

NHIS Big Data and Health Services *Consolidated Ageing Well Strategy in Korea*

Soon-Ae Shin¹, Dong-Soo Choo¹, Tae-Hwa Han², Jong-Heon Park¹,
Jong-Hee Kim¹ and Ji-Hyon Bang¹

¹Department of Big Data Steering, National Health Insurance Service, Seoul, South Korea

²Department of Medical Engineering, College of Medicine, Yonsei University, Seoul, South Korea

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Abstract: Due to rapid ageing, Korea is currently facing senior health issues, including elderly diseases, loss of roles and so on. These increase concerns over ageing well which resolves the problems associated with changes in socioeconomic structure and improves the quality of life. NHIS currently parlays big data and ICT into ageing well service. With globally renowned big data and ICT, NHIS provides and plans various health services to support seniors maintain not only physical and psychological health but also active sociality. Through introducing Korean health services combining with big data and ICT, this paper shares ageing well strategies.

1 INTRODUCTION

Over the past decade, an ageing society has become a big social issue in South Korea. There are growing concerns that the ratio of the Korean elderly is increasing faster than that of Europe as stated in an OECD report. According to a domestic report (KSIS, Korean statistical information service), the issues of an ageing society began in 2000, with the population percentage of those over 65 years-old at 7.2%, which increased to 12.7% in 2014 (NSO, National Statistical Office). Korea will be categorized as an aged society in 2018 and reach a super-aged society in 2026 with an elderly population of 20%.

This is the world's fastest ageing society as it is 1.5 times faster than Japan and 5 times faster than France (National Health Insurance Service, 2011). This hasty ageing is a major issue in Korean society because along with a low fertility rate the result will be a smaller working population to support a relatively large number of retirees. As the dependence ratio increases, society is likely to face various problems such as a higher tax rate and senior related issues, such as medical expenses, loss of roles, alienation, and so on (Lloyd-Sherlock, 2012).

Recently, there has been a growing interest in ageing well which allows seniors to independently

maintain their physical and psychological health and active social lives. NHIS plans to utilize big data and ICT for a healthy aged life as preparation for an ageing society. As a single compulsory insurer, NHIS provides insurance services for the whole population within the territory of Korea and secures all health data. Using such information, it is able to discover and manage health risk factors, and prepare for a healthy aged life.

Also, Korea has excellent ICT, which has won first place for last three years in the ICT Development Index published by ITU (International Telecommunication Union, 2014), an affiliated organization of the UN. We believe that the spread of the ICTs and internet has made ICT-based ageing-well feasible using personal, portable and mobile devices. It is possible to accomplish ageing-well that supports a healthy, active and independent life style, by providing services, which combines enormous NHIS-health data with ICT.

In this paper, we explain the existing service platform, MyHealthBank and introduce our plan to consolidate the empirical research and the health insurance related big data. It highlights the 3-Axis ageing-well strategies of standardized big data, health index based on service and realization of demonstration environment from the viewpoint of the insurer (NHIS) and users.

2 STATE-OF-NHIS' BIG DATA

2.1 Social Security Insurance System, as Social Base for Health Big Data

Korea introduced a health insurance scheme for companies with over 500 employees in 1977 (National Health Insurance Service, 2011). It achieved universal healthcare coverage in 1989, only 12 years after its introduction, which took the shortest amount of time in the world. In 2000, Korea launched a single insurer, NHIS, by integrating 375 medical insurance societies, and pursued the effective operation of the insurance system.

In 2008, it introduced the Long-Term Care Insurance Program to support the aged population, and became the third country in the world to conduct both whole health insurance and the Long-Term Care Insurance Program via NHI methods, following Germany (1995) and Japan (2000). The Long-Term Care Insurance Program is a program that provides care services to the elderly over 65 or under-65 who have geriatric diseases and difficulties in performing daily activities regardless of their income levels. Depending on the level of care required, these services are provided from home care to respite care, and lessens the financial and care-giving burden of families for caring for the elderly.

2.2 National Health Insurance Big Data, as an Initiative Step

NHIS is responsible for reviewing the eligibility of the insured, imposing and collecting contributions, distributing insurance benefits, and negotiating medical fee schedules and assessing service quality of healthcare service providers. Healthcare big data is a real-time resource which is used widely in a series of work.

With a single compulsory insurer system, the data is regularly accumulated in a single organization rather than separately collected into several institutions. There are 1.5 trillion pieces of vivid health information, including socioeconomic information of the entire population, their medical history, health examination results and elders' care services (Figure 1). It avails individuals of their health information (personal health record). After de-identification, it is also used as co-research with expertise and lays a foundation of knowledge.

For the necessary research for the aged society and the development of healthcare service, NHIS has collective agreements with the Korean Geriatrics Society to construct an elderly DB and conduct research about elderly syndromes which harm the quality of seniors' lives. In addition, from July 2014, NHIS has begun to provide a sample cohort DB (NHIS-NSC) of a million people, 2% of the total population, to support research about various target age groups, including the elderly.

2.3 National Health Promotion Centre (NHPC), Middle and Elderly-centered

NHIS provides information about personal health and health risk factor found on big data, and operates Senior Exercise Classes and Health Promotion Centres for ageing-well. Senior exercise participants are offered personalized health promotion plans including exercise and nutrition guides at more than 3,500 institutions, including local senior citizens' centres. Certified exercise instructors are assigned to the institutions and run classes for psychological comfort and social facilitation. The advantage of the service is that it is easy to access and possible to have continuous care in the case of residential changes. This is why the

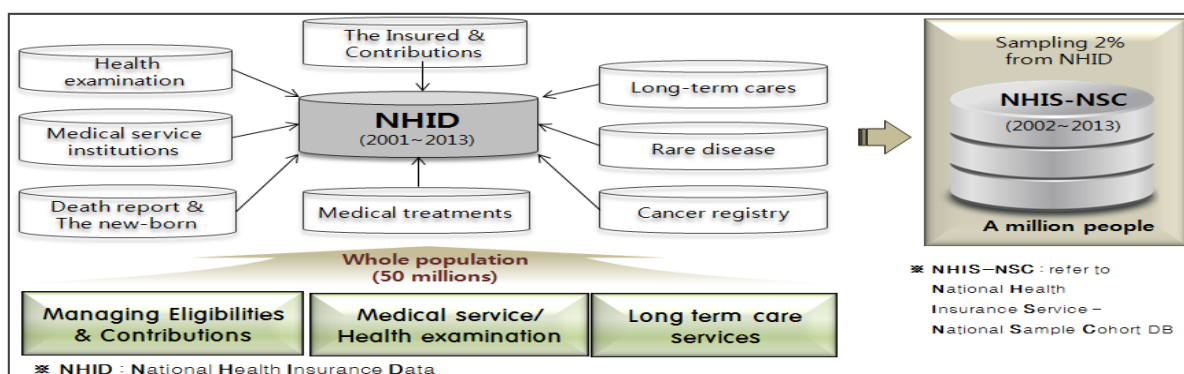


Figure 1: National Health Insurance Data (NHID) and NHIS-NSC (National Sample Cohort).

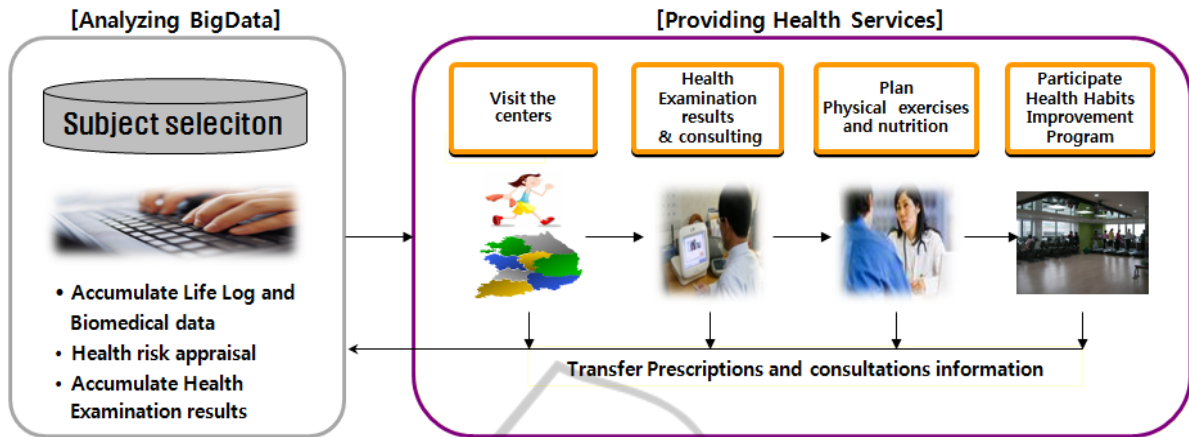


Figure 2: Operating health promotion centres using big data.

program runs using NHIS’ health platform based on ICT.

In addition, NHIS provides healthcare management services by running 20 Health Promotion Centres (Figure 2). It analyses health insurance big data to select health risk factor carriers as the recipients, and sends them brochures. When the recipients visit the centre, they are offered medical consulting and fitness examinations. Then, they receive recommendations about exercise and nutrition and health management services based on the examination results. The Health Promotion Centres program was initiated with 3 centres in 2007, and expanded to 20 centres due to increasing demands from users. There are about 60,683 users annually with a high satisfaction rate and an improvement in their health conditions.

3 RECENT APPROACHES TO PUBLIC HEALTH SERVICES

3.1 My Health Bank, Personal Health Record (PHR) Service

- **As a Personal Health Service.** NHIS has run its own website (Health-iN; <http://hi.nhis.or.kr>) for providing trustworthy health information as a single insurer since 2007. Individuals can find it on the homepage from anywhere using a well-developed domestic ICT. NHIS provides a Personal Health Record Service named ‘My Health Bank’ on the Health-iN homepage. It means that dispersing health information that is gathered in one place can be handled preciously and safely like a bank. People can log into My Health Bank, and then check their personal health record after verifying their

identification. It contains five-year of cumulated health examination results and questionnaires about health behaviours such as smoking, drinking, physical activity, and one-year medical treatment records including prescribed medicine, and self-recorded life log data.

Especially, when it comes to prescribed medicine, people can check what kind of medicine is prescribed in hospitals and pharmacies, so they can know its efficacy, interaction, contradictions in pregnancy, side effects and so on. In addition, childhood immunization records are registered at the Korea Centres for Disease Control and Prevention, so it is linked to the relevant website.

- **As a Family Health Linkage Platform.** My Health Bank provides personalized health risk prediction services using their own health data as well as by checking users’ records. The Health Risk Appraisal service produces their actual age, healthy age and target age through analysing their risk of death based on lifestyle, family history, environmental factors etc. It also provides risk prediction of stroke within 10 years and updates them with a health care message which contains information about prevention of stroke. If somebody has trouble in managing obesity, they can also use an obesity management program which offers a checklist about physical activity, nutrition and behaviour. By using a health diary, they can compare daily intake and burned calories.

My health bank, therefore, provides a one-stop health service from checking personal health records and appraising health risk to providing personalized health information. Its usage has rapidly increased since it launched in 2012, 52% from 1,793,041 users in 2012 to 2,715,040 users in 2014. It implies that people are paying attention to their health status by

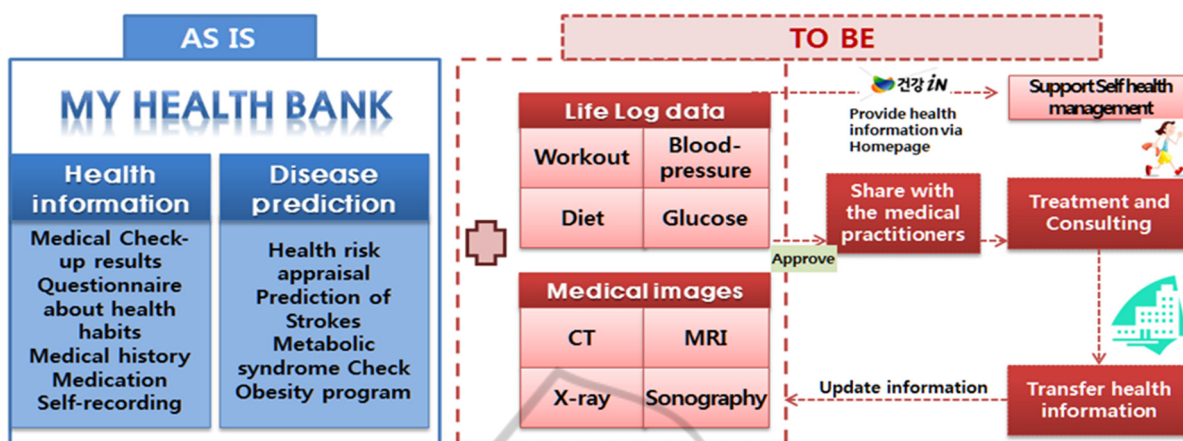


Figure 3: The present and future of personal health record (My Health Bank).

themselves. Giving proper health information on time will encourage them to have continuous interests in their health and help them prevent diseases as well as maintain healthy lives.

Furthermore, NHIS plans to expand the range of services, including fracture risk, and gather individuals' lifelong data, like workouts and diets in their daily life, and medical images (CT, MRI etc.) from the medical institutions to widen the range of health information. It is expected to be shared with those with medical expertise in the practical fields for efficient treatment (Figure 3).

3.2 Participating Government-driven Active Assisted Living Project

In order to overcome problems of ageing, Korea is striving to activate aspects of research and development and an industrial foundation. The Government-driven Korean AAL (Active Assisted Living) project started in 2014 and is planned to be carried forward as a five-year project until 2019. This project is to create AAL within public and private housing areas for seniors' independent and healthy living, so that it minimizes disease incidences as well as medical demands, but promotes better living quality.

To achieve this goal, there are 3 sub-assignments; foundation for smart public housing, development of an active ageing platform for a healthcare smart home, and resident-customized healthcare services. NHIS is responsible for designing resident-customized healthcare services. The developed platform and services are expected to be the basis for a compulsory health environment standard in times of building housing areas with the cooperation of relative institutions.

The Home Healthcare Service Project involves

development of health improvement services, health management services, safety services, social participation services and so on. NHIS plays the role of producing various health assessment index using NHI big data. The NHIS-Long-Term Care Institution is planning to test-operate the developed AAL service, which is likely to be a trial model to be assessed by visitors.

4 NHIS' CONSOLIDATING PLAN FOR AGEING WELL

In order to collect data, NHIS is highly focused on the health insurance scheme and Long-Term Care services. By using the collected data, NHIS provides a nation-wide health service. Furthermore, it tries to counteract the trend of rapid ageing by establishing strategies of standardizing data and diversification of services, especially considering the 3-Axis strategies to enhance the existing infra (Figure 4).

This enables providers to strengthen competitiveness and opportunity to expand new service models, while delivering users better understanding of their health condition. The 3-Axis are categorized into standardized big data, healthindex based service and realization of demonstration environment, which are explained below;

- Data-Axis, Reference Data for Korean Health. The Data-Axis demonstrates issues about the sampling method and data accuracy, and resolves such issues to secure reliability on big data. One step to be taken is that NHIS plans to construct reference data of those over 65 to increase the reliability in the short-term. Meanwhile it plans to refine the DB based on entire health records from infancy to death,

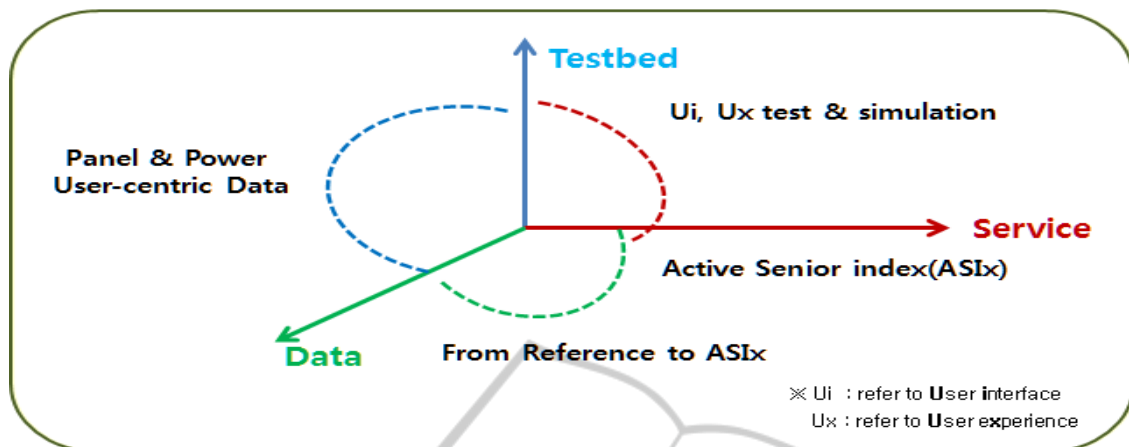


Figure 4: Consolidation axes for ageing-well.

life-long data, to extract the representative data about Korean health.

- **Service-Axis, Unit Indicator based Comprehensive Index for Active Senior.** For the Service-Axis, it hopes to achieve a health perception index model for aged health consumers using the data. As people start to observe their health conditions in comparison with the average or age-specific health condition, it motivates health-caring behaviours and, thus, becomes a starting point of providing new health supportive policies and strategies from the national perspective. NHIS is concerning ASIX model (Active Senior Index for anything; Health, Emotion, Social) to alleviate users' beliefs and understanding despite their decreasing cognitive abilities due to ageing.
- **Testbed-Axis, Real Stakeholder Panel via Senior Care Centre and Korean AAL Project.** NHIS has opened a Seoul sanatorium in 2014. It is, in fact, necessary to verify whether it fulfils the needs of the users before organizing data and services. The Seoul sanatorium possesses the best possibility of providing verification because it is easily assessable for seniors, their sustainers, their care givers and facilities.

Henceforth, it has considered a cutting-edge technology verification environment like Fraunhofer's in-House Center. The Fraunhofer-in-House Center in Duisburg, Germany, is a unique innovation workshop in Europe. It is application-oriented, and works together to research and develop. It is also successfully marketed in the field of intelligent room and building systems (<http://www.inhaus.fraunhofer.de/en.html>).

5 CONCLUSION

It is necessary Korea to have active attitudes not only for elders' physical and psychological health through an independent life, but also for ageing-well to achieve their active social lives, and prepare for the rapid ageing period. In order to attain its targets, NHIS seeks for a solution for ageing-well with effective nurturing of an excellent national health big data and ICT.

As Korea runs a single insurer system, health data is regularly accumulated in a single organization rather than separately collected into several institutions. Universal health big data allows tracking one's infancy to death, and facilitates the customized healthcare services, which accounts for historical risk factors. The developed services, in conjunctions with ICT, provide user-centred services.

NHIS already provides personal health records services using big data, and propels the development of an active ageing platform and services for the Healthcare Smart Home. AAL research and services are customized services even in Europe and US, which run in a variety sizes and depths (DWP, 2014; Kalache, 1997; WHO, 2002; Woolrych, 2012).

Korea is seeking a breakthrough to solve legal troubles in making an industrial ecosystem based on a standard platform and to follow the international standard for data coding and transmission. Meanwhile, the government is trying to cooperate with the public and private sectors to develop customized healthcare services for the elderly health.

Korea, especially, combines big data application strategies with excellent ICT to improve the Korean

AAL service strategy as a national counterplan for the rapid ageing, which is likely to be a world-wide role model.

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