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COVID-19 Pandemic Response with ICT and AI: The Case of Korea

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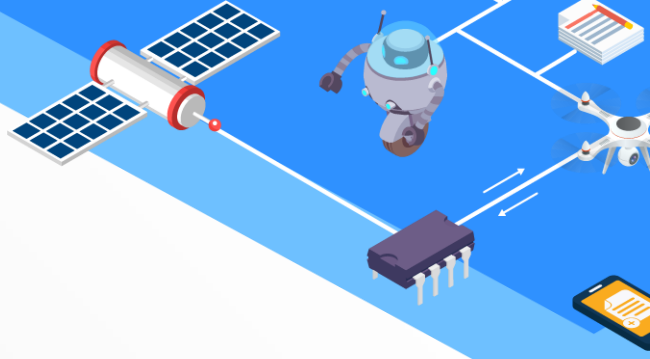
KISDI



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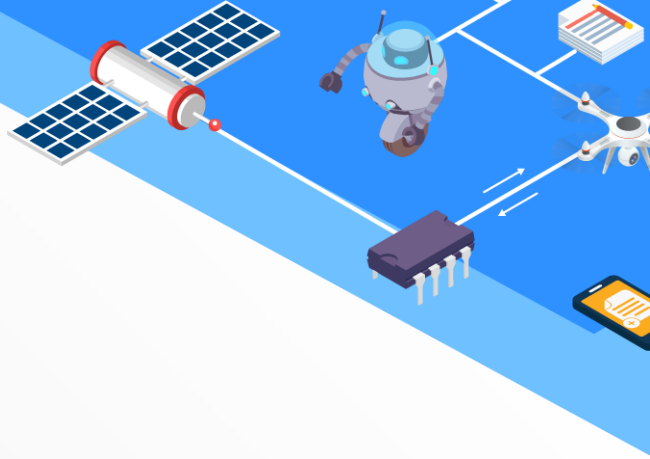
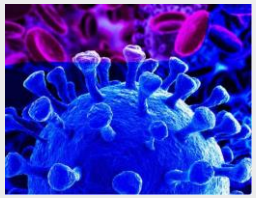
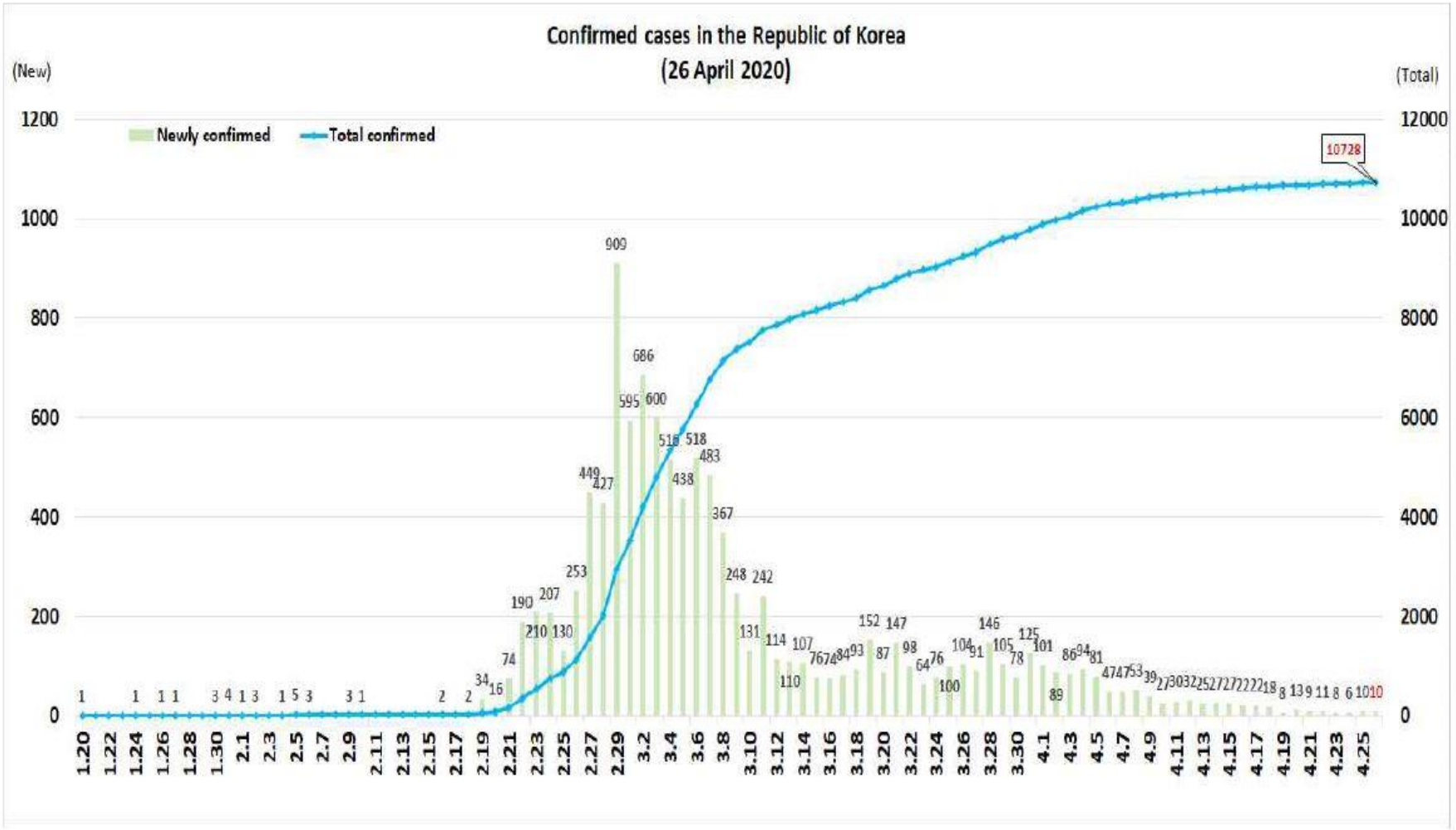


1

Flattening the curve with preemptive tests

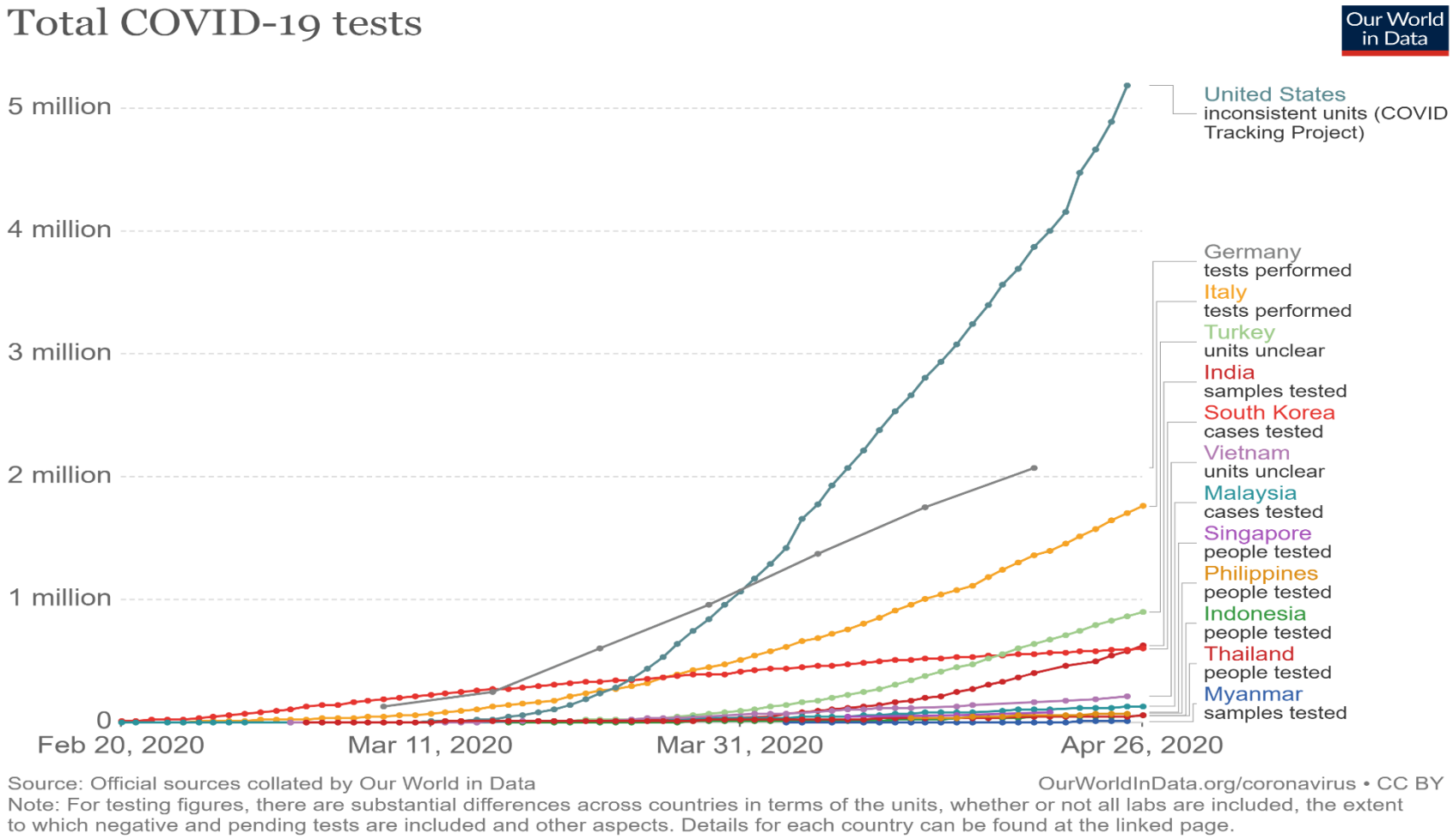


Flattening the curve in Korea



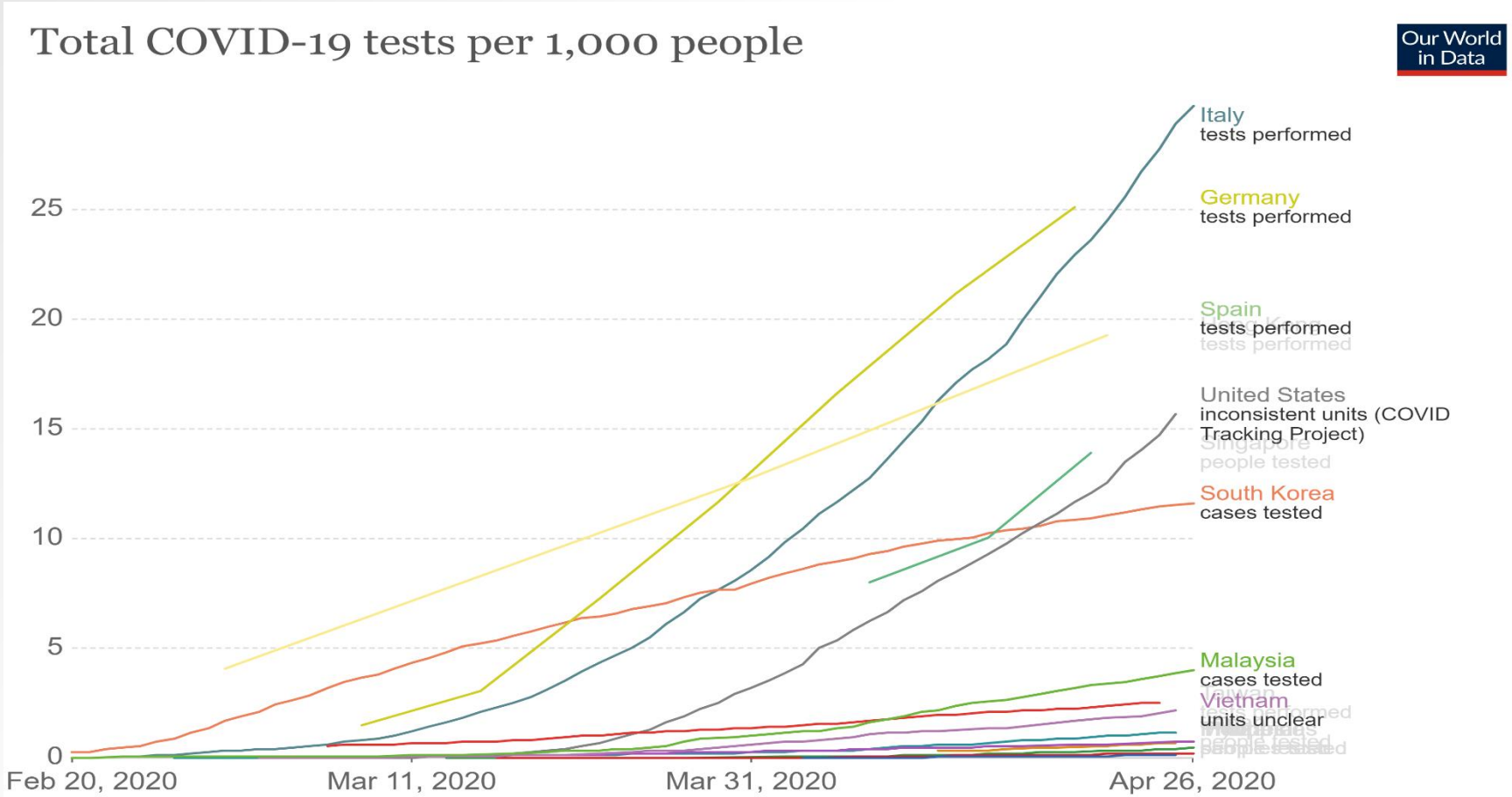
Source: cdc.go.kr

Preemptive tests for COVID-19



Source: ourworldindata.org/covid-testing

Preemptive tests for COVID-19



Source: ourworldindata.org/covid-testing

AI-based big data system was a foundation for preemptive tests

Jan. 16

Seegene (molecular biotech company) was started focusing on coronavirus.

Feb. 5

The first version of test kit made available.

Feb. 12

The test kit was **approved for use** by KCDC.

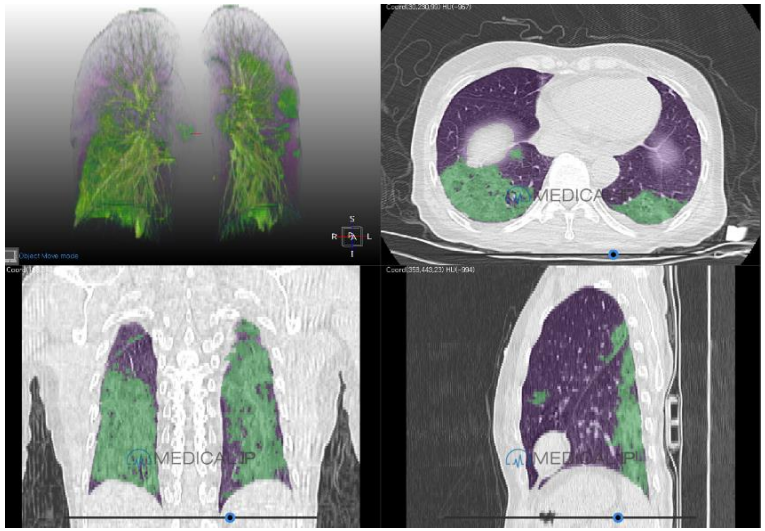
An artificial intelligence-based big data system made possible to develop a test kit quickly. It would have taken 2-3months without the AI system

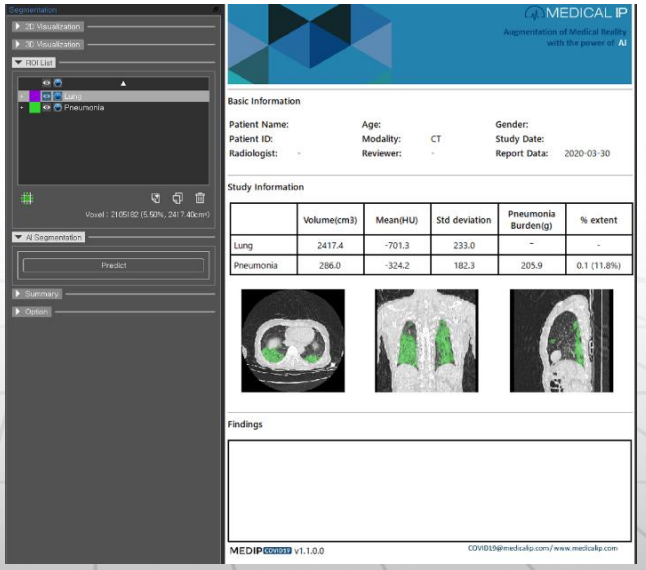
The normal process for approval would take a year and a half

Source: CNN (2020.3.12), YonhapNews (2020.3.12)

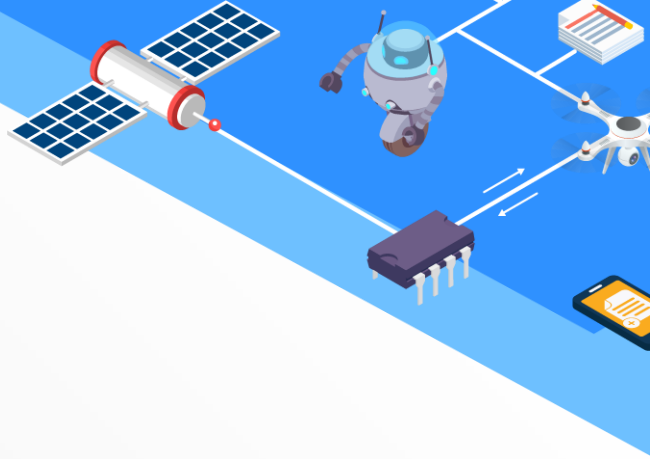
MEDIP COVID-19

- **Developed by Medical IP, a company for AI medical image analysis platform and medical 3D printing**
- **AI based medical image analysis software**
- **Diagnose Covid-19 and pneumonia in 1 minute**
- **Quantify the amount of virus in grams(g) using AI technology**

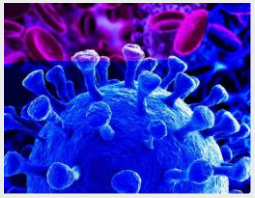




Source: Medical World News (2020.3.21) ; MTN News (2020.4.1).



2 Social Distancing and Contact Tracing



Aftermath of the MERS crisis in 2015

- **The Emergency Operations Center (EOC)** under the Korea Centers for Disease Control and Prevention (KCDC) was established **to control and command for public health crisis responses** on Sep. 1 2015**.**

Source: Ministry of Health and Welfare (MHW)

Not intrusive in cases of emergency situation?

Act on Personal Information Protection

Article 23 forbids the processing of sensitive data of individuals unless
1) explicit approval is obtained from data subject,
2) processing of sensitive information is permitted or requested by relevant laws and regulations.

While the Act has the legal basis for **allowing exceptions to Article 23 in cases of emergency situations** that require the temporary treatment of individual information for **the purposes of public health, safety and security.**

Contact Tracing

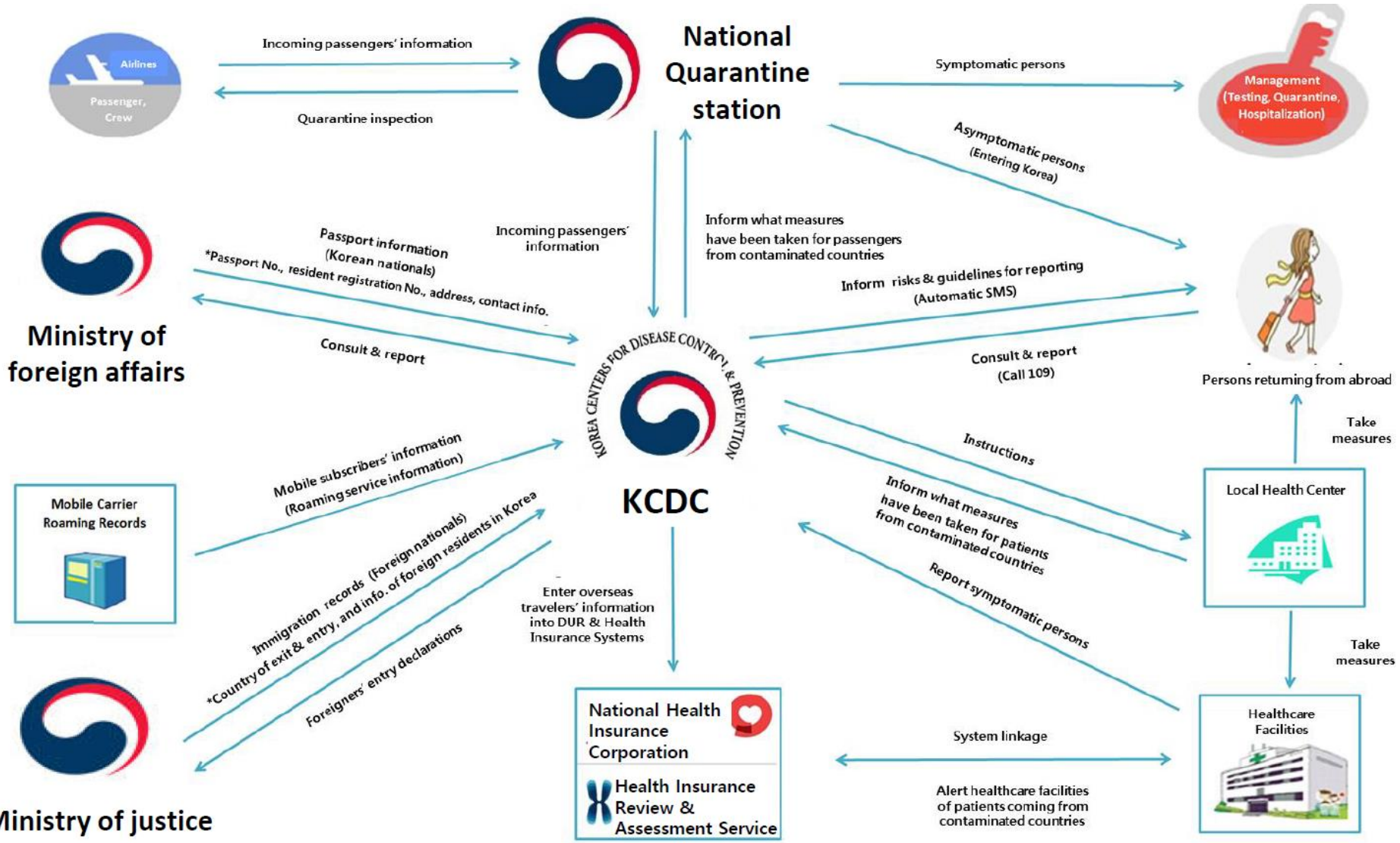
The Emergency Operations Center (EOC) is currently operating the **"Covid-19 Analysis Support System"** which is based on smart-city technology system using big data analytics. For the system to work properly, individuals' locational and travel data, medical records, sex, age, nationality etc. must be collected, processed and provided to and between agencies involved.

Act on Prevention and Management of Infectious Disease

Article 76-2 para1 stipulates that government agencies, public organizations, medical organizations, establishments, and individuals **are obligated to meet the request for information from the Ministry of Health and Welfare and/or KCDC for dealing with public health issues**

Article 76-2 para2 recently empowered **"Province, City, and local administrative authorities"** in addition to the existing authorities (MHW, KCDC) to request for locational data of confirmed patients etc. for the purpose of dealing with the Covid-19 crisis (amended on Mar 4, 2020)

Smart Quarantine Information System



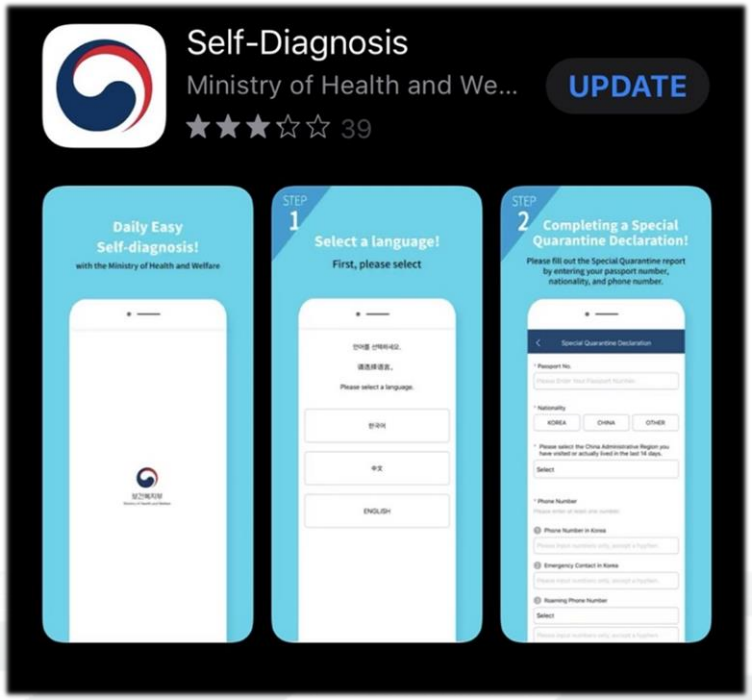
Source: Lee, Sun Gui (2020.3.27)

Covid-19 Analysis Support System

	Before	After
Analysis of Confirmed Case	Direct Analysis by epidemiology investigator (within 24 hrs)	Automatic analysis via system (within 10 min)
Access and Management of Personal Information	Manual access and management, lacking precision	Computer-automated management
Relationship among Agencies	Need to contact each agency, work overload	28 agencies communicate and share information via emergency operation center

Source: MOLIT (2020.3.25)

Self-Diagnosis Mobile Application



Outline

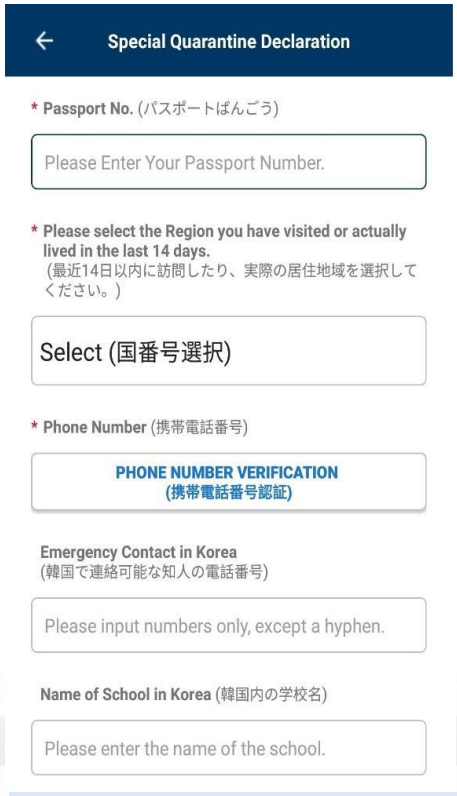
- To monitor and to control people who are required to self-quarantine

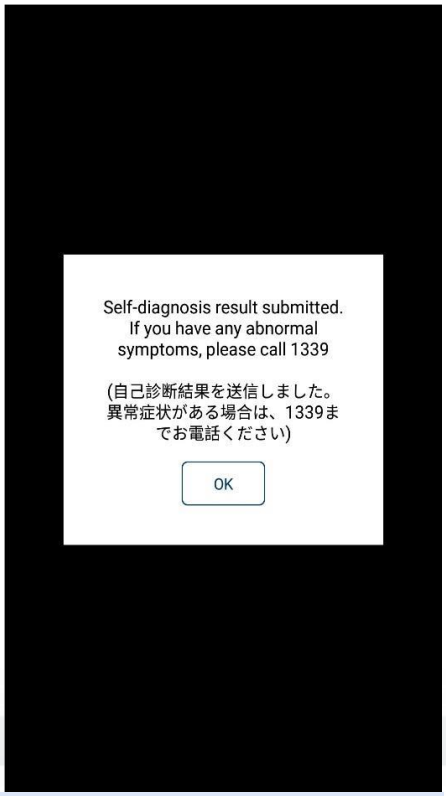
Functions

- Register personal information and addresses for self-quarantine
- Self-quarantine → Automatically inform the designated officer
- Automatically notify the designated officer when a quarantined patient is not abiding stay-at-home order
- Provide self-quarantine instructions and the designated officer's contact

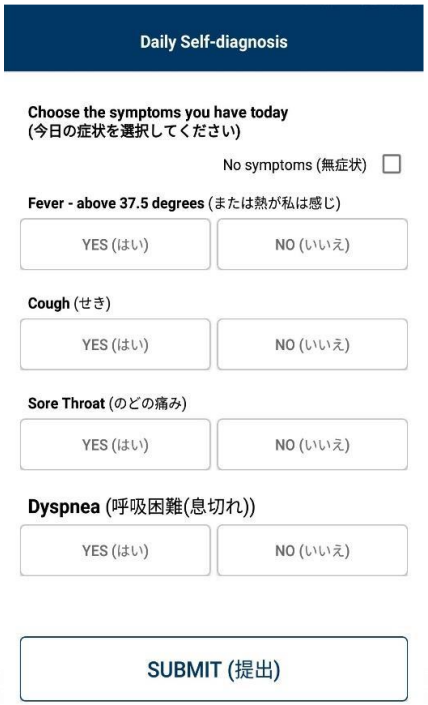
Self-Diagnosis Mobile Application

Start Self-Diagnosis with Mobile App





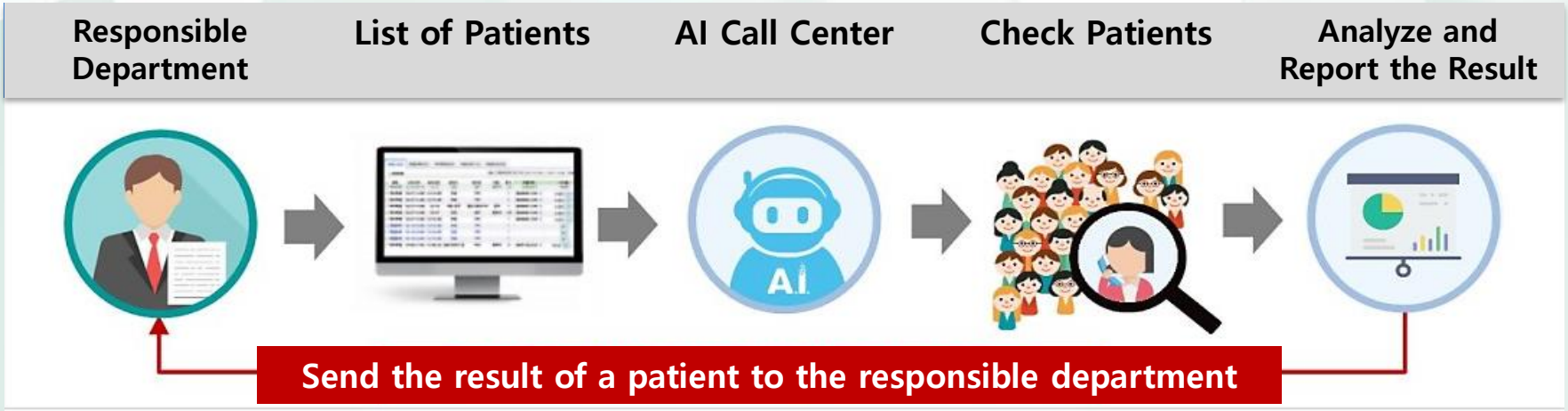
Proceed with Special Quarantine Form



Proceed with Daily Self Health Check

Source: Lee, Sun Gui (2020.3.27)

Hancom AI Check25 (AI call center)



- Hancom* has offered a free AI call center system based on voice recognition and analysis technology
- Checks the body condition (temperature, fever, cough, etc.) → turn responses into data and analyze them
- Allows to monitor the status of targets at a glance
- Resolves the problems of manpower shortage and system overload

* a comprehensive IT group in South Korea

Source: Southerton (2020.3.21)

Korea Centers for Disease Control & Prevention Call Center

- **Provide information and guidelines on major infectious diseases**
- **Provide information on infectious diseases that can affect overseas travelers**
- **Provide information on travel vaccinations**
- **Provide information on the methods of preventing, and the standards and process of reporting, notifiable infectious diseases**
- **Provide other KCDC information and connects you to a person in charge**

Service Hours
KCDC Call Center is available **24/7/365**
All the services are toll free only in Korea (international rates are charged outside of Korea)

Call-back Service
You will be offered a callback when all lines are busy.

For Foreigners
Please call **1345** (Immigration Contact Center) operated by the Ministry of Justice.
Service Hours : 09:00-22:00

Language : Korean, Chinese, English, Vietnamese, Thai, Japanese, Mongolian, Indonesian/Malay, French, Bengali, Urdu, Russian, Nepali, Khmer, Burmese, German, Spanish, Filipino, Arabic, Sinhala

Mobile Text Messages

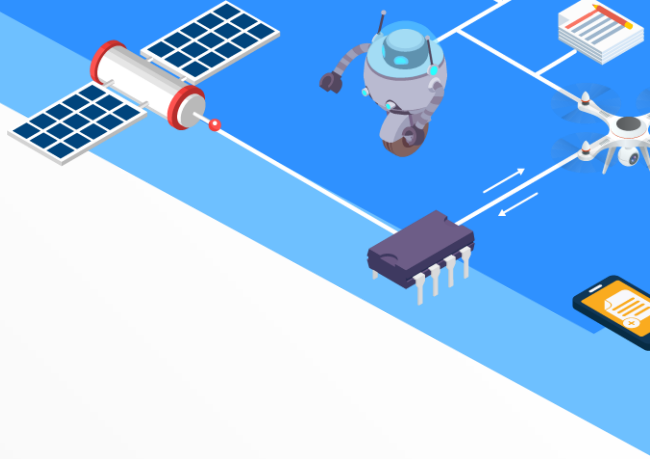
ACT ON THE MANAGEMENT OF DISASTERS AND SAFETY

The purpose of this Act is to establish disaster and safety management systems of the State and local governments and to prescribe matters necessary for the disaster prevention, preparedness, response, and recovery, activities for safety culture, and disaster and safety management, in order to preserve national land against various disasters and to protect citizens' lives, bodies, and property **[This Act enacted on March. 11, 2004]**

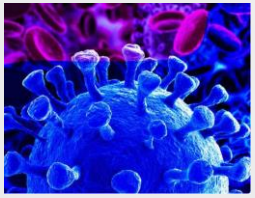
The State and local governments should actively disclose information about safety and make it convenient for anyone to use. **[This Article newly inserted on Dec. 3, 2019]**

"**disaster and safety communications network**" means a wireless communications network built and operated by a disaster management agency, emergency rescue agency, or emergency rescue and relief support agency to use for disaster management affairs or for consolidated supervision at disaster scenes.

For efficiently performing disaster broadcasting for the prediction, alert, and notification of a disaster or for the emergency measures and disaster management, a Central Disaster Broadcasting Consultative Committee may be established under the Central Committee..
This Act authorizes the government to send **mobile text messages (4G, 90 characters)** to reflect the action tips for each disaster situation.



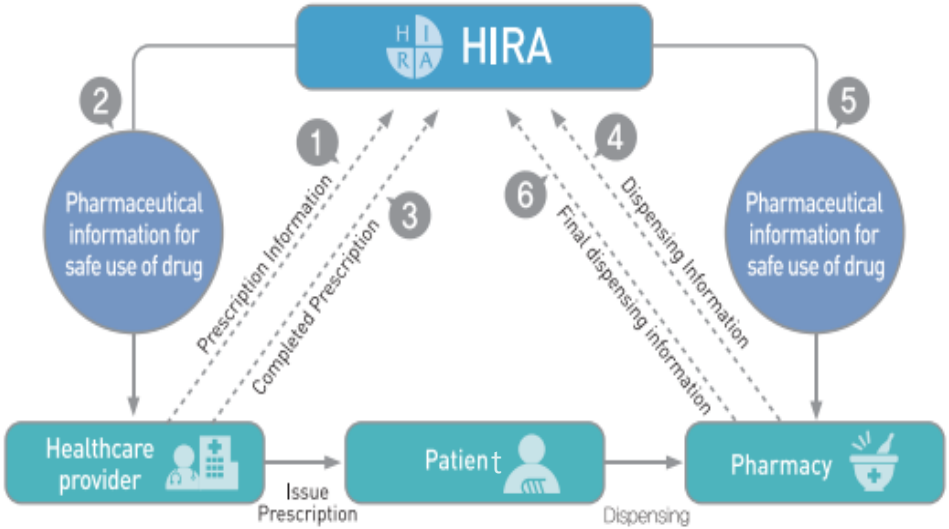
3 Public Masks and Open Data



Leveraging existing System and open data

How to manage the supply of masks: DUR (Drug Utilization Review)

The government utilized DUR system to prevent repeated sales of masks to the same person.
DUR system is real-time drug safety inspection program which checks the patient's medication history.



Source: www.hira.co.kr

** The government limits the number of masks people can buy to two per week to deal with a lack of supplies of masks and implemented 5-day rotation system for mask distribution depending on their year of birth*

Leveraging existing system and open data

The case of public-private cooperation: Mask App Service

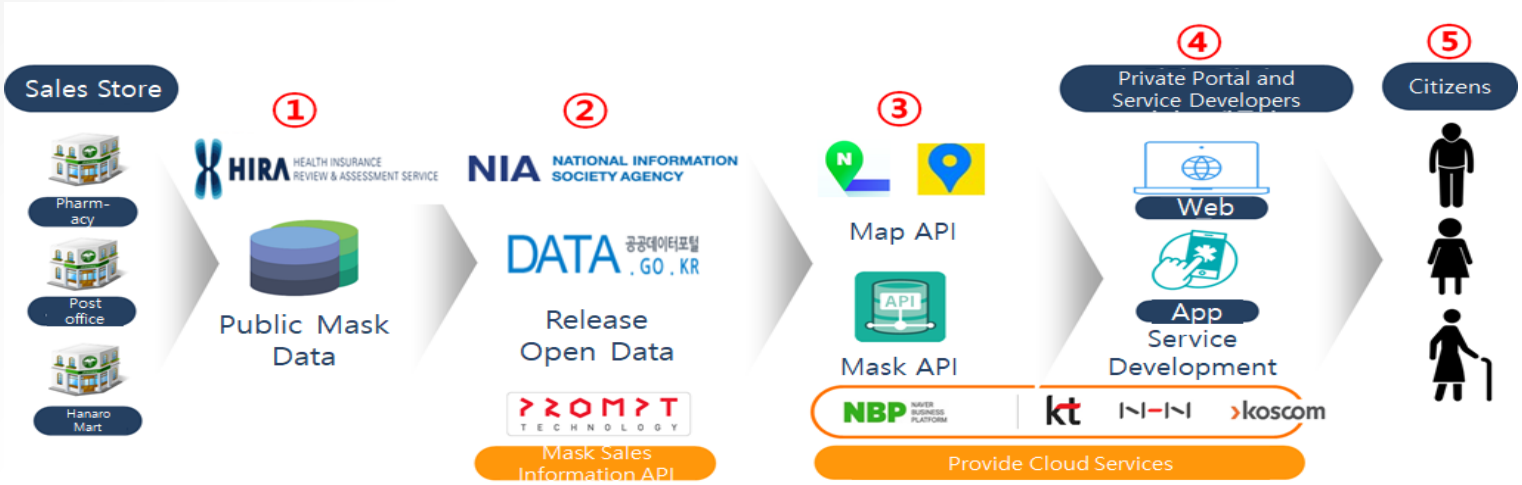
1. 'Public Mask Data' are collected on portal of HIRA (Health Insurance Review and Assessment Service)

2. NIA (National Information Society Agency) modifies the 'Public Mask Data'*
* data: name and location of the store, the code of store, amount in stock, date, etc.

3. NAVER, Kakao, and KT provide 'Public Mask Data' in the form of open API for developers

4. Cloud companies (NBP(NAVER Business Platform), KT, NHN, Koscom) provide the developers with Cloud for application development and operation

5. Launching web and mobile services based on cloud



Source: Chung, Tai. M (2020.3.27)

Leveraging existing system and open data

Providing open government data through portal

The Ministries released open data related to COVID-19 via data portal (www.data.go.kr) in the form of file data or open API

Organization (Data Provider)	Open Government Data
Health Insurance Review & Assessment Service	Information on real-time numbers of available masks, COVID-19 hospitals, etc.
The Ministry of Foreign Affairs	Information on global/regional COVID-19 situations and safety measures
The Ministry of Health and Welfare	Information on drive-through COVID-19 testing stations, COVID-19 screening center, designated public relief hospitals, etc.
The Ministry of Patriots and Veterans Affairs	Information on COVID-19 hospitals for veterans

Disclosure of COVID-19 patients' movement paths

Central and local government entities disclose the movement paths of infected patients as per the Infectious Disease Control and Prevention Act

Source: www.data.go.kr

Leveraging existing system and open data

Processing Datasets

The private-sector companies have processed the open government data and shared datasets

Developer	Shared Platform	Datasets
MINDs Lab	Git-hub (social coding platform)	Visualization of the passage of COVID-19 patients
Kaoni	https://www.ebssw.kr/corona19map/index.do	COVID-19 situation dashboard
Hanyang Univ.	Kaggle (a subsidiary of Google LLC, data analytics & machine learning platform)	Structured COVID-19 datasets by categories

Source: ETNews (2020.3.24)

Developing Websites and Mobile Apps

The variety of website and mobile apps have been developed to provide COVID-19 information to the public

Corona 100m	The app Corona 100m sends an alert to users when they come within 100 meters (328 feet) of a location previously visited by a confirmed patient.
KMA Corona Fact	The app KMA Corona Fact launched by Korea Medical Association, provides the number of confirmed patients, suspected patients and deaths from the coronavirus as well as links to global websites such as Baidu, WHO, etc.
Corona Doctor	The app Corona Doctor tracks the movements and information of confirmed patients, and provides information on designated hospitals and quarantine locations.
Corona Map	The app Corona Map marks in different colors the exact locations where each confirmed patient has been.

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