Table S1. The representative surveillance system in the world.

Name of Surveillance system	Purpose	Working principle	Initiating Countries or Organization and time	Surveillance range	Effects or Current state	Others	Reference
Global Influenza Surveillance and Response System(GISRS)	For the surveillance of influenza virus and to make recommendations around laboratory diagnostics, vaccines, and risk evaluation, and to provide global alerts.	Through effective collaboration and sharing of viruses, data and benefits based on Member States' commitment to a global public health model.	Intercepted by World Health Organization (WHO) in 1952.	Supporting 6 collaborating centers, 4 essential regulatory laboratories, and 143 institutions in 113 WHO member states.	Global mechanism of surveillance, preparedness and response for seasonal, pandemic and zoonotic influenza; Global platform for monitoring influenza epidemiology and disease; Global alert for novel influenza viruses and other respiratory pathogens.		https://www.who.int/influenza/gisrs_laboratory/en/
Global Outbreak Alert and Response Network (GOARN)	To rapidly respond to international biosecurity outbreaks; To provide international public health resources to control outbreaks and public health emergencies across the globe.	As a technical collaboration of existing institutions and networks	Developed by the WHO in 2000.	Comprising over 250 technical institutions and networks globally that respond to acute public health events with the deployment of staff and resources to affected countries.	Coordinated by an Operational Support Team based at the WHO headquarters in Geneva and governed by a Steering committee, we aim to deliver rapid and effective support to prevent and control infectious diseases outbreaks and public health emergencies when requested.	Also contributes to long term epidemic preparedness and capacity building.	https://extranet.who.int/goarn/

Name of Surveillance system	Purpose	Working principle	Initiating Countries or Organization and time	Surveillance range	Effects or Current state	Others	Reference
Biosense	To enhance the nation's capability to rapidly detect, quantify, and localize public health emergencies, particularly biologic terrorism.	Collects electronic data from multiple governmental sources. By accessing and analyzing diagnostic and prediagnostic health data	Initiated by the CDC of the US in 2003.	From national, regional, and local health data sources (e.g., clinical laboratories, hospital systems, ambulatory care sites, health plans, U.S. Department of Defense and Veterans Administration medical treatment facilities, and pharmacy chains).	Biosense will establish near real-time electronic transmission of data to local, state, and federal public health agencies.		Https://www.cdc.gov/mmwr/preview/mmwrhtml/su5301a13.htm
The Antimicrobial Resistance Monitoring and Research Program	Responding to escalating antimicrobial resistance, to aid in infection prevention and control	Uses molecular characterization to understand and control antimicrobial resistance	Launched by the US Department of Defense in 2009.	consists of a network of epidemiologists, bioinformaticists, microbiology researchers, policy makers, hospital-based infection preventionists, and healthcare providers	Collecting relevant AMR data, conduct centralized molecular characterization, and use AMR characterization feedback to implement appropriate infection prevention and control measures and influence policy.		https://academic.oup.com/cid/article/59/3/390/289597

Name of Surveillance system	Purpose	Working principle	Initiating Countries or Organization and time	Surveillance range	Effects or Current state	Others	Reference
The National Notifiable Disease Reporting System (NNDRS)	For outbreak detection and rapid response to infectious diseases.	Report confirmed cases about legal infectious disease to their superior department	Developed by the Chinese CDC since 2003.	Covering almost all of China	Less efficient; Lacking the horizontal information sharing function, and hospitals lack data comparison of patients with the same symptoms		Http://www.doc88.com/p-3512171864992.html
The Chinese National Influenza Surveillance Network (CNISN)	For surveillance and control of influenza-like cases; To strengthen the work of influenza surveillance and disease control.	pioneered the work on the influenza ecology and surveillance in the mainland of China	Housed and managed by National Institute for Viral Disease Control and Prevention since 1957.	Covers 408 network laboratories and 554 sentinel hospitals	Plays an important role in the surveillance and control of influenza-like cases, notably in the fight against avian influenza A(H7N9) in 2013		http://ivdc.chinacdc.cn/cnic/en/Aboutus/

Name of Surveillance system	Purpose	Working principle	Initiating Countries or Organization and time	Surveillance range	Effects or Current state	Others	Reference
The Laboratory Response Network (LRN)	Detecting biothreats through identifying pathogen , analyzing its origin , virulence, and antimicrobial-resistance	Laboratory-based surveillance: based on detection capabilities at a molecular level, normally through network laboratories	Established in 1999 by the US CDC, the Federal Bureau of Investigation, and the Association of Public Health Laboratories	Covers about 160 reference laboratories including state and local public health, veterinary, military, and international labs.	Playing an instrumental role in improving domestic public health infrastructure by helping to boost laboratory capacity in the US.		http://emergency.cdc.gov/lrn/index.asp
Biowatch	The Department of Homeland Security's biowatch Program provides early detection of a bioterrorism event and helps communities prepare a coordinated response. The combination of detection, rapid notification, and response planning helps federal, state, and local decision-makers take steps to save lives and mitigate damage.	Analyzing biological threats through sampling aerosols from key areas	Developed by the US in 2003.	Environment-based surveillance: promoting the detection of aerosolized biological agents.	Environmental detection systems comprise the remote detection of aerosol clouds and environmental point detection systems		Https://www.dhs.gov/publication/biowatch-program-factsheet

Name of Surveillance system	Purpose	Working principle	Initiating Countries or Organization and time	Surveillance range	Effects or Current state	Others	Reference
The Early Aberration Reporting System（EARS）	To analyze symptoms monitoring data from various sources in order to detect bioterrorism incidents in time. Later extended to detection of outbreaks and early warning analysis of seasonal infectious diseases.	Web-based surveillance: utilizing nontraditional public health data sources such as school/work absentee estimates, over-the-counter medication sales, 911 calls, ambulance run data, and veterinary data.	Developed by the U.S. Centers for Disease Control and Prevention (CDC) in 2002 (after 9/11).	This EARS system applies aberration detection algorithms to New Zealand notifiable disease surveillance data and flags anomalies.	Over-the-counter electrolyte sales preceded hospital visits for respiratory or gastrointestinal illnesses by 2.4 weeks	Aberration detection algorithms are used by the EARS system to flag events for follow-up	Http://www.bt.cdc.gov/surveillance/ears/
Google Flu Trends	To predict flu outbreaks based on web searches of google users.	Through monitoring daily health-searching behaviors.	Launched in 2008 but abandoned in 2015, by the Google Inc. And the CDC	The areas that users could access Google Flu Trends	Although it was reported to be able to, its predictions were doubted not accurate enough, its predictions were doubted not accurate enough, with the predicting results much larger than the actual influenza-like illness (ILI) provided by the US CDC.		Https://blogs.scientificamerican.com/news-blog/google-flu-trends-your-own-disease-2008-11-12/

Name of Surveillance system	Purpose	Working principle	Initiating Countries or Organization and time	Surveillance range	Effects or Current state	Others	Reference
Health map	To classify warnings by location and disease, and label them on the interactive map.	Integrating data from various electronic sources, including news media, professional records, and official warnings, and using automated data mining and analysis. Aided by artificial intelligence	Developed by Boston Children Hospital, US in in 2006.	worldwide	Alarmed the COVID-19 as early as on December 30, 2019.		https://www.sciencemag.org/news/2020/05/artificial-intelligence-systems-aim-sniff-out-signs-covid-19-outbreaks

Name of Surveillance system	Purpose	Working principle	Initiating Countries or Organization and time	Surveillance range	Effects or Current state	Others	Reference
Global Emerging Infections Surveillance （GEIS）	To improve infectious disease surveillance, prevention, and response; To support surveillance and outbreak response efforts in four infectious disease; To mitigate the threat of emerging infectious diseases to the US. military through a global laboratory network.	Through strengthening surveillance, outbreak response, collaboration, and coordination of the global DoD laboratory network.	Established in 1997 by the Department of Defense (DoD), US	Focusing areas in concert with Geographic Combatant Commands (GCC) priorities: antimicrobial resistant infections (including sexually transmitted infections), enteric infections, febrile and vector-borne infections, and respiratory infections.	Addressing militarily relevant infectious disease threats and informing force health protection (FHP) decision making.	Informing FHP decision and policy making through timely dissemination of surveillance information to key stakeholders Enhancing national and global health security by preventing, detecting, and responding to infectious disease threats Informing DoD and interagency research and development of infectious disease countermeasures such as diagnostic tools, prophylaxes, therapeutics, insecticides, and personal protective equipment	https://health.mil/Military-Health-Topics/Combat-Support/Armed-Forces-Health-Surveillance-Branch/Global-Emerging-Infections-Surveillance-and-Response
COVID-19 map	To provide timely and visualized COVID-19 data for the access of the world including researchers,	All data collected and displayed are made freely available through a	Developed by the Johns Hopkins	Global COVID-19 including the cases of	Over 1200 citations in the first 4 months since its publication. Considered authoritative as source	The dashboard are now included in the ESRI Living Atlas.	https://coronavirus.jhu.edu/map.html

Name of Surveillance system	Purpose	Working principle	Initiating Countries or Organization and time	Surveillance range	Effects or Current state	Others	Reference
	public health authorities, and the general public.	GitHub repository, along with the feature layers of the dashboard.	Coronavirus Resource Center (CRC) in 2020.	infected, death, recovered, and etc., categorized by countries and county.	of global COVID-19 epidemiological data.		
EpiPulse - the European surveillance portal for infectious diseases	For European public health authorities and global partners to collect, analyse, share, and discuss infectious disease data for threat detection, monitoring, risk assessment and outbreak response.	Collection, analysis and dissemination of indicator- and event-based surveillance data on infectious diseases and associated health issues, including global epidemic intelligence, whole-genome sequencing, and health determinants.	Launched on 22 June 2021 by the European Center of Disease Control and Prevention	Global epidemic intelligence, whole-genome sequencing, and health determinants.	Integrating several surveillance systems that were previously independent (The European Surveillance System (TESSy), the five Epidemic Intelligence Information System (EPIS) platforms and the Threat Tracking Tool (TTT)), provides new functionalities and seamless access to data in a single platform.		https://www.ecdc.europa.eu/en/publications-data/epipulse-european-surveillance-portal-infectious-diseases

Table S2. The representative surveillance organization, program or regulation in the world.

Surveillance organization, program or regulation	**Purpose**	**Iniciating Countries or Organization**	**Surveillance range**	**Iniciated or revised year**	**Effects or Current state**	**Others**	**Reference**
International Health Regulations (IHR) 2015	For surveillance system tracking .	The WHO	Expanding specific high-priority infectious diseases to include novel and changing public health risks	Revised in 2005	More than a guideline but not legislation; it relies on individual countries to self-report and is not strictly enforceable		https://www.who.int/ihr/finalversion9Nov07.pdf

The National Strategy for Countering Biological Threats	To manage the risks from naturally occurring and deliberately introduced diseases	Issued by the White House	Currently, it has established more than 4,000 surveillance sites in more than 30 major US cities, and has an international surveillance network that impacts at least 92 countries	In 2009		At present, US surveillance encompasses human-, animal-, and plant-related health for a "full spectrum type threat"	https://irp.fas.org/congress/2010_hr/biothreat.pdf

The European Center of Disease Control and Prevention	For timely alert of infectious disease outbreaks	Established	Covers 46 diseases including severe acute respiratory syndrome, West Nile fever, and avian influenza	In 2005	Is integrated into the national crisis prevention system to support early evaluation and decision-making in response to potential biosecurity threats		https://www.ecdc.europa.eu

Integrated Disease Surveillance and Response (IDSR) programs	To make surveillance and laboratory data more usable, helping public health managers and decision-makers improve detection and response to the leading causes of illness, death, and disability in African countries.	With funding from USAID, CDC's IDSR team collaborated with WHO/AFRO to lead the development of the IDSR framework and the design and development of the Technical Guidelines for Integrated Disease Surveillance and the IDSR Training Modules	43 countries in the African region	in 1988	The US CDC has played a leading role in designing, developing, implementing, monitoring and evaluating IDSR since its inception in 1988.		https://pubmed.ncbi.nlm.nih.gov/30496177

Africa CDC	To support public health initiatives of Member States and strengthen the capacity of their public health institutions to detect, prevent, control and respond quickly and effectively to disease threats.	A specialized technical institution of the African Union	Supporting African Union Member States	Officially launched in January 2017	greatly improving surveillance, emergency response, and preventon of infectious diseases	Guided by the principles of leadership, credibility, ownership, delegated authority, timely dissemination of information, and transparency in carrying out its day-to-day activities	https://africacdc.org/

the National Surveillance Integration Center (NBIC)	To integrate surveillance information and support an inter-agency surveillance community coordination and interoperability across agency borders to meet the surveillance requirements in terms of timeliness, sensitivity, specificity, and routine analysis of data	As part of the DHS Office of Health Affairs, US	serves as a bridge between federal, state, local, territorial, and tribal partners to integrate information from thousands of sources about biological threats to human, animal, plant, and environmental health, improving early warning and situational awareness.	In 2007	To enable early warning and shared situational awareness of acute biological events and support better decisions through rapid identification, characterization, localization, and tracking.	An evaluation report by the US General Accounting Office found that NBIC still lacked coordination and interoperability across agency borders	https://www.dhs.gov/taxonomy/term/2649/all/feed