.

Japan stipulates particular qualifications for a Dietician and Registered Dietician. If you graduate from a two-year junior college or vocational school that is a training facility for dieticians, you can qualify as a dietician. If you graduate from a training facility for registered dieticians or graduate from a two-year junior college or vocational school that is a training facility for dieticians and train on the job for several years, you can qualify to take the registration exam. In Japan, a Registered Dietician can provide nutritional guidance to a person who is ill and under medical supervision. In the United States and the United Kingdom, RDs lead the doctors, nurses, and pharmacists. The position of Registered Dietician in Japan is lower than that in the United States and the United Kingdom.

A comparison of program curriculums in Japan, the United States, and the United Kingdom revealed that the United States and the United Kingdom focus on collecting information from a broad base of scientific literatures, reviewing papers found on data bases, and using this knowledge in practice. The curriculum in the United States and the United Kingdom included broad academic fields such as organic chemistry, biochemistry, physiology, genetics, microbiology, pharmacology, sociology, and psychology anthropology. It appeared that many RDs graduated with postgraduate university studies.

(2) Information services to the public about health and nutrition related-research

The following websites were compared in terms of their roles as public information services on health and nutrition: 'The Nutrition Source', maintained by the Department of Nutrition at the Harvard School of Public Health in the US; 'Behind the Headline', maintained by the NHS in the UK; and 'LINKE de Diet' maintained by the National Institute of Health and Nutrition in Japan. The United States and the United Kingdom information services demonstrate a way of thinking about each topic that is based on the best science available at the time. They explain how scientific papers or news reports of studies fit in with other evidence and how we understand the results. In Japan, there has not been an information service like that which exists in the United States and the United Kingdom, but the National Institute of Health and Nutrition has a website that recently explained the outline of a paper with great clarity. In the future, these services should be expanded; it is important that universities are able to provide such services.

6 Discussion

(1) The reason that Japan had not developed health and nutrition-related research: focusing on universities

The United States and the United Kingdom have developed a great deal of health and nutrition-related research in universities, whereas Japan has not. This study found that the reasons for this discrepancy are that in Japan, health and nutrition-related research has been placed in an unsupportive environment. Moreover, it found problems related to the universities (organization), the national government, and social demands.

① The unsupportive environments in which health and nutrition-related research has been placed

In terms of the historical position of nutrition in Japan, it should be noted that during the Taisho era, dietary guidance was considered offensive and not an appropriate topic for the academy. In 1952, when the University of Tokyo was attempting to establish the Division of Nutrition, its representative wrote that coursework related to nutrition was allotted only a short time—one lecture in biochemistry—and that was too short a frame of time to properly teach nutrition.

When the Division of Nutrition at the University of Tokushima was established in 1964, the field's position within academia was described as follows:

'Nutrition research was usually conducted as one of their professional studies by biochemist, physiologist, sanitarian, and so on in their spare time. This was why there was no Department of Division of Nutrition. It just was not enough research by Department of Agriculture and Home Economy and Division of Nutrition should be established in the Department of Medicine.'

This assessment of Japan's Divisions of Nutrition has not changed much since they were first established. We could say that from the past to the present, health and nutrition-related research had not been recognized as a proper discipline or topic of academic study.

Since the Meiji era, Japanese medicine and the natural sciences have developed in accordance with German studies. Cellular research at the molecular level was the focus and gradually the field has developed specialties and academic subdivisions. Furthermore, health and nutrition-related research takes an integrated approach, bringing individual research results together, and such interdisciplinary study had some trouble developing in Japan.

For example, in Japan, public health has traditionally been part of the department of medicine. However, in the United States and the United Kingdom, public health is often an independent, multidisciplinary department, distinct from medicine. In contrast, in Japan, there has been no viewpoint from which to see public health as a discipline dependant on health and nutrition-related research. Moreover, it seems that when health and nutrition is viewed from the standpoint of medicine, disease is the central feature and a medical remedy is the solution. As compared to the United States and the United Kingdom, in Japan, the viewpoint of 'prevention' had been ignored.

② Problem of university (organization)

In Japan, research on nutrition has been conducted within the framework of agriculture or home economy departments. In that case, please consider revising the sentence as follows for readability. 'In this framework, it might be said that health-and-nutrition-related research had developed in "food" and "cooking" research and not human research.'Public health has been located in the department of medicine, while health and nutrition-related research have not.

Departments of medicine tend to divide their laboratory systems into basic research and clinical research; public health has been included in basic research. Basic research focuses on molecular, cellular, and genetic level studies. Because nutrition studies have been positioned within basic research, they tended towards micro-research. Yet, as mentioned above, health and nutrition-related research is interdisciplinary, and it needs both micro- and macro-oriented research. Thus, establishing Divisions of Health and Nutrition within Departments of Medicine in national universities in Japan is very difficult because the existing divisions need to be abolished.

Although it is important to encourage the Japanese National universities that are approved training facilities for Registered Dieticians to more actively conduct research, many more accredited private universities exist than national ones. There are only three universities approved as training facility for RDs: the Department of Medicine of University of Tokushima, Ochanomizu University, and Nara Woman's University. Only one of three universities is a coeducational university. Furthermore, these universities have not produced enough health and nutrition-related research; they need more resources to train more researchers.

③ Problem of national government

To make health and nutrition-related research in universities develop, it is important to acquire sufficient grants. In the United States, the National

Institute of Health (NIH), and the Department of Health and Human Services had a budget of $1,400 million dollars in the fiscal year of 2009, and the US Department of Agriculture had $147 million dollars. A certain percentage of these budges went to fund university studies. In contrast, there are no budgets in Japan, which aim to fund nutrition research directly This difference is considered significant.

The current position of the Nutrition Department is within the Ministry of Health, Labour and Welfare, positioned at the Senior Officer of Nutrition and Shokuiku (Food Education), Lifestyle Prevention Office, General Affairs Division, Health Service Bureau. Although there was a division of nutrition during the period after World War II, the organisation that is currently in charge of nutrition is relatively weaker than that back then. Japan's society is aging, and it is clear that health-and-nutrition-related research will become increasingly important. Therefore, it is in the interest of the national government to develop adequate systems to support this type of research.

④ Problem of social demands

Social demands become the engine of development in research. In the 'Seven Countries Study' (SCS), the University of Minnesota in the United States, the University of Kuopio (Now: University of Eastern Finland) in Finland, and the University of Wageningen in Netherlands, all reported high death rates for heart disease. They were all established departments or divisions of nutrition and had developed health and nutrition-related research. In some cases, research can develop cures for problems that inflicted heavy losses in the society. Japan and Greece both had very low death rates for heart disease. One difference was that in Greece, health and nutrition-related research was well positioned within their universities, whereas it had not developed in Japan. Heart disease had not yet motivated research in health and nutrition in Japan.

In contrast, cancer is ranked as the number one cause of death in Japan. In response, a large cohort study has been conducted by National Cancer Centre, which has been funded with a Cancer Research Grant from the Ministry of Health, Labour and Welfare. That study examines the relationship between cancer and life style and 'diet' is just treated as one aspect of lifestyle. Currently, there is not enough focus on nutrition epidemiology. We have found that there is not enough funding in the budget because the social demand for such studies is either not sufficient or not recognised.

(2) Research directions for future health and nutrition studies in Japan

The researcher ,the results of research, and environment of research and education support the health and nutrition related research within the social system. In comparing current systems in Japan, the United States and the United Kingdom, it appears that the Japanese system needs more improvement. From one perspective, it appears that the lack of an adequate research environment is why Japan's research potential on this subject has not been realised. We should change the social system, which has hindered the development of properly trained researchers. We need to enrich the environment of health and nutrition-related research in Japan.

Health-and-nutrition-related research was originally deeply related to

government policy.' It is important that just like in the United Kingdom, the Japanese government should entrust universities with the job of conducting research and applying their findings towards policy design. Like in the United States, the Japanese government should provide detailed data from the National Nutrition Survey for public use. Our findings suggest that these measures would improve health and nutrition because they would support the implementation of evidence based policies. Moreover, it is necessary that the National Institute of Health and Nutrition and Japan Science and Technology Agency (JST) fund health and nutrition-related research and contract a national university to conduct the research.

It is important to expand the range of people who conduct health and nutrition-related research. It is worth investigating how to implement changes in the Japanese system, such as the UK practice of allowing undergraduates with natural science degrees (rather than dietician degrees) to qualify for registration by taking postgraduate courses. We should also consider the US practice of continuing education as a requirement for maintaining one's registration status. Furthermore, we might re-examine our curriculums by referring to those in use in the United States and the United Kingdom and create an upper-level qualification for dieticians.

(3) A lesson for the development of an emerging field of study and interdisciplinary research in Japan

Health and nutrition-related research in Japan has not developed sufficiently. This is because it is an emerging field, dependant on interdisciplinary research, which continues to be placed in non-supportive environments and not fully recognized as worthy of academic study. When the Division of Nutrition was established in the Department of Medicine in the University of Tokushima, two conditions produced this result. One was that there was a change in the social situation that created the new status of Registered Dietician. The second condition was that the University President and the Dean of the Department of Medicine provided great leadership to produce the new division that trains Registered Dieticians. These conditions are rarely found in Japan, and without them, the new division would not have been established. It was obvious that it was difficult to maintain this energy in the long run because ultimately, the Division of Nutrition at the University of Tokushima has not conducted enough health and nutrition-related research.

Currently, the situation of universities differs from the time when the University of Tokushima established the Division of Nutrition. It has become easier to change the organization of research and education in university owing to incorporating the university in 2004. However, the work of establishing new departments has created a challenge since incorporating the university. It is likely that universities hesitate to take on the challenge of new fields. 'The government needs to introduce a system that gives preferential treatment to universities establishing new departments corresponding to social needs.

One of the main underlying reasons that health and nutrition-related research has not developed properly in Japan is that sufficient funding has not been secured. The fourth 'Science and Technology Basic Plan' begins during the fiscal year 2011. The 'Plan' promotes research directed towards the themes of 'Green

Innovation' and 'Life Innovation'. Health and nutrition-related research is necessary to 'Life Innovation' and we appreciate that interdisciplinary theme like this has been promoted.

Great leadership by the government is required in order to promote the interdisciplinary theme. The Council for Science and Technology Policy promotes a theme in their limited budget; it should adopt policies that promote important themes even if they are niche themes. Then, it is important to improve and strengthen the system of fostering people conducting research on the theme to secure enough jobs after graduating.