



Potential in “Collaborative Health Plus,” a health data science linked to corporate health insurance

~Results and Challenges from the WLAQ Survey~

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NOTICE: This represents an English translation of an original report released in Japanese by the AIG Institute in March, 2020. In the event that there are any inconsistencies between the Japanese version and the English one, the Japanese version shall control and supersede the substance of the English translated version.

Overview

For scientific and statistical research and analysis using various data related to health, as well as health data science, various types of initiatives are being executed by industry, academia, and government, but, if you are going to take an approach to obtain new health data from scratch, you need to launch a large-scale research project with plenty of fund to cover cost and comprehensiveness, which is not easy to implement.

On the other hand, if the approach of utilizing integrated data by acquiring additional data newly is taken after starting with health data such as health examinations and medical prescriptions managed by the corporate health insurance society, high-quality, comprehensive health data can be obtained at a low cost, making it relatively easy to clear these problems.

At the same time, the momentum for "data health" that utilizes medical and health data managed by the health insurance society as a resource is increasing, and, in particular, "collaborative health" where the health insurance society and employers work together to promote employee health and prevent diseases for health management is getting more attentions against the background of strong demand for the complete digitization of health examinations and medical prescription data, as well as the efficiency of health insurance management.

Because of this, advanced health data science ("collaborative health plus") is expanding, taking it one step ahead from traditional collaborative health initiatives, for joint researches between researchers who want to conduct research utilizing low-cost, high-quality health data, and corporate health insurance societies and employers, who want to use health and medical data managed intensively to promote employee health and improve management efficiency.

AIG Research Institute has recently conducted a joint research to analyze the relationship between so-called "oversitting" risk and health as a concrete approach to such collaborative health plus in collaboration with the National Institute of Occupational Safety and Health (herein after referred to as "JNIOSH"). and AIG health insurance society (herein after referred to as "AIG Health Insurance"). More than 2,000 employees participated in the survey, and they were able to obtain sufficient sample count and accuracy data to analyze the relationship between lifestyle and medical care and health, including "oversitting."

In this paper, the result of a survey we have recently conducted is summarized, including the structure of the joint research agreement, the handling of sensitive information, obtaining consent



to data provision, anonymizing data, and preparing various types of internal communication, and other results such as response rates and remaining challenges. We hope that the knowledge gained from the research will contribute to the development of "collaborative health plus" in the future.

Part 1: Collaborative health “plus”

Trend of Health Data Science

Health data science provides a mechanism to solve various health issues related to people's health, such as health preservation, medical care, and nursing care, through a scientific approach to statistically analyzing data. In recent years, this health data science has attracted attention, and there are two major factors behind this.

One reason is that IT and healthcare technologies have advanced, which makes it possible to access more precise and vast amounts of data in the form of electronic data statistically easy to process, and computers with the ability to accumulate and analyze that data can be used at a low cost. This includes technological innovations in artificial intelligence (AI), which has become a hot topic these days.

And the other is that while the number of elderly people has increased dramatically due to the declining birthrate and aging population, the number of workers supporting them has decreased, and the health insurance and long-term care insurance systems are facing a financial crisis, and urgent issues such as preventing diseases and allowing them to live healthy lives (extending healthy life expectancy) and improving the efficiency of medical and nursing care infrastructure are emerging.

In response to the growing needs of health data science, Yokohama City University, a public university corporation, has established ¹ a "Health Data Science Major" at the graduate school since fiscal year 2020, and has begun to develop data scientists in the health field. Keidanren also proposed a new era of healthcare that leverages health data in the "Healthcare in the Society 5.0 Era" in 2018.² According to them, health care in the future is expected to have the following three characteristics. It is fair to say that health data science is a concrete approach to realizing health care in this new era.

① Shift to “MI-BYO”, or pre-disease, and disease prevention

The core of health care will shift from "medical care" centered on the healing of diseases to care and "prevention" at the "pre-disease" stage before the "disease" stage. The scope of "health care" will expand, and the period of time for individuals to live healthy will be longer.

② Personalized healthcare

Uniform treatment for the average patient and symptoms will be changed focusing on groups of people or individuals. All the individuals will be able to receive prevention, care for pre-disease, treatment, and nursing care at the most appropriate timings.

③ Independent engagement of individuals

Individuals are actively involved in the care of individual health and illness. Individuals use

¹ https://www.yokohama-cu.ac.jp/ds/news/fsnbt50000000bpb-att/20190624_hds.pdf visited on Oct 29, 2019

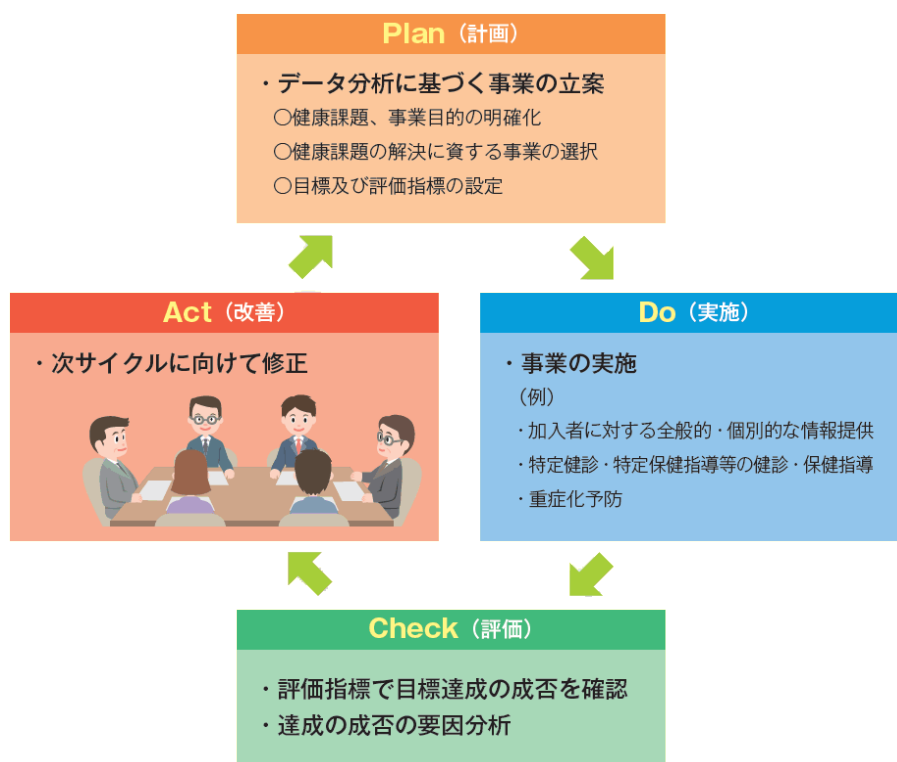
² <https://www.keidanren.or.jp/policy/2018/021.html> visited on Oct 29, 2019

IT and data on their own decisions to manage their health over life courses.

Data Health Planning and Collaborative health

In the "Health Care System Reform Plan" ³ formulated in 2002 as a medium- to long-term strategy for healthcare reform, the policy to mandate digitizing the medical prescription in the beginning of fiscal year 2011 was indicated. As a result, almost all medical prescriptions in healthcare institutions are now electrified. At the same time, it has become common to manage the results of medical examinations electronically, and the health insurance society has been able to easily and accurately grasp the health status of society members and the status of medical care and medical expenses using electronic data.

The data health plan is a business plan for effectively and efficiently implementing health services in the PDCA cycle in accordance with the analysis of medical examination and medical prescription data set by the health insurance society based on these changes. It is also regarded as the health insurance society's medium-term management plan.



PDCA Cycle of Data Health Plan (From the Ministry ⁴ of Health, Labour and Welfare's Collaborative Health Guidelines for Promoting Data Health and Health Management (2017))

³ <https://www.kantei.go.jp/jp/kakugikettei/2001/1129syakai.html> visited on Dec 19, 2019

⁴ "CollaborativeHealth Guidelines for Promoting Data Health and Health Management" released <https://www.mhlw.go.jp/stf/houdou/0000170819.html> visited on Oct 29, 2019

The data health plan proposed in the "Japan Revitalization Strategy" announced by the government in 2013 and developed by all health insurance societies has moved to the period II, which is currently planned as FY 2018-2024, following period I of FY 2015-2017, and it is expected to achieve more concrete results beyond the period I.

One of the initiatives being promoted by the government in formulating data health plans is "collaborative health."

Collaborative health refers to the facilitation of health promotion initiatives in cooperation with the employers of the organizations to which the members belong, and the following six points are required in the "Guidelines for the Implementation of Health Services based on the Health Insurance Act⁵ (Notification No. 308 of the Ministry of Health, Labour and Welfare, July 30, 2004)".

- ① Endeavor to gain an understanding from employers about the necessity of health services by using objective indicators of the health status and health issues of members.
- ② Foster a workplace environment that makes it easy to participate in health services after fully explaining the contents, implementation methods, and expected effects of health services to employers, etc.
- ③ Strive to obtain support from employers, etc. to encourage the members to participate in health services, etc.
- ④ Encourage employers to create an environment in the workplace where it is easy for members to voluntarily engage themselves in health promotion, such as smoking cessation in the workplace.
- ⑤ Make sufficient adjustments, including the definitions of roles with employers, etc., and strive for efficient implementation.
- ⑥ Strive to actively cooperate with businesses based on the Occupational Safety and Health Act implemented by employers

In other words, in addition to the management and operation of the health insurance system, collaborative health is seeking active health maintenance and promotion in cooperation with employers, as well as involvement in disease prevention. In order to promote collaborative health, the Ministry of Health, Labour and Welfare has established and published "Collaborative Health Guidelines for Promoting Data Health and Health Management (hereinafter referred to as "Guidelines")".

As seen from the name of these guidelines, collaborative health is not only part of the data health initiatives utilizing various data provided by health insurance, but also related to "health management" that has attracted attention in recent years on the employer's side. It is a concept

⁵ https://www.mhlw.go.jp/web/t_doc?dataId=84aa6295&dataType=0&pageNo=1 (visited on Dec 16,2019)

that includes the health insurance society's active involvement in health management. In fact, the Japan Health Council, which is responsible for promoting the data health plan, is also an organization that certifies and awards health management.

Initiative as Collaborative health plus

Currently, AIG Research Institute has concluded ⁶ a joint research agreement with JNIOOSH together with AIG Health Insurance, and is conducting joint research on workplace health promotion initiatives for AIG Group employees.

The "WLAQ Survey" in this paper was conducted as part of the joint research, and employees were asked to respond to the "oversitting" risk questionnaire (WLAQ) survey, and after receiving medical and medical prescription data, the two data sets were combined. It is a study to analyze the relationship between lifestyle (obtained by the questionnaire) such as "oversitting" and health indicators such as blood pressure and blood glucose level, and annual medical expenses (obtained from medical prescription data).

This research and analysis will be positioned as a derivative of collaborative health from the perspective of AIG Health Insurance. This is because AIG Research Institute, using the health examination and medical prescription data owned, is the hub to raise health awareness and provide useful health information in cooperation with the employers of individual group companies.

In addition, this study means academic research for JNIOOSH to obtain new insights into "oversitting" risks. In addition to the medical examination and medical prescription data managed by AIG Health Insurance, new survey responses are included, creating new possibilities and added value beyond the framework of conventional collaborative health.

In this paper, "collaborative health plus" is used to describe the initiative of this type of derived collaborative health that creates new added value by adding new data to health insurance data in cooperation with external research institutions. The significance and potential of this will be discussed below.

In addition, the practical knowledge and issues obtained through the implementation of this WLAQ survey will be explained in detail in Part 2, and the definition of "collaborative health plus" will be explained first.

Collaborative Health Plus Framework

The "collaborative health plus" in this paper is a health data science initiative in which the following three parties work together.

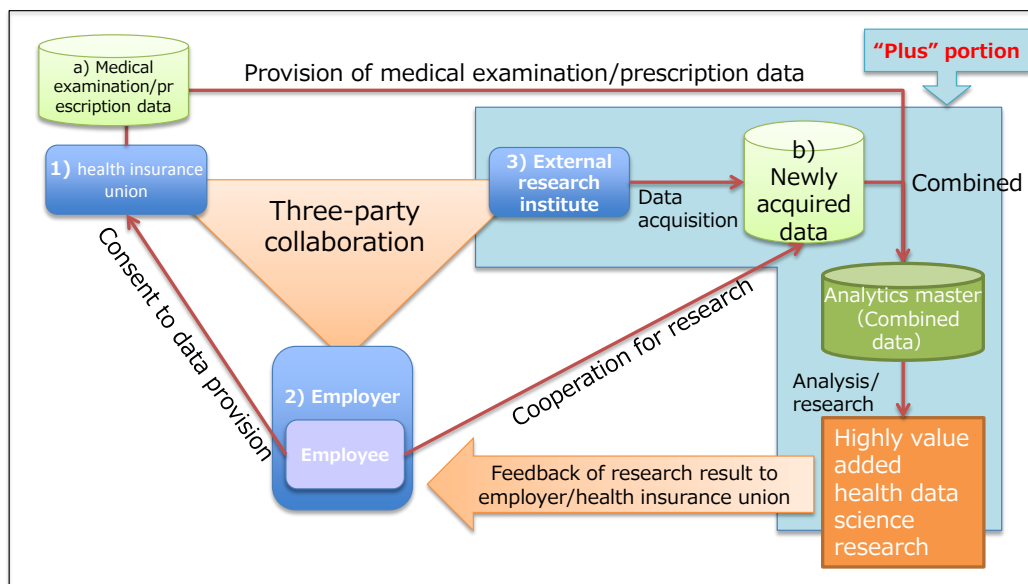
- 1) Corporate health insurance society
- 2) Employer (human resources, corporate planning, R&D, etc.)

⁶ <http://www-510.aig.co.jp/assets/documents/press-release/2019/2019-05-28-joint-research-on-health-promotion-ja.pdf> (visited on Dec 9th, 2019)

3) External research institution

And the data we deal with is as follows:

- a) Health examination data and medical prescription data managed by the health insurance society
- b) New data acquired through questionnaires, IoT equipment, additional inspections, etc.



View of the framework of collaborative health plus

The characteristics of the collaborative health plus are the found between 3) and b) above.

In the health data utilization by normal collaborative health, only the existing medical examination data is used, and the results of analysis by entrusted outsourcers are shared with the employer and the employees as a main format, while in the collaborative health plus, direct analysis of the medical examination data only is not the main objective. Its main objective is to gain new knowledge and insights into health by combining additional data (b above) and medical examination data/medical prescription data.

In addition, the data obtained is assumed to be advanced data with novelty that external research institutions (3 above) conduct research on or have technology for. By acquiring the additional data for health insurance society members and combining it with medical examination/medical prescription data provided by the health insurance society, the research institutions can analyze how the conditions indicated by the additional data relate to the health status indicated by the medical examination/medical prescription data and the status of medical consultation medication at hospitals.

The employer (above 2) is responsible for working between research institutions and the health insurance society, overseeing and leading the collaborative health plus initiative, and using the results to promote the health and health of employees.

Benefits of collaborative health plus

The collaborative health plus, which extends the collaborative health framework and promotes health data science in collaboration between external research institutions, health insurance society, and the employer, is expected to receive the following benefits compared to typical collaborative health and health data science projects:

1) Benefits for Researchers (Research Institutions)

There are many data science projects that utilize health data, some of which are run as large national-level projects.

The biggest benefit of participating in such projects and conducting data science research is, of course, the ability to access rich and advanced data. However, not all researchers interested in health data science can participate in such large-scale projects, and depending on the research topic, there is no necessity to conduct research under such a large project. Due to the size of the scale, there are many cases where cost-effectiveness deteriorates.

This is why health data science research based on the framework of collaborative health plus can be executed.

If we can collaborate working with a health insurance society of a large company with thousands to tens of thousands of society members, we can obtain additional information necessary for research in the form of questionnaires and measurements by equipment based on highly accurate and comprehensive health data (homogeneous medical examination data for all subjects, and medical prescription data for all health care programs except free medical care), and conduct research with them together.

By combining existing health insurance data with additional research that is directly covered, high-quality analytical data of a reasonable size for medical care and health can be obtained at a lower cost, which is the greatest benefit of the collaborative health plus for researchers.

In addition, it is also beneficial to be able to reduce the percentage of participants who are falling out when conducting cross-sectional research (panel data research) by data acquisition over several years. As long as the participant stay with their companies, medical prescription data can be obtained stably every year, and it is easy to contact them individually to obtain additional data. If you take a method like a "health examination event" to obtain health data, it would be difficult to encourage them to attend the event every year for five years, but, with collaborative health plus, you can expect to get multi-year data with minimal drop-out rates while keeping costs down.

2) Benefits for Employers and Health Insurance Societies

As a collaborative health business utilizing the health data of the health insurance society, the meaning of various measurements in the medical examination is explained in an

easy-to-understand manner, and medical examination data such as displaying the change of the measured values by comparison with the past figures is utilized, and medical information is widely provided to employees in the form of indicating changes in medical consultation and medication based on prescription data.

However, these are only reconstructed medical data and medical data that have already been acquired, and it is not easy to create more added value than the effect of raising health awareness through easy-to-understand information provision. In addition, such information provision business is often offered as a packaged solution by outsourcers, and tends to be a mediocre output that is not unique.

On the other hand, in the case of collaborative health plus, which works with external research institutions to acquire and implement new data in addition to the data managed by the health insurance society, the expertise of external research institutions and additional data obtained independently may provide significant value-added deliverables not only for employees but also for employers and the health insurance society.

In addition, by working together with external research institutions in which employers, health insurance societies, and employees collaborate on research results that are of social significance, employees will have higher awareness of health and interest in health insurance and greatly increase the sense of belonging to their companies.

Notes on collaborative health plus implementation

As described, the framework of collaborative health plus has many benefits for both researchers and employers/ health insurance societies, but there are some things to keep in mind when implementing it.

1) Additional data to be retrieved is relatively small.

To maximize the benefits of low-cost implementation costs in collaborative health plus, a research to obtain new data should be relatively small and cost-effective. If the percentage of additional surveys increases and the cost of that part increases, the cost reduction benefits of using health insurance data at low cost will be reduced, and as a result, it may be more effective to construct an optimized survey from zero and newly retrieve all the necessary data.

2) There is a bias in the population of health insurance data.

What you get from the health insurance database is the data of the society members who belong to the health insurance society. This means that people in their healthy 20s and 50s, who work for a particular company and their families are targeted. Of course, it does not include young people, the elderly, self-employed people, etc., and it is assumed that the composition ratio of each job category, the age composition, and the ratio of men and women will differ greatly depending on the characteristics of the companies associated. For medical prescription data, information on "non-working layers" may be available to some extent by looking at dependent data, but it is still not complete, resulting in a clear bias that is limited

to "office worker's family". In addition, in principle, medical examination data does not include that of dependents.

When conducting a research using the collaborative health plus framework, you should be aware of these population biases in advance.

However, it is thought that there are a lot of cases that work positively about issues such a bias of the target person. This is especially useful when the subject of research is "worker health and medical care." In such research, for example, if you take a new research design such as acquiring new health data by holding a "health examination event" during the daytime on weekdays, only elderly people, housewives, students, etc. who do not work during the day participate in the event. Since there is a possibility that the data of the working class that you want to obtain originally cannot be obtained enough, it will be positively meaningful to utilize the data of the corporate health insurance.

As mentioned earlier in the "Benefits" section, collaborative health plus is a scheme for cross-sectional panel data analysis, so it is desirable to conduct research that tracks a particular population over the medium to long term and sees relative changes, rather than a study that takes a snapshot of the overall picture of the health of the people.

- 3) The premise is that a scheme to obtain consent separately from the society members is assumed.

In the collaborative health plus initiative, the medical prescription data of the members belonging to the health insurance society will be used for the purpose of analyzing the relationship between the newly acquired data by external research institutions, and the results will also be used by employers.

In many cases, it is not always obvious that such usage is included in the scope of third-party use of health insurance data as stipulated in the privacy policy published by each health insurance society. Even if the research is appropriate as a health care project of the Health Insurance Society, it is safer to assume that it is a prerequisite to obtain individual consent from the society members when providing health insurance data.

Fortunately, it's not difficult to incorporate the procedure of obtaining consent to provide health insurance data at the time of retrieving additional data, because the process of acquiring new data is always included when implementing collaborative health plus.

- 4) There is a risk that sufficient number of samples may not be obtained depending on the participation rate of additional surveys

Collaborative health plus assumes that you will not only use health insurance data as it is, but will obtain some additional data, such as surveys, data measured with equipment, participation in exercise and dietary programs, and consent to provide health insurance data at that time.

Therefore, if there are few employees participating in questionnaires, and events to obtain

additional data are limited, there is a possibility that the expected number of samples will not be obtained and the investigation and analysis will not work.

In order to avoid this situation, it is important to communicate with society members in advance and to keep them updated. It is necessary to show employees the attitude to engage the top management and managers of the employer and to work together as a whole for the collaborative health plus.

Adjustment of Interests and the Roles of Employers

The difference between collaborative health plus and the conventional collaborative health is that it is a scheme in which external research institutions participate in joint research with the aim of providing academic research results.

In the case where external research institutions participate in conventional collaborative health, it is common for external research institutions to be considered subcontractors from the health insurance society. In such a scheme, external organizations are entrusted to carry out the investigation and analysis intended by the health insurance society, so there is no deviation of the research purpose with it.

However, in the collaborative health plus scheme, external research institutions are not just subcontractors, but are joint research parties who participate for an independent purpose. For this reason, "what external research institutions want to do" is not necessarily the same as the "expected results of companies and health insurance societies", and it is necessary to coordinate the objectives and interests of both parties.

For example, the rejection of a hypothesis without valid results is common in research to gain new insights in academic areas. However, the fact that the original hypothesis is rejected as a result of collaborative health plus research will disappoint the expectations of health insurance societies and companies that expect concrete results. In addition, it is assumed that the joint research will be difficult to be successful in case that the research results are hard for companies and health insurance societies to understand or the research results are difficult to leverage because the research themes are so niche.

On the other hand, in a situation where the research results expected by companies and health insurance societies remain within the range of too common sense and obsolescence, and no further adventure is allowed, new knowledge cannot be obtained for external research institutions. It is also assumed that the meaning of conducting joint research will be lost.

In realizing the collaborative health plus initiative, "employers" in particular is expected to play a role in the scheme of three-party collaboration to resolve such misperceptions and conflicts of interest, and to coordinate to achieve beneficial results for each party.

Resources from company participating in joint research as "employer" play a role in "connecting" external research institutions and health insurance societies". One of the greatest roles of "employer" is to discuss and materialize the research design and scope of joint research with

external research institutions, taking into account the purpose, motivation, expected results, and interests of both parties in the joint research.

Joint research at collaborative health plus should include both novel and academically meaningful research (even if the hypothesis may be rejected) and research that can reliably obtain results even if there is not so much novelty, and that the results lead to useful information provision to health insurance society members and companies participating in the research. Of course, it would be more desirable if the former research could be beneficial to the health insurance and its members, and if the latter research could be designed to be valuable to external research institutions from the viewpoint of data collection and other sources.

Part 2 WLAQ Research Report as Collaborative Health “Plus”

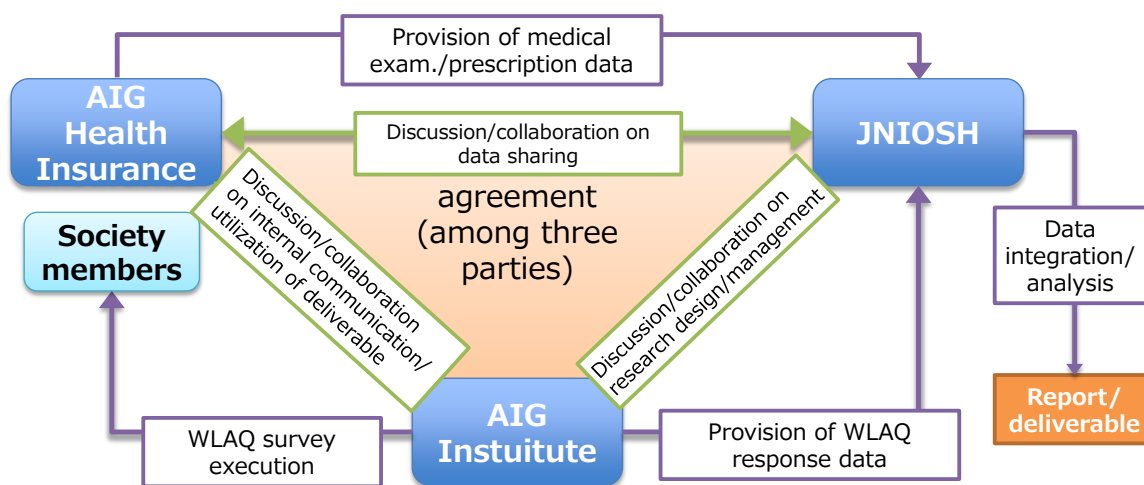
Overview of this WLAQ survey

As mentioned earlier, AIG Research Institute, AIG Health Insurance, and JNIOOSH have concluded the joint research agreement on employee health promotion, and this WLAQ survey is part of this process.

AIG health insurance society members responded to the WLAQ questionnaire on their lifestyles and the "oversitting risk" developed by JNIOOSH (a hypothesis that continuing the sitting posture for a long time is a risk factor for lifestyle-related diseases and heart diseases). And AIG Research Institute provided JNIOOSH with the collected responses to WLAQ, and AIG Health Insurance provided the medical prescription data of the respondents to JNIOOSH, respectively. Then, JNIOOSH combined the two to conduct a multifaceted analysis of the relationship between oversitting and health, which is a main stream of the survey.

In addition, this joint research is a multi-year medium-term project, and WLAQ surveys and analysis of medical examination and medical prescription data will continue to be conducted in the future and be expanded to panel data analysis.

This joint research was conducted on oversitting risks and actualized based on the aligned needs of the three parties: JNIOOSH, which wants to conduct a medium-term survey and analysis of the relationship between risks and health indicators, and AIG Research Institute, which considers employee health as "an important risk that should be reduced before problems become apparent" and makes recommendations for corporate health management through various health promotion initiatives, and AIG Health Insurance, aiming to further utilize health data and promote collaborative health as part of its data health plan.



Reference: Basic framework for WLAQ research

About the Joint Research Agreement

The first challenge faced when starting the joint research that is the premise of this entire research was that it was necessary to initiate a joint research agreement from scratch because the parties' relationships were more complex than general joint research and outsourcing.

In this joint research, JNIOH and AIG Research Institute are the main bodies for research and analysis, and the data handled included medical prescription data managed by AIG Health Insurance. For this reason, the Joint Research Agreement took a somewhat special form: a three-party agreement between JNIOH, AIG Research Institute, and AIG Health Insurance. However, although it is special, it is also considered to be a common problem that often occurs when conducting joint research in the framework of collaborative health plus.

Of course, even if you cooperate with external research institutions, if you can handle all the process management, construction of framework of the company (employee side), planning of joint research content, and support for the implementation of various negotiations and additional investigations, etc., it is theoretically possible to conduct joint research (agreements) between research institutes and health insurance societies, but, it is rare that there are actually enough resources within the health insurance society to have such planning and management functions.

These roles can be owned by expert staff such as the Human Resources and R&D departments of the companies to which the health insurance society belongs to solve such an issue, but in return, the parties to the joint research become three or more parties, and the content of the agreement (contract) becomes complicated.

Since many companies and research institutions only provide two-party contracts as templates for outsourcing or joint research, it is necessary to significantly rewrite the templates in order to prepare such a joint agreement among three parties. With regard to the joint agreement for the research, although the existing template is referred to for the structure and articles, the actual contents of the agreement was transcribed and reviewed repeatedly by the internal legal department before its completion.

In order to simplify the joint research agreement, specific research plans were split out and agreed in a separate document. In addition, in order to ensure security and anonymization at the time of data provision, we have also concluded separate service level agreements (SLAs).

Decisions about obtaining consent

As already said, it is desirable to obtain individual consents from society members for providing medical examination/prescription data.

AIG Health Insurance acquires and manages medical examination data and medical prescription data for society members, and the usage scope and content of this data are determined by the privacy policy published on the Health Insurance Website. Although the use of health insurance data in this joint research may be applicable to the purpose of usage, "for purposes that seem to be beneficial to members, such as the maintenance and promotion of the health of members" stated in the applicable privacy policy, considering the characteristics of data



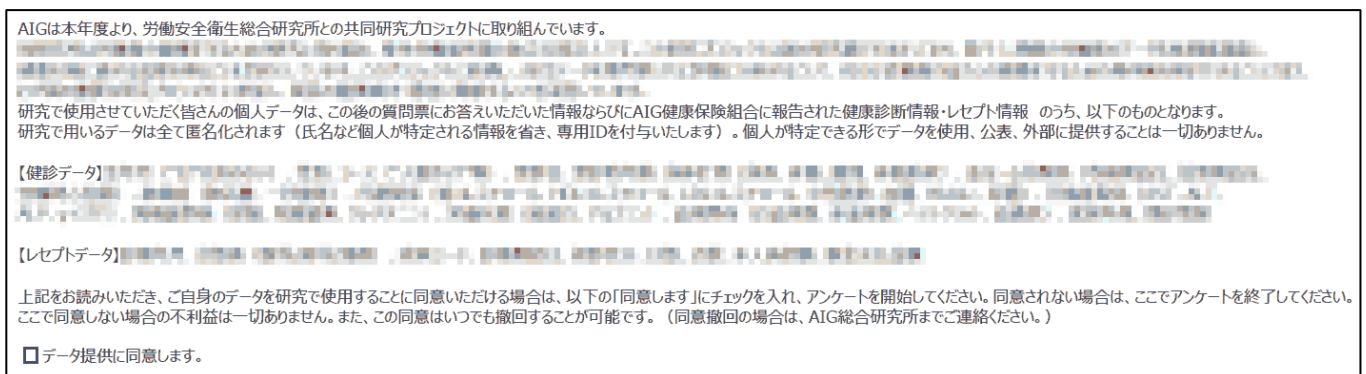
to be handled and the new initiative to integrate with the result of the questionnaire additionally acquired, we decided to obtain individual consents.

Flow of WLAQ Questionnaire

In this WLAQ survey, we used a survey tool that is provided as a service on the company's intranet. The questions were supervised by JNIOISH, and AIG Research Institute executed them on an intranet, conducted surveys, and collected responses.

As for the execution of the survey, we notified the targeted respondents in the form of a mailing list (managed by the health insurance society) for health insurance society members and news for employees on the intranet, and the URL link of the questionnaire page was included in the notification.

Clicking on that URL will take you to the top page of the WLAQ survey, and when you access the survey at the top page, you will first be taken to the consent form screen page.



(Reference) Consent form screen image

The consent form screen clearly indicates the overview of this survey, the purpose, the party executing the survey, and the individual item names of health insurance data (health examination data, medical prescription data) obtained in conjunction with the questionnaire in whitelist form (non-comprehensively). Also, it states the data is managed only with anonymous IDs and no personal information is provided.

Respondents are allowed to withdraw their consents at any time, even after their agreement, and the contact information when they wish to cancel they participation. In advance, the form of "Consent Withdrawal" was also prepared separately by the secretariat.

At the bottom of the consent form screen, you will see a check box labeled as "I agree to provide the data". The "Next" button is activated only if the check box is turned on to the actual WLAQ questionnaire. If respondents do not agree, they will drop out on this screen.

Respondents who agree to provide data will respond to the WLAQ questionnaire and enter their health insurance certificate numbers. No other personal information will be entered.

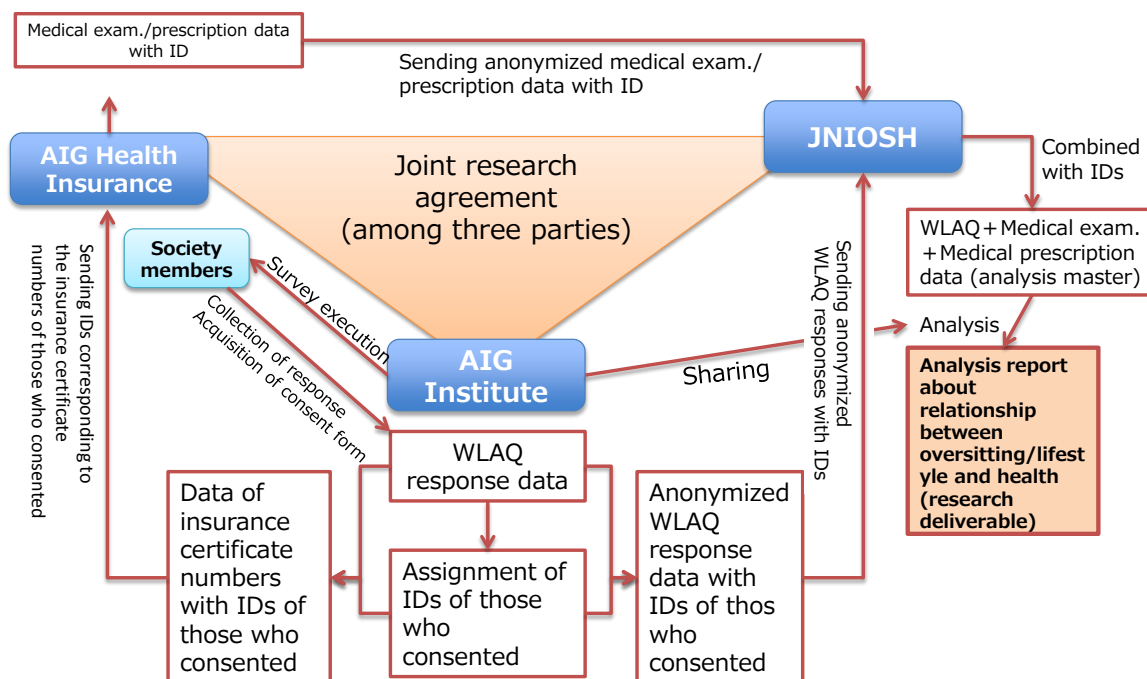
Data anonymization and data provision flow

The response data obtained by the WLAQ survey is individually converted based on the insurance card numbers using a certain logic, and the anonymized unique IDs (hereinafter referred to as "IDs") are assigned by AIG Research Institute. Because only AIG Research Institute knows this ID generation logic, and JNIOOSH and AIG Health Insurance do not know it, the conversion from IDs to insurance number certificate numbers cannot be performed by either JNIOOSH or AIG Health Insurance.

Then, AIG Research Institute will send to JNIOOSH the WLAQ response data with the insurance certificate numbers removed and the added IDs, and AIG Research Institute will send to the health insurance society the insurance card numbers of the WLAQ respondents (those who agree on data provision) and the corresponding IDs (the contents of the WLAQ questionnaire not included).

The health insurance society extracts medical examination data and medical prescription data (only items agreed upon in advance) based on the insurance certificate numbers sent by AIG Research Institute, and then deletes the insurance certificate numbers and adds the IDs before sending medical examination and medical prescription data to JNIOOSH.

JNIOOSH deduplicates the names in the WLAQ questionnaire and medical examination/prescription data sent by AIG Institutes using the IDs to obtain anonymous data (analysis master) that combines the responses to the WLAQ questionnaires and health insurance data. Based on this analysis master, we analyze the relationship between lifestyle and health, including oversitting, and generate analysis reports as the final deliverable.



(Reference) WLAQ Survey Data Acquisition, Data Provision and Anonymization Flow



It seems that this is a complex flow, but actually there are only two important aspects of data security:

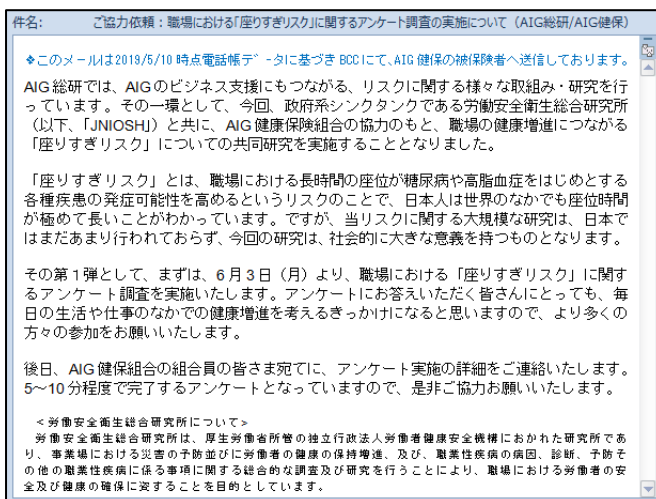
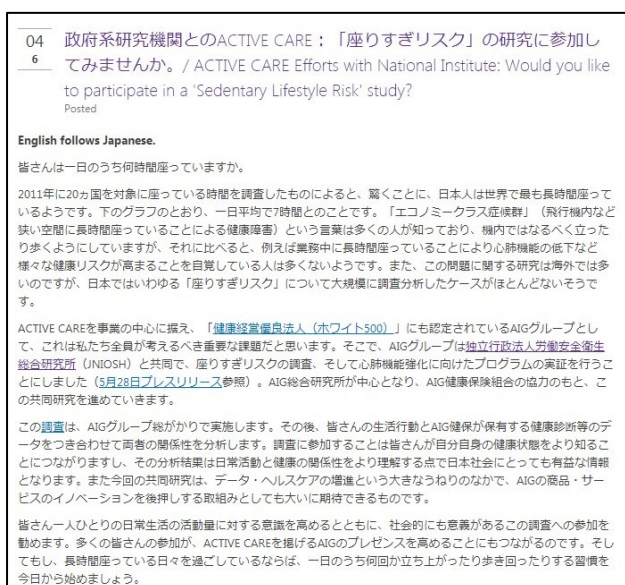
- JNIOSSH does not receive personal information including insurance certificate numbers. The name deduplication in data will be executed using IDs, but the insurance certificate numbers cannot be decrypted based on the IDs.
- AIG Research Institute will not receive health insurance data.

Internal communication and response rate

In this WLAQ survey, we took a multi-layered approach as internal communication and worked to raise awareness and motivate our employees.

Specifically, we conducted the following communications for the survey.

- 1) News release of the joint research agreement with JNIOSSH was also introduced on the company intranet.
- 2) About a week before the survey was conducted, an e-mail was sent to the respondents as a notice of the survey.
- 3) An e-mail was sent to the respondents on the start date of the survey.
- 4) On the same day, a news article of the start of the investigation was distributed on the company intranet.
- 5) On the day after the survey started, in the blog of the leader in the company, an article was published to explain the significance of the research and recommend participation.



Reference: CEO Blog (left) to encourage participation in the WLAQ survey and the Email (right) to health insurance society members



This survey did not provide any special incentives for respondents. In the e-mails and the intranet articles that announce the start of the survey, we strongly encouraged participation by explaining them the social significance of participation in the survey. Also, we appealed that response to the survey would increase awareness of their own health.

The above-mentioned internal communication was successful, and the response rate of this survey was higher than previously expected.

The WLAQ survey targeted employees who have access to AIG's survey tool (internal intranet) and are members of AIG Health Insurance, and they are generally consistent with those who are listed in the "internal email address list of the society members that AIG Health Insurance knows."

Based on this fact, the response rate was calculated as follows, assuming that the population of the respondents for the survey can be used as the number of the addresses in the mail address list.

The rate of those who opened the questionnaire page: 25.0% (a)

The dropout rate: 1.2% (b)

The response rate: 23.8% (c)=(a)-(b)

The obvious mistake rate in response: 0.2% (d)

The valid response rate: 23.6% (e)=(c)-(d)

The percentage of employees who opened the survey start page (the page where the agreement appears) reached 25.0% or 1/4 of the population. This is a very high percentage from any survey that does not offer monetary incentive.

Then, the "valid response rate" was 23.6%, excluding cases where the consent form was not accepted or the questionnaire was not fully answered (1.2%) obvious mistakes were made such as incorrect insurance certificate numbers entered regardless of the fully answered questionnaire (0.2%).

Approximately 2,100 respondents' data, that is 23.6%, was considered valid responses for this analysis.

Reviews, Future Prospects, and Challenges

In addition to support from the company, including the top management, internal human resources, and public relations departments, due to the close cooperation between the three parties involved in the joint research, we were able to participate in this WLAQ survey with a large number of employees, which was a great success. Before the survey, we targeted from 500 to 1,000 valid responses, but in reality we were able to achieve more than twice that and to obtain excellent data in quantity and quality that could be analyzed with high accuracy.



This survey does not end in a single year and continues for several years, aiming to further enhance added value through follow-up surveys (panel data analysis). Based on the success this time, we will aim to obtain more participants in the next fiscal year and beyond. The results of this survey have been fed back to participants as a brief bulletin about two months after execution, and by providing information when the paper is released by JNIOOSH, we will also encourage them to understand the significance of participating in the survey and continue to participate in the next surveys.

On the other hand, one of the challenges identified in the data aggregation process is the gap in the synchronization between survey data and health insurance data. The lifestyles provided as answers in the WLAQ questionnaire were valid as of the survey conducted (June, 2019), whereas the health insurance data associated with the answers was valid as of last year.

In particular, since the medical examination data is updated on a yearly basis, if you try to obtain complete data for all employees in the middle of the year, you will inevitably have to use the last year's data.

Since medical prescription data can be aggregated monthly, it is possible to obtain the most recent data, but then, it is not possible to synchronize the medical examination and the medical prescription data.

Of course, if you wait until the health examination data for the year you conducted the survey turns available, you can solve this synchronization problem, but then you will have another problem that the timing of analysis will be much later.

However, for this problem, even though consideration is required in the case of a single-year survey, but if the data of multiple years is accumulated by continuing the survey, the latest data can be obtained while the data of the past is referred to whenever needed, which will solve the issue over time.

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