

**Social innovation for health promotion
utilizing big data platform & social
capital platform**

: ビッグデータとソーシャルキャピタルの2つのプラットフォームを活用した健康社会イノベーション創出の試み

**Special Advisor to the Hirosaki University COI
Shigeyuki Nakaji MD PhD**

Life expectancy ranking by prefecture (2020)

	Male	Female
1	Shiga 82.73	Okayama 88.29
2	Nagano 82.68	Shiga 88.26
3	Nara 82.40	Kyoto 88.25
4	Kyoto 82.24	Nagano 88.23
44	Iwate 80.64	Ibaraki 86.94
45	Fukushima 80.60	Tochigi 86.89
46	Akita 80.48	Fukushima 86.81
47	Aomori 79.27	Aomori 86.33

3.5 y, to top

2.0 y to top

Aomori/Nagano prefecture mortality rate ranking by age group (male, in descending order, 2020)

Age-group	Aomori		Nagano	
	Death rate (Per 100,000)	Ranking	Death rate	Ranking
40~44	153 (1.4倍)	44	109	5
45~49	267 (1.2倍)	46	214	31
50~54	447 (1.6倍)	47	276	4
55~59	691 (1.5倍)	47	460	7
60~64	1113 (1.5倍)	47	731	4
65~69	1653 (1.6倍)	47	1053	2
70~74	2631 (1.4倍)	47	1906	3
75~79	4236 (1.5倍)	47	2894	1
80~84	7074 (1.3倍)	47	5623	2
85-	15357 (1.1倍)	46	13580	3

• The numbers in red indicate how many times the mortality rate is in Nagano Prefecture.

• Considering the incubation period of the three major diseases (cancer, stroke, and heart disease) that account for 70% of deaths, it is necessary to take measures from childhood.

**Age-adjusted mortality rate ranking by cause of death
in Aomori and Nagano prefectures
(Per 100,000 population, 2015, ranked from lowest to highest)**

	Male		Female	
	Aomorio	Nagano	Aomori	Nagano
Total	47	1	47	1
Malignancy	47	1	47	2
Heart	42	13	32	3
Stroke	47	32	45	30
Pneumonia	47	1	44	1
Accident	41	18	36	8
Sucide	37	33	8	26
Kidney	47	5	45	4
Liver	40	34	35	5

**Ministry of Health, Labor and Welfare: Age-adjusted mortality
rate by prefecture in 2015**

Comparison of health-related indicators in Aomori and Nagano prefectures (ranked from the best)

	Aomori		Nagano	
	M	F	M	F
Smoking rate	47	46	8	18
Drinking rate	47	40	5	15
Salt intake	46	43	42	40
Vegetable intake	31	29	1	1
Proportion of Obesity	44	46	11	9
Stomach cancer check-up rate	27	17	7	12
Health checkup rate	37	32	5	5
Daily step number	46	41	19	11
Proportion of people who play sports	47	47	14	8
Number of public nurse	25		1	
Number of Doctor	42		31	
Prefectural income (per capita)	41		22	

Overview of Healthy Life Expectancy of Aomori Prefecture Residents

- The shortest-lived prefecture in Japan
(2.5 years difference from Shiga/Nagano prefecture)**
- All ages are more likely to die, especially men in their 40s-60s**
- High mortality from all diseases: especially 3 major lifestyle-related diseases (cancer, stroke, heart disease) + suicide**
- Background: Bad lifestyle (drinking, smoking, lack of exercise, salt intake), low health checkup rate, late hospital visit, poor hospital attendance**

Basic Philosophy and Strategy of the Project

1. Health promotion does not exist in isolation: it should be linked to the economy and countermeasures against the declining birthrate.

2. Health promotion should become a central theme of regional revitalization.

3. All industry, government, academia, and citizens need to become stakeholders (open innovation)

4. It is necessary to understand and respond to the interests of industry, government, academia, and citizens.

***Interest (benefit) of each field/organization**

(1) Company (industry): profit

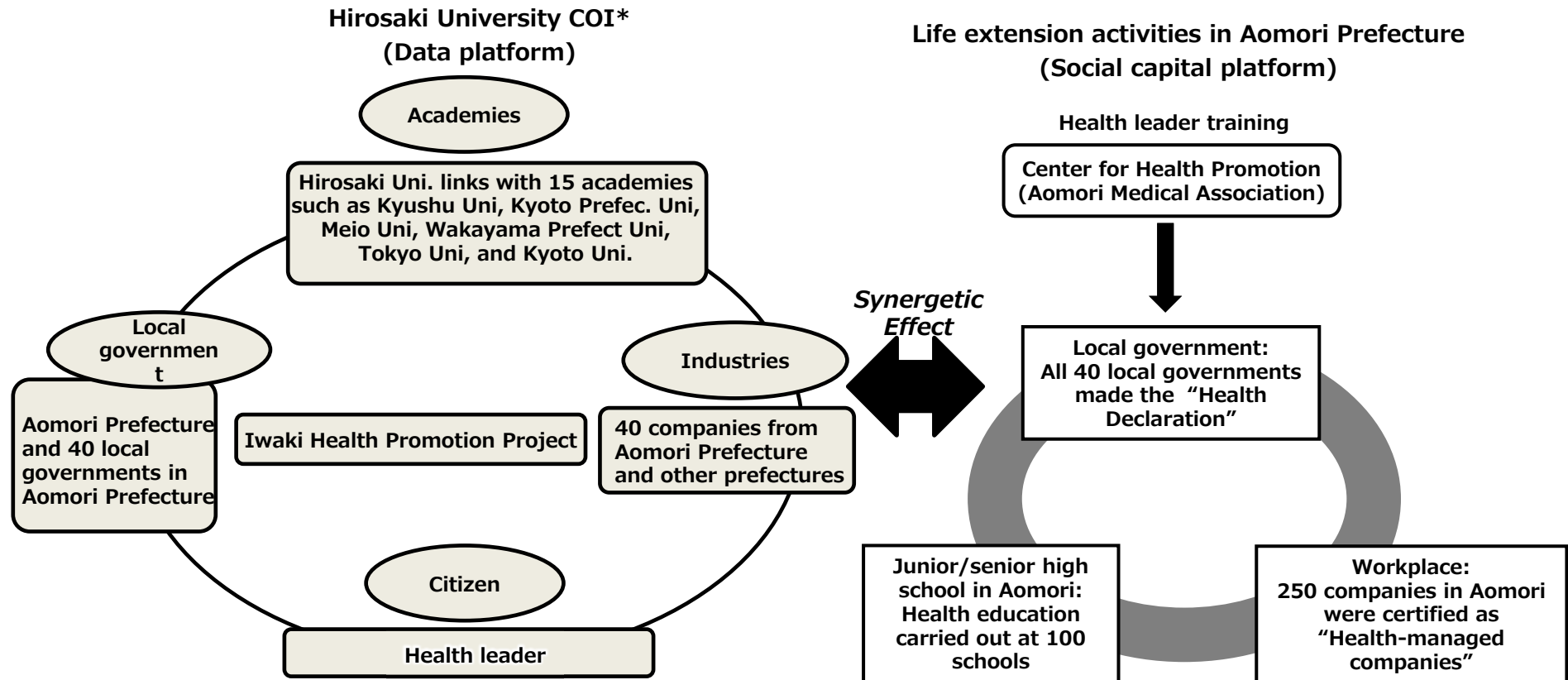
(2) Municipalities (local government): medical cost control

(3) Universities/researchers (academics): research

(4) Citizens (People): Demands for health

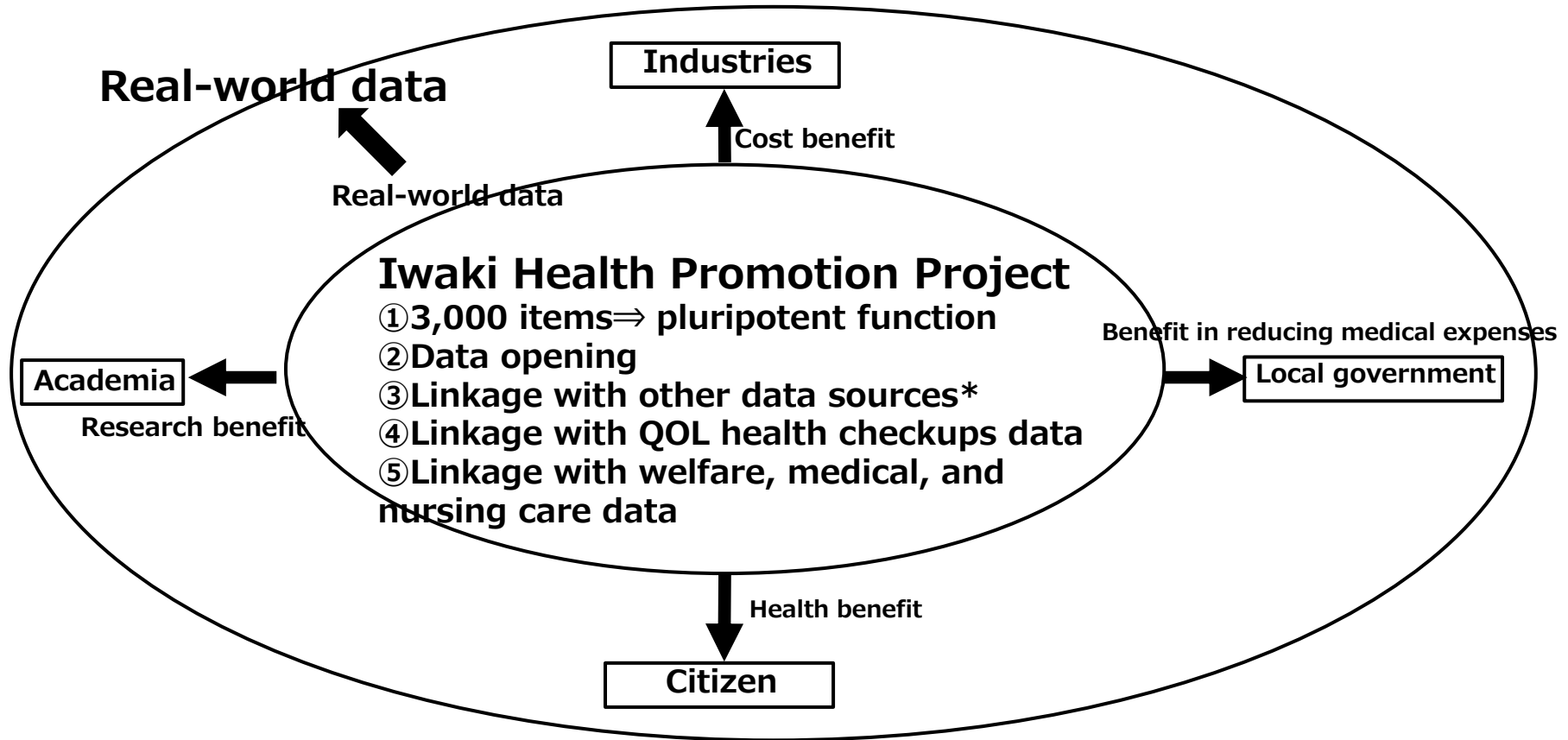
5. We need a broad and robust health open innovation platform centered on real-world data centered on the Iwaki Health Promotion Project.

Linkage of Hirosaki University Center of Innovation with life extension activities in Aomori Prefecture.



*COI: Center Of Innovation

Strategy for building real-world data.



*Kyoto Pref Univ Med, Wakayama Med Univ, Meio Univ, Kyushu Univ, Tohoku Univ, Juntendo Univ, Ritsumeikan Univ, Tsukuba Univ, Hiroshima Univ, Osaka Univ, Meijo Univ, Nagoya Univ etc.

Overview of Health Promotion Activities in Aomori Prefecture

Hirosaki Univ. COI (Center Of Innovation)

Iwaki Health Promotion Project

Big data

Local government

**Health declaration
(All 40 municipalities)**

School

**Health education
(100 schools)**

Company

**Health management
certification system
(370 companies)**

Health leader development

Health Promotion Center

青森県内すべての自治体が健康宣言達成



Health declaration by the mayor of all municipalities

市町村の健康宣言
全**40**市町村が宣言





Health education at school



職域：企業での健康づくりの取り組み

Corporate
health
promotion

県の入札で5ポイント付与のインセンティブ



▲青森銀行健康宣言

▼北星交通健康宣言



▲▼みちのく銀行健康づくり研修



青森県健康経営
認定制度 (H29)
県の入札で5ポイント付
与のインセンティブ
認定企業約370社



Aomori Medical Association Health Promotion Center (core organization for social implementation)



①健康リーダー (健やか隊員) 育成

健やか隊員育成風景 (健やか力推進センターによる)



座学 (講義)



運動 (実習)



食事 (講義)



ワークショップ

15

②健康づくりサポート

健やか隊員 約6,000人 誕生!

Center of innovation (COI) through collaboration among industry, government, academia, and citizens



学

●シーズの創出 ●学術的知見の提供

弘前大学

(代表機関/主管大学)

京都大学/東大医科研

(サテライト拠点/副主管大学) (サテライト拠点/副主管大学)

九州大学/京都府立医科大学/名城大学/
和歌山県立医科大学/東京大学/
名古屋大学/東京医科歯科大学/名城大学
中央大学/慶應義塾大学/京都府立大学/志學館大学/
公立はこだて未来大学/徳島大学/同志社女子大学/青森中央学院大学

連携

連携

官

●新事業創出支援
●健康づくりの支援

青森県 / 弘前市 / 青森県の
40市町村(健康宣言都市)

【福岡県】久山町
【京都府】京丹後市
【沖縄県】名護市 / 国頭村 /
大宜味村 / 東村 / 今帰仁村 /
本部町 / 恩納村 / 宜野座村 / 金武町 /
伊江村 / 伊平屋村 / 伊是名村
【和歌山県】かつらぎ町/みなべ町/高野町

産

金

●新事業・雇用創出

マルマンCS/東北化学薬品/テクノスルガ・ラボ/
栄研/イオン東北/カゴメ/エーザイ/花王/協和
発酵バイオ/ライオン/オムロンヘルスケア/ベネッ
セコーポレーション/シスメックス/ヒューマン・メタ
ボローム・テクノロジーズ/日本コプ共済/クラ
シエHD/ローソン/楽天/サントリー食品インタ
ーナショナル/アツギ/ハウス食品/ファミリーク
ッキングスクール/大塚製薬/ミルテル/明治安田
生命保険相互会社/ファンケル/青森銀行/みち
のく銀行/味の素/大正製薬/シルタス/ICI/
現代けんこう出版/DeSC/小林製薬/サノフィ
パスツール/EAファーマ/三菱商事/プリファード
NWS/NTT...etc

京都銀行/ベネッセスタイルケア/IIJグローバル
ソリューションズ/三井住友信託銀行/大日本
印刷/住友林業/みずほ情報総研/エルブズ/
マネーフォワード/京都信用金庫/SOMPO未
来研究所/三菱UFJ銀行/三井住友銀行/伊
予銀行/住友生命保険/みずほ銀行/京セラコ
ミュニケーションシステム/第一生命保険/アスコ
エパートナーズ/第一フロンティア生命保険/
東京海上日動火災保険 ※一部参画予定含む

**Open
Innovation2.0**

《弘前大学健康未来イノベーションセンター
(データサイエンスセンターを含む) が中心》

※COIプロジェクトで構築したネットワークや成果を最大限活かす

連携

連携

民

●健康づくりの普及・促進

健康リーダー
健康サポーター
食生活改善推進員etc

研

●最先端健康研究(AI)

国立健康・栄養研究所/
理化学研究所/
産業技術総合研究所/
青森県産業技術センター

岩木健康増進プロジェクト

Iwaki Health Promotion Project (2005-2023)

※医師を中心とした**総勢200～300名程度**が連続10日間(AM6:00-PM3:00)実施:岩木地区

※健(検)診受診者：20～**94歳**。1人あたり所要時間は**平均5-7(10)時間**(小・中学生も別途実施)



嗅覚検査



整形外科



歯科



体力測定

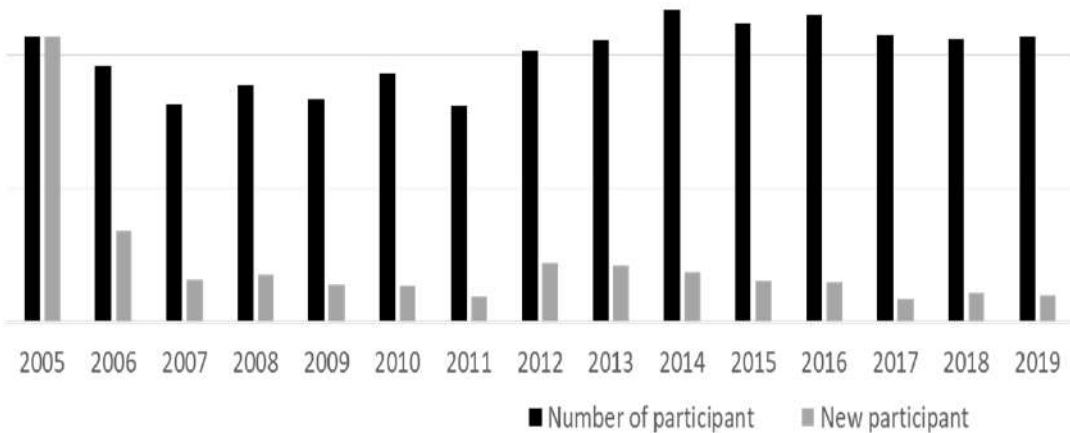


握力



感覚検査

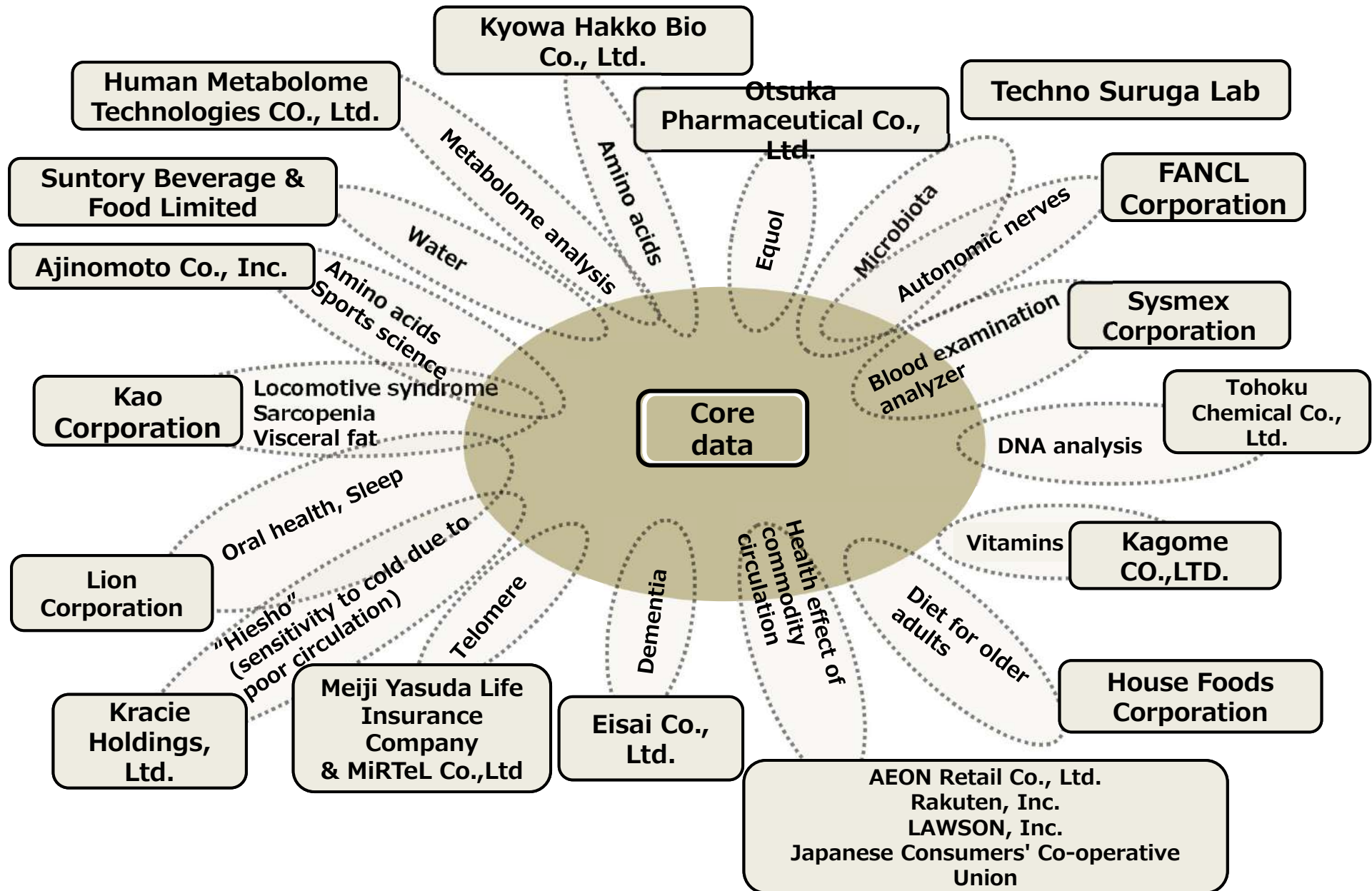
Participants of the Iwaki Health Promotion Project
(About 20,000 in total)



Items Measured in the Iwaki Health Promotion Project

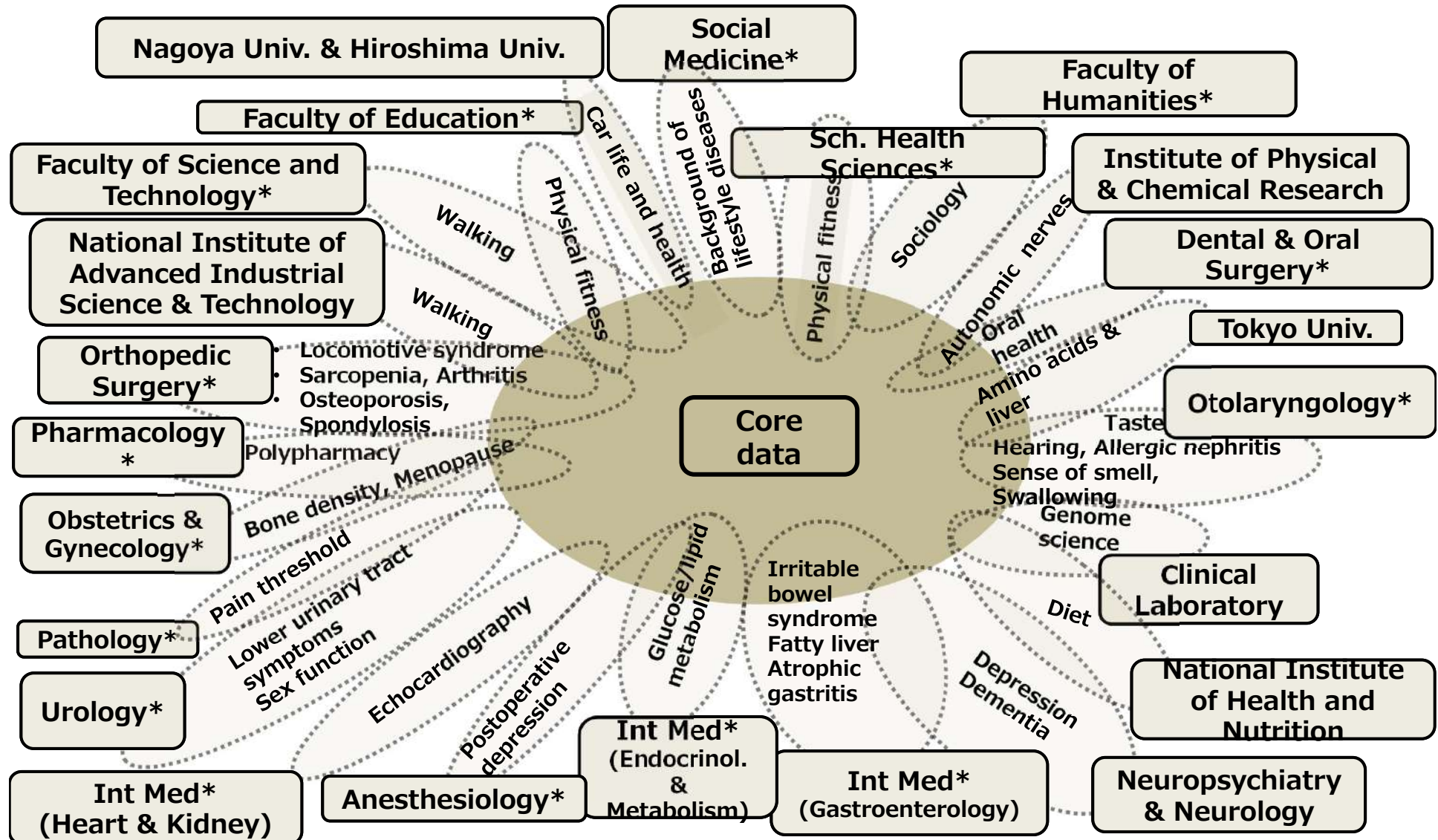
1. Questionnaire: Family structure, educational history, medical history, family history, current medication, lifestyle (smoking, alcohol, exercise), motion and time study, Perceived Health Competence Scale, daily activities, oral hygiene, menstruation status, number of pregnancies or deliveries, bone fracture history
2. Diet: Food Frequency Questionnaire
3. Body composition: % fat, muscle volume, visceral fat volume, etc.
4. Bone density (using ultrasonography)
5. Cardiovascular-related items: Blood pressure, electrocardiography, echocardiography, brachial-ankle pulse wave velocity, ABI (Ankle Brachial Index), fundus examination
6. Abdominal ultrasonography (for liver, pancreas, gall bladder, etc.)
7. Pulmonary function (using spirometer)
8. Physical fitness (20 items): Grip strength, sit-and-reach, lateral jumps, long jump with standing, standing balance with opened eyes, bar gripping reaction time, etc.
9. Blood examination:
 - ① Basic items (50 items): Leukocyte number, platelet number, hemoglobin, liver function, renal function
 - ② Immunoglobulins, complements, uric acid, electrodes, etc.
 - ③ Trace elements (14 items): manganese, zinc, selenium, chrome, nickel, etc.
 - ④ Glucose, lipid, and bone metabolism: HbA1c, blood glucose, LDL-/HDL-cholesterol, triglyceride, etc.
 - ⑤ Amino acids (36 types), fatty acids (21 types)
 - ⑥ Hormones (15 types), cytokines (7 types), and vitamins (10 types)
 - ⑦ Neutrophil function: Reactive oxygen production capability, phagocytic activity, serum opsonin activity
10. Cognitive function: Mini-Mental State Examination, Wechsler Memory Scale-Revised
11. Depressive state: Center for Epidemiologic Studies Depression Scale
12. Feces: Microbiota (16S-rRNA×MiSeq method, shotgun analysis method)
13. Urine (10 items): 8-OHdG, trace albumin, cortisol, aldosterone, equol, etc.
14. Hearing, vision, and olfactory tests
15. Sleeping status: Pittsburgh Sleep Quality Index, polysomnography
16. Oral cavity: Oral flora, microbiota (16S-rRNA×MiSeq method, shotgun analysis method), number of remaining teeth, periodontal disease, occlusal function, etc.
17. Orthopedic findings (20 items): Joint movable range (knee, hip joint), hydrarthrosis (knee), joint fissure (carpal tunnel), MRI images (knee, cervical vertebra, lumbar vertebra), etc.
18. Skin (5 items): Transepidermal water loss, horny layer moisture, carotenoids, PH, skin typing
19. Advanced glycation end products
20. Exhaled gas (6 types): NO, CO, H₂, CH₄, etc.
21. Whole genome analysis
22. Metabolome analysis (blood)

Collaborations with companies. Participated companies and their interests/contribution to the core data



Collaboration with researchers from Hirosaki University and other research institutes

*At Hirosaki University. Participated departments from Hirosaki University and other research institutes, and their interests/contribution to the core data.



QOL checkup flow chart

Examinee

Questionnaire

- ① Medical history, ② Diet, ③ Exercise habit, ④ Smoking habit, ⑤ Alcohol intake, ⑥ Sleeping, ⑦ Defecation/urination, etc.

Metabolic syndrome

- ① Body composition (including visceral fat area)
*Kao Co.
② Blood pressure
③ Serum lipids
④ Diabetes
⑤ Arteriosclerosis
*MiRTel Co., Ltd

Oral hygiene

- Periodontal disease, etc.
*Lion Co.

Locomotive syndrome

- ① Bone density
② Physical fitness

- ① Depression
② Cognitive function
*Eisai Co., Ltd.

Quality-of-Life Exam

- ① Vegetable check
*Kagome Co., Ltd.
② Gustatory sense
*House Foods Co.
③ Poor blood circulation
*Kracie Holdings, Ltd.
④ Autonomic nerves
*FANCL Co.

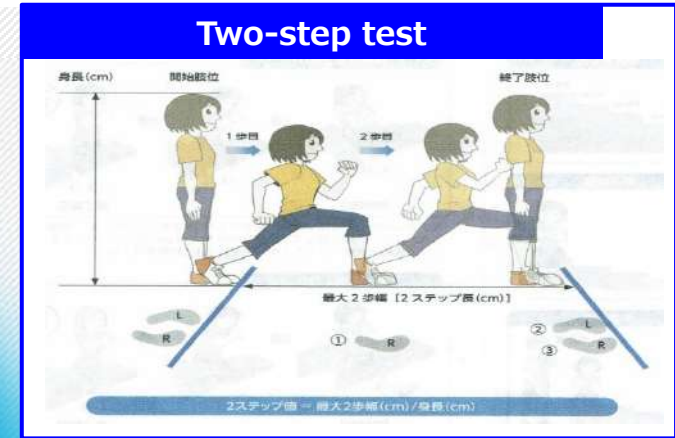
Results – can be available in two hours

Health education program *Benesse Co.

*QOL: Quality Of Life

QOL健診の測定内容

Measurement contents of QOL health checkup



Develop and introduce new digital equipment.



Your Health Power Up Sheet

Examinee ID Q0492310-002	Examinee's name eng taro	Gender Male	Age 28
-----------------------------	-----------------------------	----------------	-----------

Lifestyle data

Eat	
Lifestyle Habits	Your Habits
Do you eat faster compared to others?	nomal
Do you consume snacks or sweet drinks in addition to your 3 main meals?	Daily
Do you have dinner within 2 hours before bedtime 3 or more times a week?	No
Do you skip breakfast 3 or more times a week?	No
Exercise	
Lifestyle Habits	Your Habits
Have you engaged in moderate sweating exercise for at least 30 minutes, 2 or more days a week, for over a year?	No
Do you engage in walking or equivalent physical activity for at least 1 hour daily as part of your daily routine?	No
Is your walking speed faster compared to same-age individuals of the same sex?	fast
Take a rest/Sleep	
Lifestyle Habits	Your Habits
How many hours do you sleep?	6 hours 30 minutes
Are you able to get sufficient rest through sleep?	Yes
Oral care	
Lifestyle Habits	Your Habits
Number of times you brush your teeth per day	2 times
Have you visited a dental clinic in the past year?	No visit
Smoking	
Lifestyle Habits	Your Habits
Do you smoke?	No
drinking alcohol	
Lifestyle Habits	Your Habits
Do you consume alcohol?	Daily
How much alcohol do you drink on average per day? * deficit is a bed	more than 3 cups

Your lifestyle Cha deficit is a bed lifestyle habit

Legend: — no, last time

inspection and evaluation result data

physical examination	reference value (standard)	result	explanation
stature	-	171.4	
body weight	-	71.5	
BMI	18.5 or more/ less than 25.0	24.3	indicators of obesity
Visceral fat level	less than 10	10.0	
Estimated Bone Mass	>or= 2.9	2.8	indicates bone strength
Stand up	one leg 40cm	Both legs 10 cm	look at the strength of the lower limbs
2 steps	1.3 or more	1.3	indicates overall strength of muscles, balance, and flexibility of the lower extremities
grip (of hand)	>or= 36kg	32	indicates overall muscle strength
blood pressure			
	reference value (standard)	result	explanation
systolic (upper blood pressure)	<or= 129mmHg	136	blood pressure when the heart contracts (the degree of blood pump in arteries)
Diastolic (lower blood)	<or= 84mmHg	82	blood pressure when the heart is dilated
Vegicheck values			
	reference value (standard)	result	explanation
Vegicheck values	7.0 or higher	7.0	indicates intake of green and yellow vegetables(high in carotenoids)
UEstimated Vegetable intake	350g or higher	350	
CESd			
	reference value (standard)	result	explanation
CESd	Less than 16	16	the higher the number, the stronger the depression

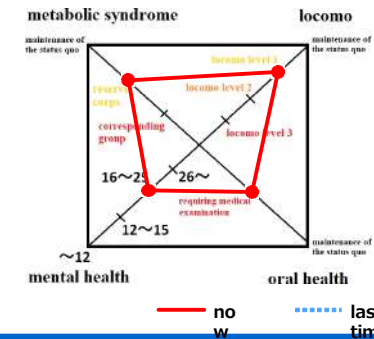
deficit is standard/outside the reference

Health index/Judgment

metabolic syndrome		
Health	your health index	judgment
Visceral fat level	10.0	reserve corps
blood pressure systolic	136	
Diastolic	82	
locomo		
Health	your health index	judgment
Stand up	Both legs 10 cm	locomo level 1
2 steps	1.3	
grip (of hand)	32	corresponding group
oral health		
Health	your health index	judgment
Have you visited a dental clinic in the past year?	No visit	dental check required
mental health		
Health	your health index	judgment
CESd	16	depressive tendency

* deficit is a bed lifestyle habit

your health chart



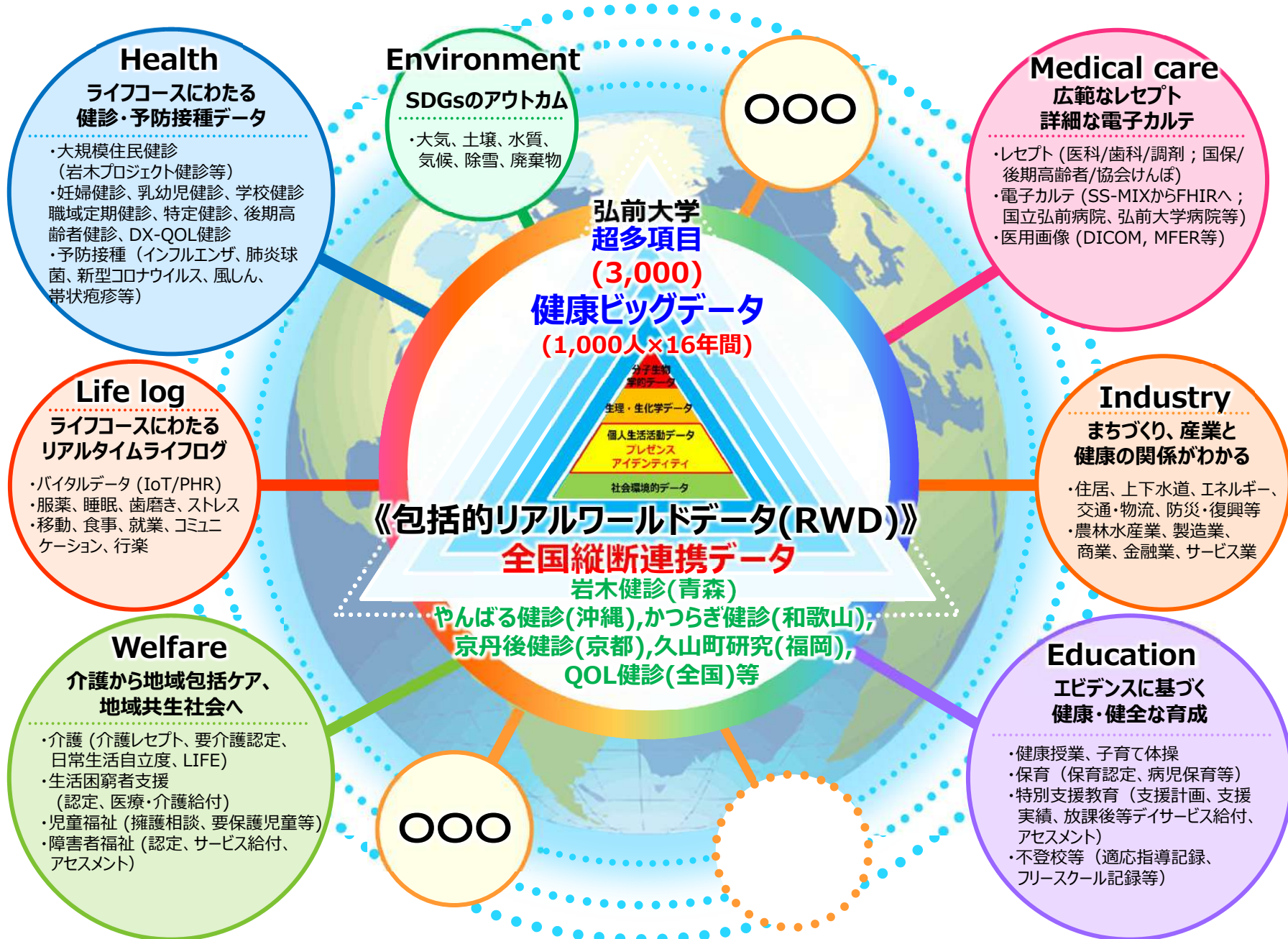
Lifestyle-related disease prevention/ health promotion issues

- improvement of eating habits
- improvement of exercise habits
- erelief of mental and physical fatigue
- improvement of oral care habits
- improvement of drinking habits

QOL checkup at a Vietnamese company (2019&2023)



Comprehensive real-world data



Possibilities of big data

① A wide variety of combinations

Ex) Relationship between intestinal bacteria and oral bacteria

② Wide and long analysis

Ex) Economy, QOL, purpose of life, etc. can be targeted.

③ Bringing together diverse human resources and organizations

Ex) Researchers for culture/science, companies, local governments, and citizens can participate.

④ Others with unexpectedly large potential

Basically, sufficient understanding of citizens is essential.

Overview of "Hirosaki COI Model (Package)"

