Topic-Setting Program to Advance Cutting-Edge Humanities and Social Sciences Research

(Responding to Real Society)

Progress Report

(Summary of Final Report)

[Development of the safe and trusted care system and life infrastructure in local communities under the depopulation]

Core-Researcher: Hikaru Samuta

Institution: Kanazawa University

Academic Unit: Institute of Human and Social Sciences

Position: Professor

Research Period: FY2015 - FY2018

1. Basic information of research project

Research Area	Building an anxiety-free care system in a shrinking society; Establishing a lifeline infrastructure	
Project Title	Development of the safe and trusted care system and life infrastructure in local communities under the depopulation	
Institution	Kanazawa University	
Core-Researcher (Name, Academic Unit & Position)	Hikaru Samuta, Institute of Human and Social Sciences, Kanazawa University, Professor	
Project Period	FY2015 - FY2018	
Appropriations Plan (¥)	FY2015	JPY 3,520,000
	FY2016	JPY 3,960,000
	FY2017	JPY 2,730,000
	FY2018	JPY 1,020,000

2. Purpose of research

Under the low birthrate and super aged society, the control (containment) of the total amount of social security expenditure is considered as an issue. At the same time, effective use of existing facilities and area management as a whole become important under the budget constraints due to depopulation and tax revenue decline. In order to realize a longevity health society where elderly people can live in peace in the communities where they are accustomed until the end of their lives, it is desirable to establish a detailed care system that matches the actual situation of each area, not a uniform medical cost control policy. Is it possible to maintain the quality of life while curbing the total social costs by fully grasping individual care needs and characteristics by areas based on the database and establishing integrated community care-system of multi-actors and multi-professionals with appropriate urban planning that correspond to the local characteristics?

In order to verify the above hypotheses, we will carry out the following interdisciplinary research projects. First, we develop a tool to analyze the local realities of elderly welfare by combining the late-stage elderly insurance data and medical data with the National Health Insurance database (health checkup data, medical insurance data, care welfare data) which the national government is promoting to create. Local information we collect are medical care expenses, distribution of care needs (nursing care level, health degree, diseases, etc.), living condition of elderly persons (family constitution, occupation, etc.), supply of welfare facilities (medical institutions, care services, home-care companies, and care workers), persons' daily living range and mode of transportation. These data are cross-analyzed to extract area characteristics, and GIS technology is used to visualize spatial and temporal information related to the welfare of the elderly.

The second is the study of processes for reflecting the findings obtained by data analysis in regional policies. At present, integrated community care-system model projects and action

plans for community welfare are being promoted all over the country, centering on the Community General Support Centers. In order to reflect on such planning, data analysis is used to "visualize" the actual conditions of the elderly welfare in each area as a tool for promoting understanding and information sharing among local residents and stakeholders. By integrating such quantitative data with on-site information possessed by care managers and local NPOs, we consider measures to be utilized for public-private partnership in action plans, integrated community care stations, public health services, etc. Furthermore, we consider measures to input these area information into the regional land-use planning of the wide area, for example, the reconstruction of public housing and the restructuring of multifunctional public facilities and transportation facilities.

Finally, through these processes, we lead to the development of policy design for the healthy community and evaluation tools according to area characteristics., Though the results of social implementation would not have reached a clear suppression of social security costs during the period of research planning, we develop and install evaluation indicators that can be observed at fixed points after the planning period. Through a series of research and social implementation, we formulate a policy design that enables residents and local governments to understand area characteristics of their communities with data and to select more appropriate care system.

3. Outline of research (including study member)

This research project has been implemented by organizing the following five research groups.

・ The regional policy group outlines the current trend of social security system and local finances underlying the research projects, and studies the process and evaluation indicators of policy design that forms community care-systems.

・ The elderly welfare and health group analyzes the current situation of care-system in each area based on the database combining with on-site information, and reveals area characteristics and issues of elderly welfare.

・ Area management group consolidates medical and nursing care needs of elderly people at district level, and analyzes them from the urban, transportation and facility planning viewpoints.

・ The database and big data group develops analysis tools for the database to "visualize" the community care-system as the core method in this project.

・ The social implementation group arranges cooperation with municipality and local stakeholders, and coordinates appropriately between research projects and social implementation.

The main fields of research and social implementation are urban and rural areas in Hokuriku region facing rapid depopulation and aging, and the comparison targets are small suburban cities in Kanto metropolitan area. Specifically, we select K city and H city in I prefecture as urban and rural areas in the peripheral region, and H town in S prefecture as a

suburb small city in the metropolitan region. In these areas, our group has accumulated experience support for end-of-life care and family care problems, search for the relationship between nutrition with dementia, and creation of local support networks for the elderly needing care. Based on cooperative relationship between Kanazawa University and local government staffs that have been cultivated so far, we have been working on joint researches with the participation of coordinators who can bridge the university and the local government and practitioners directly involved in creating local support network.

The contents and methods of this project are as follows.

The regional policy group advances analysis of the social security system and social security finance over integrated community care-system, and study on systematized statistics to capture comprehensively the multifaceted aspects of the medical and nursing care economy in the region. Namely, (1) expenditure side (medical and nursing care insurance, personal burden, home care labors), (2) service side (medical institutions, nursing facilities, pharmacy and medicine shops, councils of social welfare etc.), and (3) distribution aspect (output-input trade and gross value added).

Among them, regarding the expenditure aspect of (1), we analyzed the current status and transition of National Health Insurance accounting and Long-term Care Insurance accounting within local government finance, and comparison among local governments. And this group examines the disparity in the condition behind gaps of the medical and care expenses among the local governments utilized various statistics in both insurances and local finance. Next, a questionnaire survey was conducted targeting all family caregivers about the actual conditions of family care, taking K city and I city as an example, in cooperation with the database and big data group. From questionnaire results, we estimated the economic loss associated with the leave or change in work to take care of their families.

Also, with regard to the distribution aspect of (3), we tried to analyze the impact on the regional economy through that the demand and expenses for medical and nursing care increase as the population ages, utilizing regional input-output analysis of the medical sector, taking K city and H city as an example. We also estimated the economic ripple effect produced by medical expenses and long-term care insurance payment expenses, and the economic loss by the turnover to care, job change, and unpaid care work of family caregivers. Furthermore, Monte Carlo simulation analysis was conducted on the estimation of economic loss of family caregivers and of the economic ripple effect using an input-output table.

The elderly welfare and health group has been working on four themes. First, we analyzed the relation between the type of hospital, distance traveled, and traffic for cancer patients aged 60 to 74, with the use of the National Health Insurance Database (KDB) and arcGIS software. The second was to analyze the health characteristics of the elderly and the progress of the degree of care required with related factors, from the elderly big data (collated data of the elderly KDB and the municipalities' holding data). As the third, the relationship between the morbidity status of lifestyle-related diseases such as diabetes and the future

morbidity of dementia and decease was analyzed from the collation of medical checkup data (40 years of age or older) and the late-stage elderly insurance data. The fourth was a survey focusing on social capital among social factors that might affect health.

The area management group analyzed the actual distribution of individuals requiring assistance during disaster and evacuation simulation so that the municipalities would use the area information on elderly people clarified above in other departments such as urban planning and disaster prevention. In relation to the above-mentioned results, our project team and H city of I prefecture started a study on social implementation to digitize and integrate administrative data into cross-administrative big data, including medical and long-term care data, which had been disconnected up to now.

In a super-aged and depopulated society, the future trend of urban development will be the formation of “compact city and network”, and it is important to aim for the realization of a healthy society. About 90% of the long-term care insurance recipients are the late-stage elderly people. Therefore the area management group, from the urban planning point of view, analyzed the relation between the area characteristics (especially the location of the target facilities necessary for daily life such as hospitals and retail stores and transportation convenience) and the daily living range pattern of the elderly, and consider optimal placement policies for medical facilities, care and welfare facilities, health promotion facilities, etc.

Specifically, first, we clarified the factor of the regional difference in the ratio of certification of needed long-term care, using the National Health Insurance Database and the GIS data for the elderly people in K city of I prefecture. This group conducted the relativity analysis of the location of the components (commercial facilities, medical facilities, various activity facilities: community centers, parks, etc.) of the frequency (convenience) of going out which is highly relevant to the risk for the certification of care needs of elderly people, and the convenience of transportation. Second, in order to evaluate the elderly people's ability to cope with disasters in each area in K city of I prefecture, we tried to assess the risk of victims of persons requiring special assistance (certification of needed long-term care) in the event of disasters. We performed prediction of the number of people in need of support during disaster and assessment of "fragility" at the time of the earthquake on a very detailed area (neighborhood basis). Third, the common characteristics of the living range of the elderly were extracted, based on the survey data on the elderly in a provincial city. It brings out implications to the setting of "daily living area" in integrated community care-systems, specifically, considering the discussion about whether the junior high school ward, which is regarded as a standard, is appropriate. Currently, there are 38 cities in Japan that make the "Health Cities Declaration", become members of the Health Cities Association (Japan Branch), and have been carrying out activities to extend their healthy life expectancy. We investigated about such their activity situation.

The social implementation group smoothly promoted the above research activities, and worked to establish a collaboration between related stakeholders in order to connect it to social implementation and policy development on site. We organized a "preventive advanced policy

conference" in collaboration with the local government (K city), and examine the feedback process between researchers and policy practitioners to reflect output from analysis of health related data to the local policies. Also in H city, we set up a "policy proposal meeting based on big data" to incorporate a site viewpoint and issues into research and to facilitate social implementation of research results.

We also focused on expanding the data that is the basis of research. In the KDB and the late-stage elderly insurance database there is a range where coverage is limited to local health information under 74 years old, due to the nature of the data only for National Health Insurance subscribers. Therefore, we established a cooperative relationship with the Association Kenpo Ishikawa Branch so that it enabled us to cover over 80% of the total population of H city.

4. Organization of research project

Group	Member	Belonging and Occupation	Role and Theme
Core-Researcher	Hikaru Samuta	Institute of Human and Social Sciences, Kanazawa University, Professor	Theorizing of policy design
【 Regional Policy Group】 Group leader	Toshikazu Yokoyama	School of Social Welfare, Bukkyo University, Professor	Social security system
Member	Kimiko Takeda	Institute of Human and Social Sciences, Kanazawa University, Professor	Evaluation of community care system considering financial conditions
【Elderly Welfare and Health Group】 Group leader	Kiyoko Yanagihara	Institute of Medical, Pharmaceutical and Health Sciences, Kanazawa University, Associate Professor	Analysis of the factor of progress of nursing care for the elderly requiring care from KDB data and field survey
Member	Moeko Shinohara	Institute of Medical, Pharmaceutical and Health Sciences, Kanazawa University, Associate Professor	Investigation of the cause of onset and progress of dementia in elderly person from KDB data
Member	Hiromasa Tsujiguchi	Institute of Medical, Pharmaceutical and Health Sciences, Kanazawa University, Assistant Professor	Community health assessment from KDB data
【 Area Management Group】 Group leader	Junichi Takayama	Institute of Science and Engineering, Kanazawa University, Professor	Examination of facility optimal layout plan
Member	Tatsuya Nishino	Institute of Science and Engineering, Kanazawa University, Associate Professor	Analysis of daily life characteristics of elderly people

			and related analysis of health area characteristics
【 Database and Big Data Group】 Group leader	Masahiko Sagae	Institute of Human and Social Sciences, Kanazawa University, Professor	Characteristic analysis of high risk and low risk groups such as total medical expenses, degree of need of nursing care, and health guidance required
Member	Makoto Fujiu	Institute of Science and Engineering, Kanazawa University, Associate Professor	Analysis of Long-term Care Insurance Data and Analysis of Health Longevity and Unhealthy Areas
【 Social Imple-mentation Group】 Group leader, Practitioner	Chiaki Sakakibara	Popoponet (NPO), Director	Social implementation in the local community (Komatsu City)
Member（Practitioner）	Kazuhiro Sankaku	Mayor's Polucy Planning Office, Nanto City, Toyama	Social implementation in the local community (Nanto City)
Member	Kohei Hirako	Frontier Science and Social Co-creation Initiative, Kanazawa University, Assistant Professor	Coordination of research activities and social implementation

5. Research results and outcomes produced

Overall, the following three points are the results of this research subject. First, we developed a support tool that the local government could accurately grasp the regional characteristics with data for the precautionary-type community welfare policy required for the super-aged society. The integrated community care "visualization" system is also provided by the Ministry of Health, Labor and Welfare. Our research project, unlike that system, made it possible that medical personnel, public health nurses, administrative personnel and researchers of medical and health sciences analyze the correlation between the degree of care required and various factors while repeating feedback with experts, and consider measures from a medical point of view for areas with low performance as a health guidance priority areas.

The second is utilization of data on elderly people into the urban planning. In our project, the "visualized" data on elderly people and health in each area was shared beyond the narrow framework of health and welfare administration, towards the policy integration into urban planning, such as facilities location planning, regional traffic plan, disaster prevention and evacuation plan, assuming a super-aged society. It is not only engineering data analysis, but includes contents to consider the process of coordinating cross-sectioning policy across departments while conducting appropriate information management. It is the result of interdisciplinary research.

Third is the "visualization" of the local medical and nursing care economy. While the medical and nursing care sectors is required to curb the total cost of healthcare and social security, they are

currently the only employment expansion sectors in the regional economy. Not only visible burden of medical expenses and social security expenses, but also invisibles “social costs” such as the burden of family care are big problems for the local community. How should we comprehensively consider such multifaceted aspects of the medical and nursing care economy in the regions? It is important not to look only at the total cost reduction of medical expenses and long-term care expenses, but to check whether the medical and long-term care economy has a sustainable circulation mechanism. In this study, we tried to "visualize" the actual conditions of the medical and nursing care economy in the region and the economic processes to be cared for, by means of financial analysis of medical and long-term care insurance, completed covered questionnaire survey for caregivers, and regional input-output analysis of the medical care and nursing care sector.

The significance of this research is proposing an evidence based healthy community policy design integrated regional welfare, city planning, and regional economic policy, putting together the above.

With regard to the individual themes, the following contributions have been made through the relevant academic research and social implementation.

The database and big data group conducted a mail questionnaire for all subjects in K city and I city for "analysis of the actual condition of requiring long-term care and support and family caregivers". This survey was the first detailed analysis in such areas about the working hours of long-term care by family caregivers, changes in working conditions due to long-term care, and changes in annual income, focusing on the percentage and care working hours of family caregivers who are unemployed or full-time homemakers. This survey can be a valuable resource for regional policy planning.

According to the questionnaire survey, the average age of needed care / support was 83.5 years and the average age of family caregivers was 64.9 years, that means old people providing care for old people. With regard to the work situation of family caregivers, 30.8% of family caregivers are engaged in care with turnover or job change etc. The proportion of leaving job is 29.3% among them, and 9.0% of all family caregivers had leaved job.

As a result of estimation, the amount of economic loss caused by leave or change the workforces from the current companies to care for their elderly families was 1.66 billion yen. On the other hand, we tried to estimate the economic loss of non-employed care workers by converting the care work hours to wages, as they are excluded from turnover or job changes for long-term care. The minimum wage conversion amount for long-term care works of unemployed and full-time homemakers was 1.36 billion yen. The average nursing care workers payment conversion was 2.48 billion yen. The economic ripple effect of medical expenses and long-term care expenses will increase from 43.37 billion yen in 2014 to 52.25 billion yen in 2025. The number of job inductions in productive-age population in the K city will rise from 15% in 2014 to 22% in 2025. This suggests that it may not be enough to supply employment within the region due to the decline in the productive-age population.

The elderly welfare and health group has achieved the following results from four initiatives. The first was to analyze medical institution type, hospital distance, and traffic in association with

actual conditions of treatment for cancer patients aged 60 to 74, using KDB in K city and arcGIS software. About seventy percent of K-city's early-stage elderly cancer patients received care in the residential secondary medical area. That there is cancer medical treatment cooperation base hospital in K city as medium-scale city, is factor of high receiving care in secondary medical area (generally cancer treatment tends to increase in tertiary medical area).

The second was the analysis of the health characteristics of the elderly from the elderly big data (collated data of the elderly KDB and the city) and of the progress of the degree of care required and related factors. As health characteristics we compared the degree of need for nursing care level and dementia and the rate of admission to facilities, divided into 25 elementary school districts. By district comparison, there were the differences of certification rate of the nursing care level II-V was 2.1 times, dementia was 1.9 times, and facility admission rate was 2.5 times. As for the state of deterioration of the nursing care level (compared to 3 years) and related factors, maintenance of the of the nursing care level was about 40%, 60% was worse, and the level II was worse than III. The reason for the deterioration in the nursing care level was not related to the content of the care service, but considered to follow the survival curve (life curve) due to aging.

Third, we analyzed the relevance of the prevalence of lifestyle-related diseases such as diabetes in 2006 with future dementia and state of death, from the collation between K city's examination data for 2006 (40 years old and over) and medical care insurance data for the elderly in 2006-2016. It unraveled that diabetes and HbA1c (JDS) 6.1% or more should be associated with 13 years of need for care (risk 1.3 times) / cognitive decline (risk 1.4 times) and that there is some possibility to useful for prevention of diabetes requires care / prevention of dementia.

The fourth was a survey in S towns in I prefecture, focusing on social factors affecting health, especially social capital. Monitoring was conducted by raising three indicators in the social capital indexing. It implicated some possibility that "sufficiency in social networks" and "participation in citizen activities" at the individual level and "contribution to society" at the community level could be linked to the improvement of the mental health of the population. In other words, the fact that social capital at the local level was linked to the health of individual residents suggests that area management and intervention may help to improve the health of individual residents.

The area management group clarified the factor of the area difference of the ratio of certification of needed long-term care, using the National Health Insurance Database and GIS data for late-stage elderly people in the K city in I prefecture. Specifically, we analyzed the relationship of the location of the components (commercial facilities, medical facilities, various activity facilities: community centers, parks, etc.) of the frequency (convenience) of going out which is highly relevant to the risk for the certification of care needs of elderly people, and the convenience of public transportation. As a result, a clear correlation was not found between the facility proximity and the number of the certification of needed support, but there are some areas where convenience for going out is good and the number of the certification of needed support is small, and some areas where convenience for going out is bad and the number of the certification of needed support is large. From these analysis results, it can be said that the area management that enhances the convenience of going out is important, considering the future urban planning.

Next, we tried the disaster risk assessment of the person in need of support (care requiring certification person) at the time of the earthquake occurrence for H city in I Prefecture, focusing on the elderly people's ability to cope with the disaster. Specifically, we performed prediction of the number of people in need of support "fragility" evaluation by the earthquake on a very detailed area (neighborhood basis), which is an issue at the time of the earthquake occurrence. The need for support with chronic diseases that require urgency at the time of earthquake occurrence (patients with ischemic heart disease, patients with cerebrovascular disease, patients who need dialysis) is considered as the need for support. Quantitative evaluation of "fragility" was analyzed by focusing on the three elements of people, buildings and road network. Through this analysis, it was clarify the relationship between the number of requiring support during disasters and the vulnerability during earthquakes by detailed area (neighborhood basis).

The results of our research so far have been compiled and published as a book at the end of the fiscal year (Samuta Hikaru, Hirako Kohei ed., "Integrated Community Care-system and Area Management: The Possibility of Creating a Healthy Community Using Data Visualization" Minerva Shobo, 2019 March, ISBN: 9784623085095).

6. In future expansion

During this research subject period, there are some research subjects that have not been completed. So, we will continue to improve research results in cooperation with local governments. First, though visualization of district characteristic data of health made it possible to set priority areas for health guidance, it is a next task to verify whether health guidance according to matters actually would improves the effects of dementia prevention etc. or not. Second, since some indicators have emerged (such as oral care, social capital and so on) to improve regional health inequalities, it is yet to be addressed to verify through evidence-based trial and error policy practice about whether to be effective when these factors are actually deployed in policy. Third, we proposed criteria and indicators to evaluate the medical and nursing care economy in the region over the aspect of spending, service, and distribution. But, it is not comprehensive, and continuous work is needed. Fourth, though we have shown the possibility of utilizing health databases in other policy fields such as area management, there is room to study policy development to integrate different databases of administrative jurisdictional departments. As for this, it is developed to the next project as shown below.

Founded on this research project, we concluded a partnership research agreement with Hakui City, NEC and Kanazawa University from 2017 (representative: Masahiko Sagae), and started joint research program on “The grand design of Hakui City using big data and AI in a population-reduced society”. We will consider information visualization and collaborative activities for data-based policy making, using the NEC advanced technology AI "NEC the WISE", based on various data groups (big data) such as medical insurance data and population data held by the city and various research data of Kanazawa University.

In addition, we applied and adopted in December last year for “Corporate-led (top-down) type research subject” at Kanazawa University, which started in fiscal 2018. The name of the

research theme is "interdisciplinary research toward promoting integrated community care-system: co-creative research on preventive policy design based on area data analysis" (represented by Hikaru Samuta. FY 2018-2019). It would provide a basis for continuing and developing this research. We will go forward and implement support tools that enable local governments to accurately capture area characteristics with data in view of local diversity and to verify the preventive effects based on evidence. In fiscal 2019, based on the tripartite partnership project by Hakui City, NEC and Kanazawa University, we plan to use integrated database to “visualize” with health problem diagnosis charts for each area, and to construct a support tool to make a policy trial of health improvement measures based on future simulation.