

The Strategy of Tracking Travel History of Infected Persons to Make Public and Impose Quarantine Measures

Currently, South Korea is one of the only countries that is keeping its borders open and still admitting individuals coming from foreign countries. It has not closed its borders like Europe and other nations, nor has it implemented a forced lockdown. Yet, the number of new infections has been kept steady at about 100 per day. I think that this is largely because of Korea's strategy to track its citizens' activities. Korea is tracking an infected person's detailed movements, down to even identifying the people they have come in contact with, to impose individual quarantine measures. In addition, they are quick to close down buildings at contaminated sites and quarantine the area. All of this takes no more than 24 hours to accomplish. They test many people quickly, and they are also swift to identify those that have had contact with the infected person, thus making their target of quarantine very clear and specific. But without such a system set in place, it is difficult to either identify the infected person or the people that have had contact with them. It is also hard to know what specific sites to block off and decontaminate. In this case, a nationwide lockdown and the closing of borders become the only viable method of control.

The Government's Decision to Analyze and Reveal Infected Person's Travel Data

The South Korean government is quick to reveal to the public the travel path of the infected person as soon as they have identified the individual. This kind of process may arouse feelings of unease in Western countries, as it is considered an intrusion of personal privacy. But upon closer examination, one can see that Korea is very careful to protect the personal identity of the individual as much as possible. While the infected person's travel history is revealed, their name, address, work place, and other readily trackable information is kept confidential.

The West may be quick to criticize this sharing of information as a violation of personal privacy, but in actuality, there has been no damage suffered by infected individuals as a result of their travel history being made public. It is very difficult to identify an individual with just that information. However, it can be said that there is a certain degree of an invasion of privacy when their cell phone and credit card histories are traced. But in order to reveal the exact locations the infected person has been in to prevent the further spread of the virus, it is hard to deny that there is a need to extract appropriate data. By using this technique of tracing travel histories, the impact of second and third wave infections may be lessened. In addition, people who see that they were at the same location, at the same time, as the infected individual can use that information to know that they should be tested and self-quarantine.

The basic process for self-quarantine is as follows. When an infected person is identified, the health department that initially confirmed the diagnosis reports it to the appropriate municipal office and Korea's Center for Disease Control and Prevention (KCDC), which is run by the central government. Then the person in charge of the public health surveillance of the Immediate Response Team interviews the patient to identify their route of travel in order to block off the contaminated sites. Next, KCDC requests telecom companies to share the patient's GPS information from their cell phones, and likewise asks for their transaction history from credit card companies. They also review their DUR (Drug Utilization Review) to find out where the patient purchased medicine, to retrace the route of the infected person ever more precisely. (On a side note, the municipal office can request footage of local CCTVs and conduct interviews during this process, but the GPS information on cell phones and credit card history can only be retrieved through KCDC. Upon receiving a request from the municipal office, KCDC requests the necessary information through the police department).

The municipal office utilizes CCTV footage, as necessary, to most accurately identify an infected person's travel route. Through this, they are also able to identify the people that came into close contact with the infected patient, and are thus able to know who needs to be quarantined. Moreover, they are able to identify other critical information such as: whether or not the patient was using a mask, if they were traveling with another person, their method of transportation, etc. The people who came into contact with the infected individuals are then messaged and placed into self-quarantine, and along with the appropriate health training that is necessary, they receive supplies that will be necessary for the quarantine period.

In order to minimize the degree of invasion of privacy and yet gather crucial information, an individual's route is only tracked from a day before they showed symptoms up to the period when quarantine started. They also do not reveal the full travel route of the infected patient, and take out information about their place of residence and work. In order to prevent the spread of the virus among people who came into close proximity with the infected person during this window of time, they identify the crowded locations the infected person travelled, where the probability of infection was likely the highest. By identifying which bystanders wore masks, how close they were to the infected person, and how long they were at that location, they decide which additional individuals should be recommended for self-quarantine. For example, they will not reveal the travel routes of individuals who were wearing protective masks and lingered only very shortly at the location where the infected person was.

Also, by revealing information to the public about how long the infected person was at that particular location and at what time, others are able to judge for themselves whether they should be tested for the virus. Utilizing CCTV footage and other similar means to identify people who were in close contact with the infected, KCDC recommends self-quarantine and closely monitors their state. Examples of some things they can do during this process are to identify taxi license plates, bus numbers, passenger information, etc. in order to inform all necessary parties that they have been in close proximity with the infected person, and thus recommended for testing and self-quarantine.

[Table]

Defining the Degree of Close Contact with the Infected

- 1) People who diagnosed or took care of the infected patient without proper protective gear
- 2) People who were in close proximity to the infected person (ie. family, co-workers, classmates, meet-up buddies). People who used the same method of transportation or were within close distance (2 meters) to the infected person showing symptoms

Credits: KCDC

To reiterate, this method of tracing one's travel history may seem very invasive to countries in the West, like European nations. But Korea has continually worked to reveal necessary information while minimizing the risk of violating the individual's privacy, and I personally think that this compromise achieves a correct balance between sacrificing certain rights of an individual's privacy and protecting the public health.

[Table]

The Travel History and Kinds of Information Revealed about the Infected

The infected patient's travel history and a record of who they came in contact with is revealed after taking into consideration individual privacy concerns, epidemiological needs, legal issues, etc.

The Kind of Information Revealed

- ① Applicable towards: Infected patients -> confirmed by medical professional and currently showing symptoms
- ② Period of public disclosure: According to Article 38.2 of the Disaster and Safety Control Law, after a warning has been issued
- ③ Extent of disclosure
 - Personal information: Will not reveal information from travel history that allows individual to be uniquely identified
 - Period of Revealed History: 1 day before showing COVID19 symptoms up to first day of quarantine
 - Reveals the method of transportation as well as location/time of when risk of infection was high
 - ✖ The degree of those considered to have been at risk due to proximity with the infected is determined by factors such as whether they were wearing a mask, duration of stay at location, etc.
 - Does not reveal address or workplace of infected
 - ✖ However, if there is a risk of several at the workplace having been infected, then the workplace could be revealed
 - Without disclosing information that would make it possible to track down the infected patient, they will reveal information about time/space that had high risk of infection
 - Building: A specific floor or room, and if a common arena, the specific time, specific store name, etc.
 - Names of Stores: The names of stores and address
 - Public Transportation: Route number, vehicle number, embarkation and disembarkation times
 - If all individuals that had contact have been successfully identified, then the above information may not be made public

Credits: KCDC

Associated Laws

The usage of personal information of the infected individuals carefully follows the protocol set forth by the law regarding the Prevention and Care of Infectious Diseases in order to carry out precise epidemiological surveys during critical, high-risk states. This law was enacted after experiencing the need for such protocols during the 2015 MERS outbreak. According to the law, during special circumstances, the appropriate government body can use personal information of its citizens, without first getting the individual's consent, after taking appropriate measures with the necessary governing agencies to carry out measures necessary for the prevention of widespread infection.

It is thus absolutely necessary to use the method of tracking individual travel histories only under a national crisis, and countries need such special laws, like South Korea, that will allow them to use such information to speedily identify infected individuals. Korea had to experience the 2015 MERS Outbreak to earn societal agreement for the need of such standards, and so there was a sense of societal consensus behind the creation of this law. As is the case, it will be understandably difficult to create similar laws under similar circumstances in other countries. But through this COVID19 pandemic, it is important for nations to create a societal discourse to earn public consensus to enact relevant laws, and if necessary, put it to the vote.

The Central Government's Implementation of a New COVID19 Tracking System

From March 16, the South Korean government has used Smart City technology to administer a system that supports epidemiological surveys. Previously, epidemiological analyses were conducted based on, as set forth by the law, The Ministry of Health and Welfare requesting the police for individual travel histories, and then going through the 19 municipal and the other district police departments to again request telecommunication companies to reveal the GPS history of individuals—a process which could take up to 24 hours.

Summary of COVID19 Epidemiological Survey Process



Main Characteristic: Infected Person's Travel Route System used to identify travel history within 10 minutes, automatically sorted and personal information uploaded as data for real time information sharing among the 28 facilities in the system network

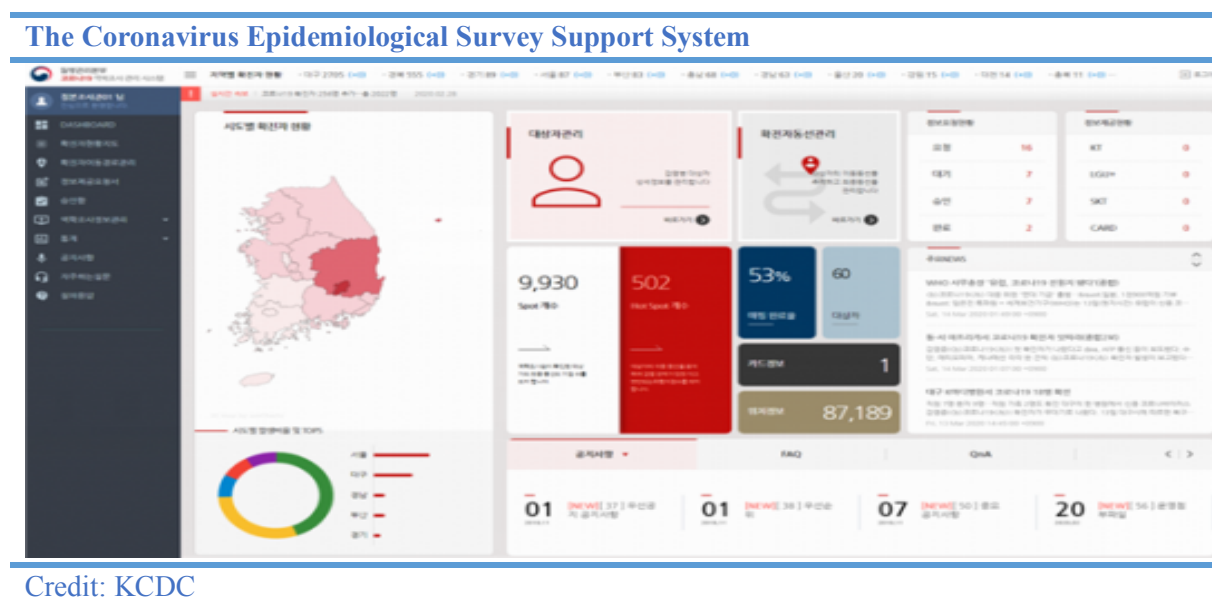
This newly developed system utilizes the cooperation of the police departments, Credit Finance Association, 3 major telecommunication companies, and the 22 credit card companies to update travel and transaction information in real time. In addition, analysis of big data is used to automatically determine travel route and location information per specified time period and reflect it visually on a map. It also analyses locations with a large pocket of infection to identify the spreader within that region, in addition to other analytical information. As the process to do the same task, which once took 24 hours, is now reduced to 10 minutes, it takes a heavy load off the epidemiological surveyors and allows for a much faster and efficient way to react to situations when mass infection occurs.

Security Maintenance of the System

The COVID19 epidemiological survey system uses a citizen's personal information, but ensures the safety of its maintenance by minimizing the number of subjects it must identify, and following a strict guideline for administration. If an epidemiologist determines that further information is necessary, they only ask for necessary information out of the pool of infected candidates, and are required to go through additional steps to request the cooperation of the police.

Only a limited number of people are allowed access to information on the system, and the rights are strictly divided based on departments. The viewing and analysis of data is only made available to KCDC's epidemiologist, and other central government officials are not allowed direct access to this information.

In order to prevent hacking from the outside, the system is operated under a private network with dual firewalls and a secure log-in process. All access and activity logs to the system are automatically saved and stored to prevent the misuse of private information and to promote responsible use of the data. This system will be run under a limited amount of time, explicitly for the purpose of dealing with the critical issue of infective diseases. As soon as the dangers of COVID19 pass, all private information of individuals will be deleted. During administration, a security official will continuously monitor the system, and experts in various fields will give their input as necessary to continuously strengthen the security of the system.




Travel Histories Made Public By Municipal Offices

During the beginning of the coronavirus pandemic, an infected person's travel history was independently monitored by KCDC (of the central government), but as the number of infected persons grew, data was also opened to municipal offices. The director of the Ministry of Health can grant rights to municipal branches. According to Article 3 of the guide outlining the right for the central government to grant administrative authority to municipal offices, the administration of daily occurring tasks can be delegated to the municipal powers.

Through this, each municipal office is individually making public the travel history of an infected person from their municipality, and when such a person is identified, the information is first uploaded to the municipal office's website and text messages sent to its residents.

Therefore, if only a nation's central government agency is held responsible for the role of making public the travel history of an infected individual, it will soon become overwhelming for it to cover a vast area of geographical regions. This responsibility should be delegated to the epidemiological team of each municipal office, and information should be gathered once again at the central government level and released again for verification. If there is yet no relevant law or standard to guide such processes, it is of course wise to take this step first. It is also important to clearly separate the roles of the municipal and central government agencies and systemize the process in order to avoid confusion and disorder.

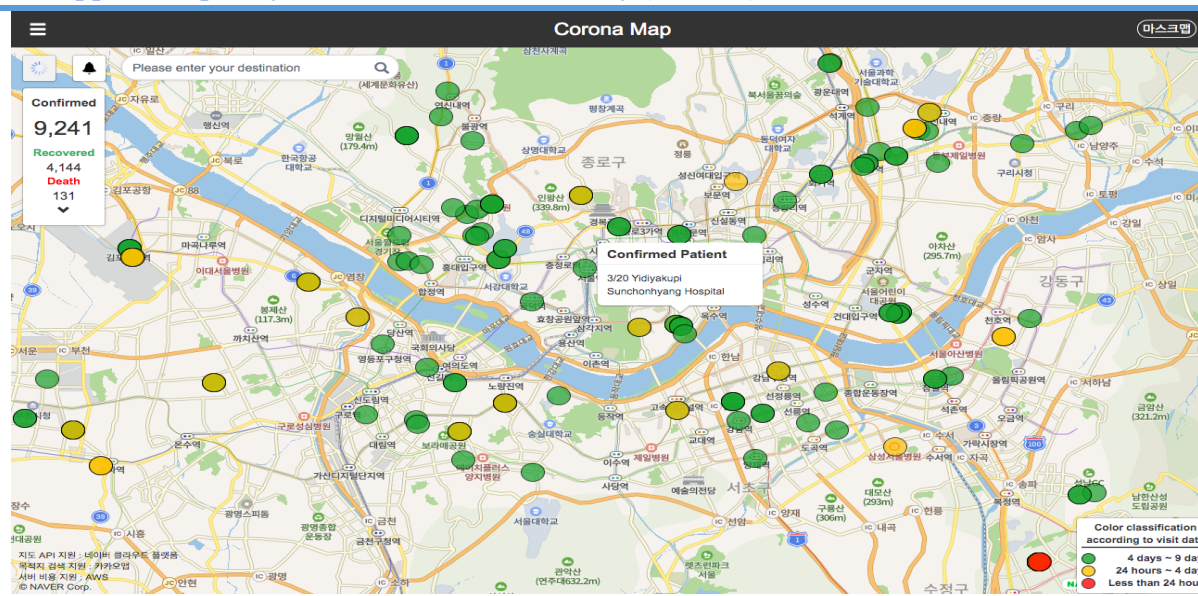
Municipal Office Releasing Travel Information to the Public (Homepage)	Municipal Office Releasing Travel Information to the Public (Cell Phone Text)
<p>지자체 소식</p> <hr/> <p>코로나19 강릉시 확진자 (강릉 6번환자) 동선 공개</p> <hr/> <p>강원도 강릉시</p> <p>강릉-6(40대/여자)</p> <p>3월 15일(일) 10:34 자택에서 외출 / 가족 1명 동행 / 자차</p> <p>3월 15일(일) 13:00~14:29 원주 소재 식당 / 동행자2명 (가족1, 지인1)과 점심식사 / 자차</p> <p>3월 15일(일) 16:09~18:04 강릉 로그옴 커피숍 / 동행자 2명 / 자차</p> <p>3월 15일(일) 18:30 강릉 자택으로 귀가 / 확진자와 가족 모두 마스크 착용 / 자차</p> <p>3월 16일(월) 09:17 자택에서 외출 / 혼자 외출 (마스크 착용) / 자차</p> <p>3월 16일(월) 09:43~10:15 강릉동인병원 외부 선별진료소 검체 채취 / 자차</p> <p>3월 16일(월) 10:58~19:45 강릉 교동 옷가게(매점) 영업 / 자차</p> <p>3월 16일(월) 20:05 자택으로 귀가 / 마스크 착용 / 자차</p> <p>3월 17일(화) 09:54 자택에서 외출 / 마스크 착용 / 자차</p> <p>3월 17일(화) 10:23~15:48 강릉 교동 옷가게(매점) 영업 / 자차</p> <p>3월 17일(화) 17:10 강릉의료원 입원 / 자차</p> <p>※ 추가 역학조사 결과에 따라 일부 수정 보완 가능</p>	<p> [안양시청][정정]4번째 확진자 동선 정정합니다 (2.22.)10:30~11:52 의왕 인더뷰카페>14:00~20:30 안산 선부동 시댁 저녁식사</p> <p>[안양시청] [2.23]11:06석천로171번길20우리마트>12:37양화로216 수스커피(테이크아웃) 4번째 확진자가 2.25일에는 수스커피에 방문하지 않았습니다</p> <p>오후 5:24</p>

Credit: (Left) Municipality Office of Gangneung gov.kr (Right) xetown.com

The Development of Coronavirus Tracking Apps by Non-Governmental Parties

According to foreign presses such as Reuters and CNN, South Korea's websites and apps that reveal the travel history of infected persons serve as a good model for other nations to follow. Of course there may be some difficulties to implement the same system in places where individual privacy is a much more sensitive issue. South Korea has successfully garnered the cooperation of the public in implementing this system for COVID19 tracking, and non-governmental, private parties used government released data to make applications that allows people to closely track the travel routes of infected persons. To date, there are over five applications that have been released to serve this purpose.

An App Developed by a Non-Governmental Party (Website)



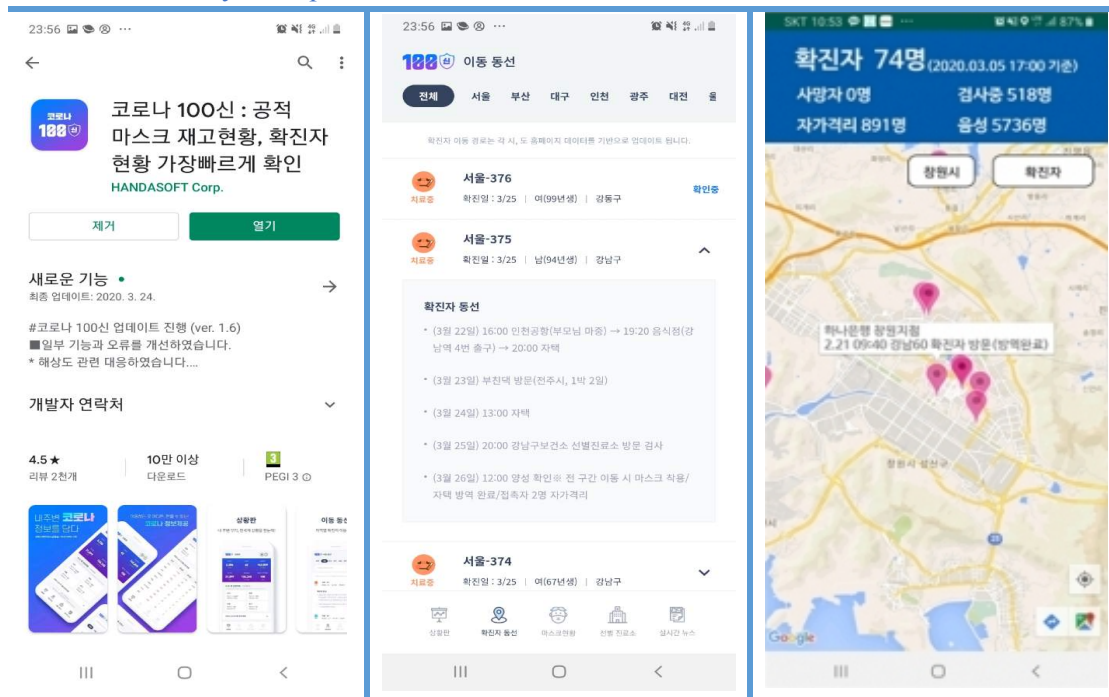
Credits: coronamap.site

To be more specific, the information that is released by the municipal and central government is gathered in one location for individual application developers to create apps that show the travel route of an infected person on a map to better visually convey critical information, such as the number of infected persons, locations they travelled, people showing symptoms, etc. A map can reveal at what time and at what place infected persons were, and what modes of transportation they used. People can check this information in real time and find out if they were ever in the same location, at the same time, as an infected person. If such is the case, they can visit a local health center and get a coronavirus test for free. It also allows people to avoid these contaminated sites and helps prevent the further spread of infection.

In this app, green indicates a route that is between 4 days and 9 days old, while yellow indicates information for a time period in which anywhere between 4 days and 24 hours have passed. Red indicates the most recent travel history of an infected person. As this indicates the highest risk for others, people can take extra precaution to avoid these red places, and feel safe in the areas that are marked green.

An Application Developed by Non-Governmental Party

- Coronavirus map applications reveal detailed information about an infected person's travel history in maps and words

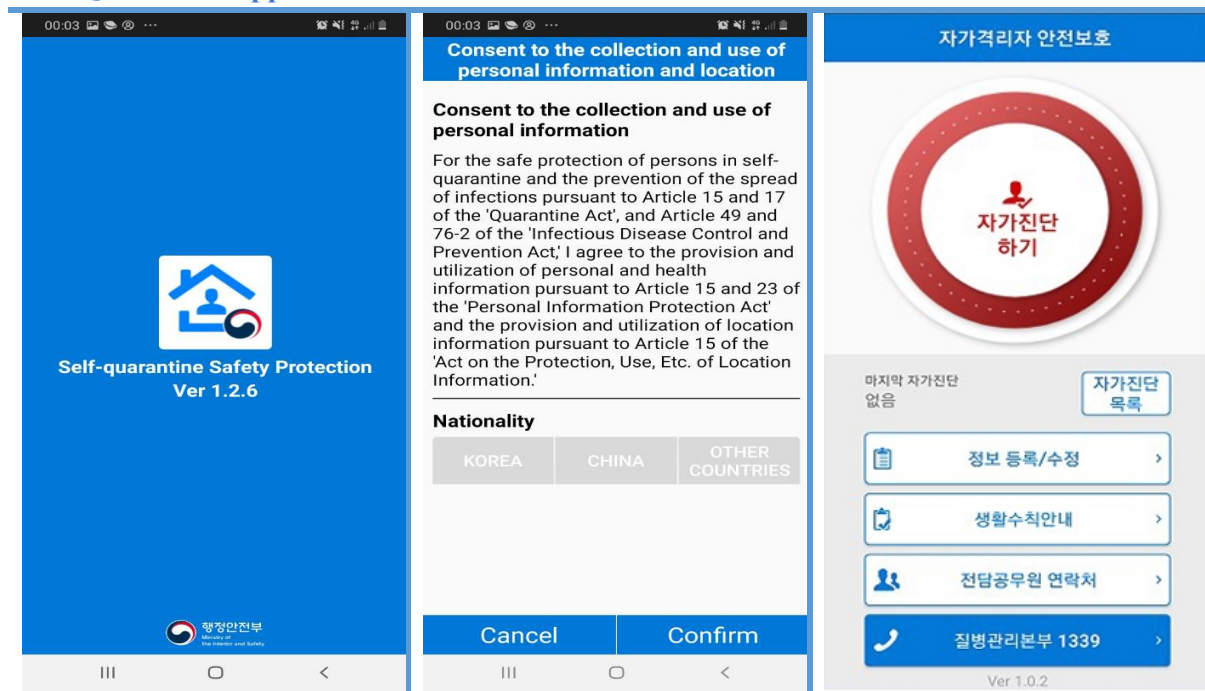


Credits: Google Play Store

Credits: Gyungnam
Coronavirus App

The Maintenance of Individuals in Self-Quarantine Through a Self-Quarantine App

Self-Quarantine Application



Credits: South Korean Government

There is also an app that can be used for self-quarantine and tracking purposes. It is the Self-Quarantine Application developed by the government. All people who are requested to self-quarantine are asked to download this app and use it for two weeks. This app is especially effective in making sure that a person under self-quarantine does not travel outside of their restricted boundaries during this period. It also allows for a relatively small number of government workers to oversee a large number of the infected population.

The Self-Quarantine app was developed by the government for the purpose of monitoring individuals, and it is required to be downloaded and installed for all people in quarantine. This app allows for the government worker that is put in charge of the user to directly communicate with (required twice per day) and monitor the condition of the individual. Once in the morning and once in the afternoon, an alarm rings with survey questions asking users to report any newly developed symptoms, such as fever, cough, headache, etc. by clicking Yes or No, and sending the answers.

The government worker in charge of monitoring the individual receives this data, and if symptoms have developed, appropriate actions are taken. If the person in quarantine does not submit the survey results, the government worker calls the individual to check in. In addition, the app uses the GPS system to ring an alarm if the self-quarantined individual travels outside the limits set in place. The app will also sound an alarm if the individual tries to turn off the GPS tracking function in an attempt to violate the restrictions. If an individual is confirmed to have travelled outside of their restricted limits, the government worker is required to report this to the police. To prevent cases where the cell phone is purposely left behind as the individual travels outside of set limits, the municipal government and police work together to run unannounced visits on self-quarantined individuals.

The app also has guidelines about daily life activities and reveals contact information of their designated government worker in order to ask questions and make requests as needed. When a self-quarantine order is made, the designated government worker walks them through the application installation, which can only be put to use after putting in the government worker's number and government ID. This app has two interfaces, one for the user and one for the government worker, and offers service in three languages (Korean, English, and Chinese).

As the number of individuals coming in from foreign countries has increased since March 30, the government has made it a requirement for all to install the Self-Quarantine application at the airport, or else admittance to the country is not permitted. Those that do not have a smartphone are required to give a number of a resident individual that can be contacted twice daily to check up on their status.

The Penalty for Self-Quarantine Violation

Up to mid-March, it was just recommended that foreign visitors to Korea be placed in self-quarantine. But such recommendations ignored, many continued to travel about and spread the disease widely. In addition, many of these spreaders were asymptomatic when they first entered the country, and only started showing symptoms after they started traveling around the country and eventually tested positive. If one such infected person was identified, the places they travelled had to be blocked off and people they came into contact with were tracked and put in self-quarantine. The damage done was big. This was when the government decided to make it mandatory for all coming in from foreign countries to enter a mandatory period of self-quarantine. Originally, a penalty of upwards to 3,000,000 KRW was set in place for those violating self-quarantine measures. After the passing of the coronavirus law, the

penalty has been increased to up to 10,000,000 KRW or one year in prison, effective as of April 5th. In terms of self-quarantine measures, much of the administrative rights have been delegated to the municipal offices. Busan operates its own operation center to which one can report self-quarantine violators.

Currently, South Korea's strategy is to treat asymptomatic individuals with equally great caution. They test widely and aggressively to track all necessary infected persons and put them in self-quarantine, while quickly closing off contaminated sites. As of current, this entire process does not even take a full day. Self-quarantined individuals are also attentive and careful to follow their given protocol. In order for this kind of orderly system to exist, a law has to be made and it must be ensured that there is enough administrative strength to implement it. The central government has to work flexibly with the municipal offices, and the dedicated labor of government workers is ever so vital.

Lastly, it should be mentioned again that while the invasion of individual privacy should be limited as much as possible, an individual should also be willing to sacrifice some discomfort to reveal necessary information for the sake of public health. These are the terms in which society must find consensus; the government and individual citizens must work together to communicate and make effective compromises.

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