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# 2021 Annual Report

Taiwan Centers for Disease Control

# CDC

2021 | Centers for Disease Control Annual Report

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# Message from the Director-General

In 2020, COVID-19 wreaked havoc around the world, overwhelming medical and health systems in countries across the globe, seriously hindering socioeconomic development, and transforming people's lifestyles. In this annual report, we illustrate how the Taiwan Centers for Disease Control (Taiwan CDC), the competent authority in charge of nationwide communicable disease prevention and control, protected the safety of our nation's citizens during the worst pandemic in a century.

Taiwan's experiences of battling SARS in 2003 led it to uphold four main principles when responding to COVID-19: timely response, early deployment, prudent actions, and transparency. We benefitted from democratic governance and strength in technology, which resulted in a high degree of public compliance for each disease prevention measure. In 2020, there were hardly any large-scale outbreaks of domestic cases in Taiwan; most of the confirmed cases were imported. Since Taiwan did not need to impose any lockdowns or adopt other extreme disease prevention measures, people could go about their normal lives. Taiwan's disease prevention strategies in this fight against COVID-19 are summarized in the "Focus" section of this annual report, in order to share the "Taiwan Model" with the world.

In 2020, while Taiwan and the rest of the world jointly combated COVID-19, and several vaccines were developed, providing a light at the end of the tunnel in this fight against COVID-19, the intermediate outcome of the fight shows just how difficult it is to beat this disease. SARS-CoV-2, the virus that causes COVID-19, is sly,

having mutated to variants possessing even greater transmissibility and pathogenicity. The long, drawn-out struggle has led to disease prevention fatigue among the general public, creating an even greater challenge to those tasked with preventing and controlling the spread of COVID-19. Therefore, it has become more critical for countries to cooperate, share their research results, and jointly develop new techniques, so that everyone can return to a normal way of life as soon as possible. As a member of the international community, Taiwan is wholeheartedly willing to join in these efforts towards achieving the goal of global health security.

Jih-Haw Chou, D.D.S., M.P.H.
Director-General, Taiwan Centers for Disease Control


# 01

# About Taiwan CDC

# About Taiwan CDC

Owing to the reorganization of the Executive Yuan and its subordinate agencies, the Taiwan Centers for Disease Control (Taiwan CDC) was organizationally restructured in 2013. Taiwan CDC is the agency in charge of communicable disease control in Taiwan and shall implement the following matters:

1. Planning and execution of policies and relevant regulations concerning the prevention and control of communicable diseases.
2. Prevention, control, investigation, research, and laboratory testing of various communicable diseases.
3. Reporting and surveillance of diseases within the country; collection and exchange of international disease information.
4. Preparedness, response, and emergency management of disease outbreaks.
5. Provision of pharmaceuticals for disease control, government-funded vaccines, biologics, and immunization against notifiable disease.
6. Quarantine and sanitary control of international airports and ports; health management of migrant workers.
7. Formulation of laboratory testing standards of various diseases; verification of laboratory testing; biosafety management.
8. Training of disease control and quarantine professionals.
9. International cooperation and exchanges on disease control.

## Organizational Structure

Taiwan CDC is under the command of the director-general, who is assisted by two deputy directors and a chief secretary. Since government restructuring in July 2013, Taiwan CDC has comprised six divisions, five offices, two centers, six regional centers, and two task forces (Figure 1-1), as follows:

1. Six Divisions: Division of Planning and Coordination; Division of Acute Infectious Diseases; Division of Chronic Infectious Diseases; Division of Preparedness and Emerging Infectious Diseases; Division of Infection Control and Biosafety; Division of Quarantine
2. Two Centers: Epidemic Intelligence Center; Center for Diagnostics and Vaccine Development
3. Five Offices: Information Management Office; Secretariat; Personnel Office; Accounting and Statistics Office; Civil Service Ethics Office

4. Six Regional Centers: Taipei Regional Center; Northern Regional Center; Central Regional Center; Southern Regional Center; Kaohsiung-Pingtung Regional Center; Eastern Regional Center
5. Two Task Forces: Public Relations Office; Office of Preventive Medicine

**Figure 1-1 Organization**


Distribution of Employees by Gender, Age, and Education: At the end of December 2020, there were 787 Taiwan CDC employees, with a male to female ratio of 1:3. Average age was 42.1 with 72.3% under 49 years old (Table 1-1). About 44% graduated from university or college while 55% completed a graduate school degree (Table1-2).

### Table 1-1 Age Distribution of Taiwan CDC Employees

| Under 29 years | 30-39 years | 40-49 years | 50-59 years | 60-65 years |
|---|---|---|---|---|
| 12.7% | 29.1% | 30.5% | 24.4% | 3.3% |

### Table 1-2 Education Level of Taiwan CDC Employees

| Graduate School | University | College | High School or Under |
|---|---|---|---|
| 54.6% | 32.5% | 11.9% | 0.8% |

## Core Values of Taiwan CDC

**1. Expertise Cultivation**

Putting science and new knowledge into action to strengthen Taiwan's capacity for preventing and confronting emerging infectious diseases.

**2. Pragmatic Actions**

Working relentlessly around the clock to implement disease prevention measures and ensure the health and wellbeing of the people in Taiwan.

**3. Concerted Efforts**

Cooperating with central and local governments, experts, and NGOs in epidemic control; strengthening international cooperation to keep abreast of the latest knowledge and technology.

**4. Securing Public Trust**

Enhancing communications to ensure public access to real-time information and win the public's trust and praise.

# 02

## 2020 Focus - COVID-19 Pandemic and Control

# Focus: COVID-19 Pandemic Control

At the end of 2019, COVID-19 began to quickly spread around the world, carried by people moving across borders. By the end of 2020, more than 82 million people had been infected and more than 1.8 million people died as a result of this disease. Cases spread to 191 nations and regions, many of which resorted to lockdowns in the face of overburdened health systems, and as a result severely affected people's normal way of life.

After battling SARS in 2003, Taiwan has remained vigilant of epidemics by strengthening its monitoring systems and response capacity. Face with COVID-19, the worst pandemic in a century, Taiwan preemptively acted based on four main principles: timely response, early deployment, prudent actions, and transparency. Hard work and technological prowess demonstrated by the government, private entities, and everyone in the country contributed to innovative disease prevention policies. In 2020, most COVID-19 cases in Taiwan were imported and there were hardly any large-scale local outbreaks. Since Taiwan did not need to impose any lockdowns or adopt other extreme disease prevention measures, people could go about their normal lives.

## Taiwan's COVID-19 Prevention Measures

1. **Planning, Command, and Allocation**

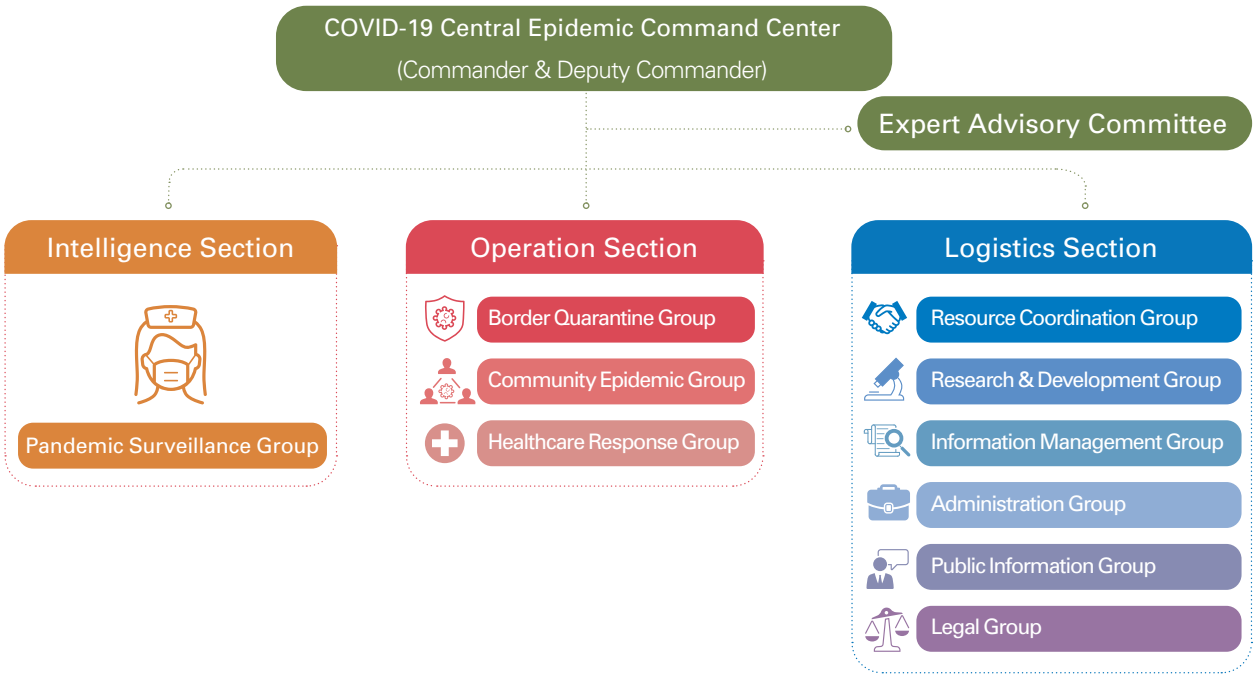
   On December 31, 2019, as reports of pneumonia of unknown etiology emerged in Wuhan, China, Taiwan promptly informed the World Health Organization (WHO) and formulated a response and preparation plan. On January 20, 2020, Taiwan established the Central Epidemic Command Center (CECC) for Severe Pneumonia with Novel Pathogens, which was responsible for comprehensive planning and integration of resources and personnel at all levels of the government, aiming to quickly conduct disease prevention and control tasks. Before the WHO announced COVID-19 as a Public Health Emergency of International Concern on January 30, 2020, Taiwan had already implemented a series of response measures.

   The CECC's framework consists of three main sections: intelligence, operation, and logistics. These sections oversee 10 groups and include officials from various departments and agencies. Disease prevention tasks are assigned among different groups, and the Expert Advisory Panel consists of experts and scholars who offer medical recommendations and professional advice on techniques for preventing disease.

2. **Pandemic Surveillance and Risk Assessment**

   When facing an emerging infectious disease, event-based surveillance is critical. At the end of 2019, when Taiwan first discovered pneumonia of unknown etiology in Wuhan, authorities began to investigate the sources of such information on the nation's popular online forum PTT. Throughout the pandemic, officials continued to use social media

## Organizational Structure of CECC




for timely monitoring and identification of disease-related information. By gathering information on COVID-19 and public sentiment from a wide variety of channels, Taiwan was able to build a database covering the pandemic situation and prevention measures of various countries around the world. This was used to judge the situation in each country and categorize their risk level. These data became a valuable reference for subsequent disease prevention policies and decision-making.

In January 2020, as the COVID-19 situation in Mainland China gradually became more severe, in consideration of the frequent cross-strait travel between Taiwan and Mainland China, Taiwan Centers for Disease Control (Taiwan CDC) classified COVID-19 as a Category 5 Communicable Disease that requires suspected cases that meet the conditions for case reporting to be reported within 24 hours of detection. At this early stage, since disease symptoms, transmission modes, and severity were unclear, officials made rolling changes to criteria for case reporting based on the latest domestic and international situation and research. Community monitoring and testing criteria were broadened several times, with the objective of improving monitoring sensitivity.

### 3. Strict Management of Border Risks

On December 31, 2019, Taiwan strengthened border quarantine measures to include onboard quarantine inspections of passengers on direct flights from Wuhan. As the international COVID-19 situation worsened, Taiwan quickly adjusted and expanded border control measures. On March 19, 2020, Taiwan banned entry of all foreign nationals. All inbound passengers were required to undergo 14 days of home quarantine.

Furthermore, other measures were adopted, including a reduction in the number of cross-strait flight routes from airports in China to only five airports, suspension of airport transfers and berthing of cruise ships in Taiwan's ports, and suspension of cross-strait passenger boat services, to lower risks caused by the additional movement of people.

To continue necessary international social, economic and trade activities, Taiwan permitted flexible adjustments to quarantine measures for ships and airlines under the precondition that disease prevention safety could be upheld. These changes ensure continued operations in the fishing, offshore wind power, and airline transport industries. Rolling adjustments reduced the number of days in quarantine for short-term business travelers from moderate-to-low risk countries.

Due to the severity of the COVID-19 pandemic globally, on December 1, Taiwan introduced strengthened disease prevention measures under the Fall-Winter COVID-19 Prevention Program. All international passengers who arrived at or transited through an airport in Taiwan were required to show a certificate of a negative COVID-19 RT-PCR test report issued within three days (working days) prior to boarding their flight.

**4. Implementing Community Disease Prevention**

In order to prevent the virus from entering communities and spreading further in Taiwan, Taiwan CDC introduced a number of prevention measures, including enhanced reporting of suspected cases, expanded community monitoring, and early detection of confirmed cases and complemented these measures with follow-up quarantine and isolation treatment as well as timely updates on patients' conditions. People at risk of infection were subject to tracking and management measures. Smart technologies and cross-departmental cooperation supported the plans of local governments to provide services and implement home isolation and quarantine procedures. Disease prevention measures and related recommendations for densely populated areas or activities further strengthened safety at places with high risk of transmission.

Since the COVID-19 situation in Taiwan was relatively stable, we began to relax control measures and restrictions starting on June 7, 2020, allowing people to return to a normal way of life and regular business activities to resume. We continue to encourage members of the general public to carry out a new lifestyle for disease prevention, which emphasizes frequent handwashing, mask wearing, regular body temperature taking, social distancing, contact information registration at public venues, and regular environmental cleaning and disinfection. Through these measures, we can lower the risk of disease transmission in the community.

**5. Strengthening Medical Preparedness**

After the SARS epidemic, Taiwan sought to build the "Communicable Disease Control Medical Network," which designated response hospitals and negative

pressure isolation wards in every city and county. The response plan also included annual drills and training.

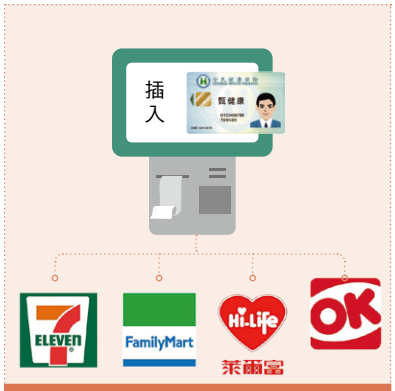
The COVID-19 pandemic posed a major challenge to Taiwan's medical system. To achieve our three goals of slowing the speed of disease transmission, maintaining operations of the medical system, and reducing the number of severe cases and deaths, Taiwan introduced 10 contingency and preparedness plans for healthcare facilities, long-term care facilities, and biosafety laboratories. These plans were: strengthening infection control and biosafety; conducting onsite inspections and response drills without prior notice; designation, tracking, and management of risk levels in individual cases through the National Health Insurance System and handling and treatment of the cases; traffic control bundling and patient ward segregation and bidirectional referrals; preparedness strategies for response hospitals and designated wards; building a national testing network; keeping track of the capacity of the medical system to receive and treat patients; increasing the capacity of group quarantine facilities; entry/exit restrictions and personnel control in medical and care institutions; and strengthening health monitoring among healthcare workers.

**6. Allocation of Disease Prevention Resources**

Due to experiences of battling SARS, Taiwan already had a 3-tier safety and reserves system in place for disease prevention resources before this pandemic began. Taiwan CDC, local governments, and hospitals were all required to maintain a safe stockpile of personal protective equipment including surgical masks, N95 masks, and coveralls. The government built an information system to manage these resources so that personal protective equipment can be quickly supplied to health workers and disease prevention personnel in the event of a disease outbreak.

Name-based Mask Distribution System 1.0: Pharmacies and local health centers sell masks.


Name-based Mask Distribution System 2.0: Adds online access. Everyone can preorder masks by using the eMask system.




Name-based Mask Distribution System 3.0: Adds the pre-ordering service at convenience stores.

Implementing a name-based mask distribution system to improve mask distribution.

Shortly after the emergence of the COVID-19 epidemic, there was a rising public demand for masks driven by fear of a mask shortage. The Ministry of Economic Affairs negotiated and worked together with domestic raw material suppliers and manufacturers to expand production capacities. To ensure reasonable distribution of masks among health workers, disease prevention personnel, and the general public, the government requisitioned all domestically produced masks so that it could manage distribution through a name-based system. Private enterprises also volunteered to begin or expand production of disinfecting alcohol, coveralls, protective gowns, in order to stabilize domestic supplies.

## Conclusion

Successful implementation of the above disease prevention measures depended heavily on Taiwan's information technology industry. Technical developments included the Quarantine System for Entry, enabling inbound passengers to quickly complete quarantine procedures in a way that lowered the burden on workers. Since the National Health Insurance coverage rate is very high, Taiwan used this system to record the history of travel and contact of high-risk individuals, and health professionals could use the travel history, occupation, contact history, and cluster (TOCC) information stored in the system to support diagnosis procedures.

To help the public fully understand and comply with disease prevention policies, the CECC held frequent live-streamed news conferences. Using new media and other channels, it quickly explained the latest developments in the pandemic situation and prevention policies. Taiwan CDC also expanded the capacity of the 1922 Communicable Disease Reporting and Consultation Hotline to provide information and solutions to caller inquiries.

The global COVID-19 pandemic remains severe. Vaccines are critical for bringing the disease under control. Taiwan is securing vaccines in several directions at the same time, including international sponsorship (participation in the COVAX system led by the WHO, GAVI, and CEPI), direct procurement from manufacturers, and domestic production to disperse risk and quickly obtain safe and effective vaccines. Taiwan CDC has already planned priority groups for vaccination based on degree of risk, and will carry out its immunization plan in phases in 2021.

Infectious diseases know no borders. In the face of this unprecedented health crisis, the whole world must work together to address the daunting challenges posed by the pandemic. At the beginning of the pandemic, after Taiwan ensured sufficient supplies of masks and other personal protective equipment that met basic domestic demands, it began to donate a portion of requisitioned resources to more than 80 countries. In the future, Taiwan hopes to cooperate with all countries on vaccine R&D and distribution in order to end the COVID-19 pandemic as soon as possible and life for everyone can return to normal.

# 2020 COVID-19 Disease Prevention Timeline

2019

## 12.31

After learning that there had been cases of pneumonia of unknown etiology in Wuhan, China, Taiwan CDC sent an email to the IHR focal point under the WHO requesting further information and began to conduct onboard quarantine inspections of passengers on direct flights from Wuhan.

2020

## 1.12

Taiwan sent two experts to Wuhan, China to obtain information about the epidemic situation and prevention and control measures.

## 1.15

Taiwan officially classified Severe Pneumonia with Novel Pathogens as a Category 5 Communicable Disease.

## 2.10

Taiwan reduced the number of routes for direct flights between Taiwan and China from 50 to five. All passengers who transited in China, Hong Kong or Macau on the way to Taiwan were placed under home quarantine for 14 days upon entering Taiwan.

All direct cross-strait sea passenger transport routes were suspended.

## 2.11

Entry by all Hong Kong or Macau residents was suspended.

## 2.25

The president promulgated the "Special Act for Prevention, Relief and Revitalization Measures for Severe Pneumonia with Novel Pathogens."

## 2.27

The CECC was elevated to a Level 1 center.

## 3.12

The Name-based Mask Distribution System 2.0 was launched, which added online pre-ordering of masks that can be picked up at convenience stores.

## 3.19

Entry restrictions were imposed on all foreign nationals entering Taiwan. Additionally, all inbound travelers were required to undergo home quarantine for 14 days.

## 6.24

Under the Global Cooperation and Training Framework (GCTF) cooperation model, Taiwan joined the United States, Japan, and Australia in an online workshop titled: "COVID-19: Preparing for the Second Wave."

## 6.25

Taiwan Taoyuan International Airport conditionally opened to transit passengers.

## 6.29

Entry measures relaxed for foreign nationals (except for those applying to enter Taiwan for tourism or regular social visits). Foreign travelers must present a negative COVID-19 RT-PCR test result issued within three days prior to boarding the flight to Taiwan and undergo a 14-day home quarantine upon entry.

## 7.16

Mainland Chinese children 2 years old or younger who possess an ROC Resident Certificate by reason of having Taiwanese national parents were allowed to apply for entry into Taiwan.

## 8.10

US Department of Health and Human Services Secretary Alex Azar II visited Taiwan and joined Taiwan's Minister of Health and Welfare Shih-Chung Chen in witnessing the signing of a Memorandum of Understanding (MOU) on health cooperation by representatives of the Taiwan Council for U.S. Affairs and the American Institute in Taiwan. The MOU strengthens bilateral health cooperation.

## 8.13

Taiwan expanded entry of Mainland Chinese children of Taiwanese parents to include children aged 2 to 6 years old. The children must be accompanied by their parents when returning to Taiwan.

## 1.20

As the epidemic situations in Thailand, Japan, South Korea and other neighboring countries worsened, Taiwan established the Level 3 CECC for Severe Pneumonia with Novel Pathogens.

## 1.21

Taiwan confirmed its first imported COVID-19 case.

## 1.23

The Chinese authorities announced a lockdown and citywide quarantine in Wuhan. All Taiwanese airlines suspended direct flights to and from Wuhan.

Taiwan upgraded the CECC for Severe Pneumonia with Novel Pathogens to a Level 2 center.

## 2.6

Taiwan introduced a name-based mask distribution system, in which members of the general public brought their National Health Insurance cards to designated pharmacies to purchase up to two masks over a seven-day period.

## 2.7

An entry ban was imposed on foreign nationals who traveled to and/or lived in China (not including Hong Kong or Macau) within the past 14 days.

Taiwan expanded border controls by suspending the entry of Chinese nationals to Taiwan. Taiwanese nationals with recent travel history to China, Hong Kong or Macau were placed under home quarantine for 14 days upon entering Taiwan.

International cruise ships were prohibited from docking in Taiwan's harbors.

## 3.20

The travel notice for all countries was raised to level 3, which states that people should avoid any nonessential travel abroad.

## 3.24

Suspension of all transit flights through Taiwan.


## 4.22

The Name-based Mask Distribution System 3.0 was launched, which included pre-ordering and payment at major convenience store chains.

## 4.30

Members of the general public were encouraged to carry out the New Lifestyle for Epidemic Prevention, which sought to both prevent disease and raise quality of life.

## 6.22

Taiwan implemented the "Regulations Concerning Short-Term Business Travelers' Applications for Shortened Quarantine Periods in Taiwan," enabling some eligible business travelers to shorten their home quarantine periods.

## 6.17

Taiwan permitted entry by overseas students from 11 countries and regions considered as having a low COVID-19 risk.

## 8.24

Taiwan allowed all overseas students to return to Taiwan for their studies.

## 9.24

Mainland Chinese spouses of ROC nationals as well as Mainland Chinese spouses and underage children of foreign nationals accompanying the foreign national were allowed to apply to enter Taiwan.

## 12.1

Taiwan launched the Fall-Winter COVID-19 Prevention Program, which required travelers to present a certificate of a negative COVID-19 RT-PCR test result issued within three days prior to boarding the flight to Taiwan.

# Domestic Epidemic Prevention and Control

# 03

# Current Immunization Program & Vaccine Injury Compensation Program in Taiwan

## National Immunization Programs

### Current Status

The Taiwan government provides free immunizations to children up to 6 years of age, including BCG, 5-in-1 (diphtheria and tetanus toxoid with acellular pertussis, Haemophilus influenza type b, and inactivated polio, DTaP-Hib-IPV), hepatitis B, pneumococcal conjugate vaccine (PCV), varicella, measles, mumps, rubella (MMR), hepatitis A, Japanese encephalitis, tetanus, diphtheria toxoids, acellular pertussis and inactivated polio vaccine (DTaP-IPV) and influenza. The current immunization schedule is shown in table 3-1. Parents of newborns are given a children's health handbook with a recommended immunization schedule. Children can receive vaccinations at 347 health stations and more than 1,500 contracted hospitals and clinics across Taiwan.

Health stations regularly carry out health promotion programs for improving coverage rate. The programs include mailing reminder postcards, making notification phone calls, scheduling home visits, and providing media announcements. Moreover, public health

**Table 3-1 Current Immunization Schedule in Taiwan**

| Vaccine \ Age | <24hr | 1 month | 2 months | 4 months | 5 months | 6 months | 12 months | 15 months | 18 months | 21 months | 27 months | 5 years | 1-6th grade Primary school students |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| Hepatitis B | HepB1 | HepB2 | | | | HepB3 | | | | | | | |
| BCG | | | | | BCG | | | | | | | | |
| Diphtheria, Tetanus, Pertussis, Hib, Polio | | | DTaP-Hib-IPV 1 | DTaP-Hib-IPV 2 | | DTaP-Hib-IPV 3 | | | DTaP-Hib-IPV4 | | | DTap-IPV | |
| Pneumococcal conjugate vaccine[note1] | | | PCV13 1 | PCV13 2 | | | PCV13 3 | | | | | | |
| Varicella | | | | | | | Var | | | | | | |
| Measles, Mumps, Rubella | | | | | | | MMR1 | | | | | MMR2 | |
| Japanese Encephalitis[note2] | | | | | | | | JE1 | | | JE2 | JE3[note3] | |
| Hepatitis A[note4] | | | | | | | HepA1 | | HepA2 | | | | |
| Influenza | | | | | | Influenza (yearly) | | | | | | | |

note1: 2 primary doses at least 8 weeks apart

note2: The mouse brain-derived vaccine was replaced by the Vero cell-derived Japanese encephalitis vaccine in May 2017.

note3: JE3 (live attenuated cell-based vaccine) was provided for 5-yr children who have received 2 doses of inactivated JE vaccine.

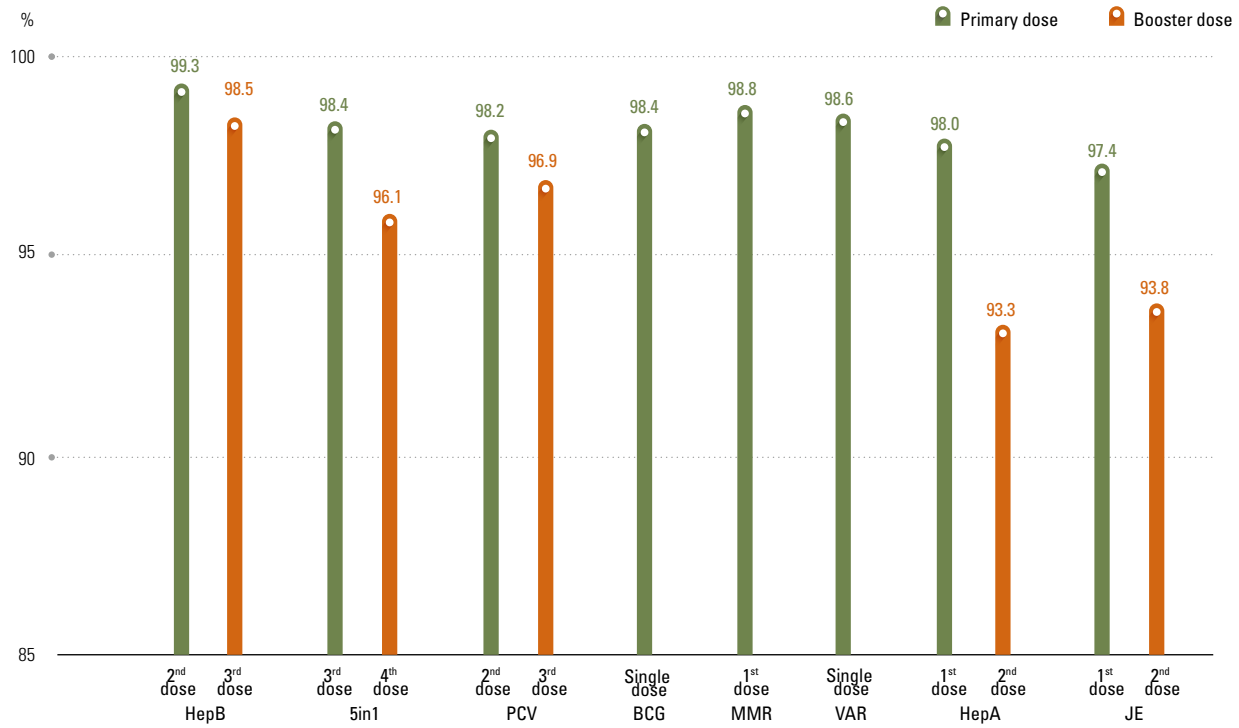
note4: In January 2018, hepatitis A vaccine was introduced into routine immunization program for children born after January 2017. The original hepatitis A vaccine program for children registered in selected aboriginal areas are implemented continuously.

nurses at the health stations where children are registered regularly monitor immunization records and follow up on children who have not received up-to-date immunization to ensure those children complete the vaccination series. The immunization coverage rate of primary doses was as high as above 96%. (Figure 3-1)

## Accomplishments

1. The world's first universal hepatitis B vaccination program has been implemented in Taiwan since July 1986 that demonstrated great impacts of such vaccination program by reducing the rates of both HBV infection and hepatocellular carcinoma.
2. With the promotion of vaccination policies, many major infectious diseases that have threatened national health such as poliomyelitis, diphtheria, and measles have been effectively controlled, eliminated, or even eradicated.

**Figure 3-1 National Immunization Coverage**




Source: The values were calculated in December 2020 by compiling retrospectively the immunization data of the National Immunization Information System

Footnote:
- HepB: Hepatitis B vaccine
- 5in1: DTaP-Hib-IPV
- PCV: Pneumococcal 13-valent conjugate vaccine
- BCG: Bacillus Calmette-Guérin vaccine
- MMR: Measles, mumps and rubella combination vaccine
- VAR: Varicella vaccine
- HepA: Hepatitis A vaccine
- JE: Japanese encephalitis vaccine

3. The National Vaccine Fund was launched in 2010 based on Article 27 of the Communicable Disease Control Act. Due to the establishment of the National Vaccine Fund, it is possible to expand national immunization program to protect children's health, including:

   (1) Replaced DTwP and OPV with DTaP-IPV-Hib in 2010.

   (2) Replaced Tdap and OPV given to new primary school enrollees with Tdap-IPV in 2011. In order to improve the effectiveness of the booster dose, Tdap-IPV was replaced with DTaP-IPV in 2017.

   (3) Gradually expanded pneumococcal conjugate vaccine (PCV) vaccination target from 2009 to 2014. In 2015, 13-valent PCV (PCV13) was introduced into routine immunization for children.

   (4) Replaced the mouse brain-derived Japanese encephalitis (JE) vaccine with the live attenuated cell-based JE vaccine in 2017, which has fewer side effects, high efficacy, and the manufacturing process is also in line with the humanitarian use of animal models and international standards.

   (5) Expanded the target individuals for hepatitis B immunoglobulin (HBIG) from infants born to HBeAg-positive mothers to infants born to HBsAg-positive mothers in 2019 to prevent more mother-to-infant transmission of hepatitis B.

4. In order to improve the quality of vaccination services and encourage the hospitals and clinics continuously providing convenient and high-quality vaccination services, the subsided vaccination treatment fee has to be expanded from 2018. Children and the elderly should not pay diagnostic fees for the public funded vaccines.

5. In January 2018, Taiwan introduced hepatitis A vaccine into children routine immunization program for children born after January 2017, and hepatitis A vaccine provided under the program was donated by Paujar Charity Foundation.

### Future Prospects

With a stable source of support from the National Vaccine Fund, Taiwan CDC will gradually add new vaccines to the routine immunization schedule based on cost-effectiveness and recommendations of the Advisory Committee on Immunization Practices. In the future, Taiwan CDC will continue to provide pneumococcal vaccine for the elderly over 75 years of age and plan to gradually expand the targets to high-risk groups and elderly over 65 years of age.

## National Immunization Information System

### Current Status

In 2004, Taiwan CDC established the National Immunization Information System (NIIS) to

consolidate immunization data scattered among various health stations into one database. NIIS, together with household registration authorities and medical institutions, has improved the management of immunization operations and the efficiency of storage and retrieval of immunization information. Household data are obtained from the Department of Household Registration, Ministry of the Interior. The information is updated daily and transmitted to NIIS. Through NIIS, authorities can remind parents via text and e-mail of their children's immunization schedule, thereby improving immunization coverage rates.

## Accomplishments

1. Enhanced the functions and efficiency of the central database to handle yearly increases in data quantities and improve management efficiency.
2. Adopted multiple strategies to trace and urge the unvaccinated to get vaccinated, thereby reducing delays and raising the coverage rate.
3. For children entering the country, entry information from the National Immigration Agency, Ministry of the Interior is compared with NIIS data to find children who have not received the MMR vaccine. Local health agencies will then arrange vaccination.
4. The revision of NIIS was launched in 2018, upgrading system capabilities and effectiveness.

## Future Prospects

1. Promote the use of vaccination records in National Insurance IC cards to report immunization information at contract hospitals/clinics, improve the accuracy, completeness and timeliness of immunization data.
2. Strengthen management of atypical cases, such as foreign spouses of citizens, children who follow their parents working abroad and children who fail to complete their immunizations due to family factors.
3. Integrate various databases and systems (foreign spouses, reporting of communicable diseases, National Immigration Agency, Ministry of the Interior) and diversify NIIS immunization reminders to improve the coverage rate.

# Polio, Measles, Congenital Rubella Syndrome, and Neonatal Tetanus Eradication Programs

## Current Status

Taiwan launched polio, measles, congenital rubella syndrome (CRS), and neonatal tetanus (NT) eradication programs in 1991. Since achieving its goal of polio eradication on October 29, 2000, Taiwan has maintained the eradication situation of polio by maintaining a high polio-related vaccine coverage rate and improving surveillance systems.

Measles and Rubella became the primary elimination target after polio. In 2020, there were no confirmed measles cases and rubella cases. No confirmed NT case has been reported since 1996 apart from a child born to a foreign mother in 2001. From 1994 to 2008, five cases of CRS were confirmed, four of which were in patients born to foreign mothers. No confirmed CRS case has been reported from 2009 to 2016. In 2017, one CRS case born to a foreign mother was confirmed through CRS active surveillance. From 2018 to 2020, there were no confirmed CRS cases.

## Accomplishments

1. In 2020, 33 AFP (acute flaccid paralysis) cases under the age of 15 were reported and investigated. None of the cases were polio or polio compatible.
2. Since January 1, 2009, all foreigners applying for residence or settlement must submit either a report showing they are antibody positive for measles/rubella report or an immunization certificate. This requirement is also included in the physical check for foreign laborers before entry.
3. Encourage the institutions contacting foreign traveler frequently to provide one dose of MMR vaccination for their personnel who were born after 1981.
4. Encourage flight attendants and ground crews to receive one dose of MMR vaccine.

## Future Prospects

1. Prevent the importation of polio to maintain eradication of the disease.
2. Complete measles and rubella elimination certification in accordance with the WHO.

# Hepatitis Immunization Program

## Current Status

Since 1982, Taiwan CDC has proposed a series of five-year programs. Priorities include: improving the surveillance system for acute cases, improving the immunization coverage rate of hepatitis B vaccine, severing hepatitis A infection paths, enhancing health education related to liver disease control, improving blood transfusion management, and raising hepatitis examination quality. Since 2018, Taiwan introduced the Hepatitis A vaccine into children routine immunization program for children born after January 2017.

## Accomplishments

**Hepatitis A**

1. Confirmed cases of acute viral hepatitis A in Taiwan were reduced from 633 in 1995 to 74 in 2020; the incidence rate was lowered from 2.96 out of 100,000 people in 1995 to 0.31 out of 100,000 people in 2020. In aboriginal regions, confirmed cases were reduced from 183 in 1995 to 2 in 2020 and the incidence rate was lowered from 90.7 out of 100,000 people in 1995 to 1 in 2020.

2. The coverage rate of the first dose of HepA for babies born in 2017 was 97.8%.

**Hepatitis B**

1. The carrier rate of children at age 6 declined significantly and steadily from 10.5% in 1989 to 0.8% in 2007.

2. The coverage rates of the second and third doses of HepB for babies born in 2018 were 99.0% and 98.4%, respectively

## Future Prospects

Infants born to a mother who is e antigen positive face a 10% chance of becoming chronic carriers of hepatitis B even after receiving hepatitis B immunoglobulin (HBIG) and three doses of immunoprophylaxis. Taiwan CDC has offered free hepatitis B screenings for these children at age 1 since September 2010. It will continue to raise screening coverage and study effectiveness of the vaccination.

# Vaccine Injury Compensation Program (VICP)

In response to a case in which a child received oral poliomyelitis vaccination and subsequently developed polio in 1986, the Ministry of Health and Welfare established a Vaccine Injury Compensation Fund in June 1988. The fund enables individuals to claim compensations from their local health bureau in the event of death, disabilities, serious illnesses, or adverse reaction resulting from vaccination. Review of claims by the Vaccine Injury Compensation Working Group ensures the causal relationship between the vaccine and the adverse events to eliminate vaccination worries.

For effective use of vaccine injury compensation resources and to strengthen protection of compensation rights and guarantees, the Regulations Governing Collection and Review of Relief Fund for Victims of Immunization was amended in recent years. Highlights were as follows:

1. The procedure of statement of opinion was amended. The Working Group may, ex officio or by request of the claimant, notify the claimant to state his or her opinions on a given date at a designated place.

2. We revised the criteria and classification of causality between vaccination and alleged injury (Table 3-2), based on the causality assessment of an adverse event following immunization which was commissioned by the WHO.

3. To implement the essence of no-fault compensation, we established the factors to consider for deciding the amount of compensation.

**Table 3-2 Types of Compensation, Vaccine Injury Compensation Program**

| Relief Items | Criteria | | | Amount of Compensation (US$ 1,000) |
|---|---|---|---|---|
| | Definition/Degree of Impairment | | Causality Conclusion | |
| Compensation for Death | - | | Vaccine-related | 16.1~193.5 |
| | | | Indeterminate | 9.7~112.9 |
| Compensation for Impairment | By the types and degrees of impairments regulated by laws for the protection of the rights of the mentally and physically impaired, but excluding conversion disorder associated with psychological factors. | 4-extremely severe | Vaccine-related | 16.1~193.5 |
| | | | Indeterminate | 9.7~112.9 |
| | | 3-severe | Vaccine-related | 9.7~161.3 |
| | | | Indeterminate | 6.5~96.8 |
| | | 2-moderate | Vaccine-related | 6.5~129.0 |
| | | | Indeterminate | 3.2~80.6 |
| | | 1-mild | Vaccine-related | 3.2~80.6 |
| | | | Indeterminate | 1.6~64.5 |
| Compensation for Severe Illnesses | To be decided by the regulations and the scopes of severe illnesses and injuries defined by the National Health Insurance and the illnesses considered as severe adverse reactions by the Procedure for Reporting Severe Adverse Reactions to Medicines, but not meeting the definition of impairment. | | Vaccine-related | 0.6~96.8 |
| | | | Indeterminate | 0.6~38.8 |
| Compensation for Other Adverse Reactions | Other adverse reactions not meeting the definition of severe illnesses. However, mild, commonly seen or expectable adverse reactions of immunization are excluded | | Vaccine-related/ Indeterminate | 0~6.5 |
| Funeral Subsidies | Funeral subsidies are provided if an autopsy is performed to determine whether the death is caused by the vaccine. | | - | 9.7 |
| Medical Cost Subsidies | Examination and treatment performed to help clarify the causal relationship between vaccination and symptoms. | | - | 0~6.5 |
| Stillbirth or Abortion Suspected to be Caused by Vaccination of the Fetus or Embryo undergone by Autopsy or Testing | Gestation after 20 weeks | | - | 3.2 |
| | Gestation less than 20 weeks | | - | 1.6 |

Following the claim evaluation process (Figure 3-2), in 2020, 162 cases were settled, a total of 2,100 claims had been reviewed since program inception(Figure 3-3), and compensation disbursement had reached US$ 4.2 million.

**Figure 3-2 Flowchart for Vaccine Injury Compensation Claims Evaluation Process**

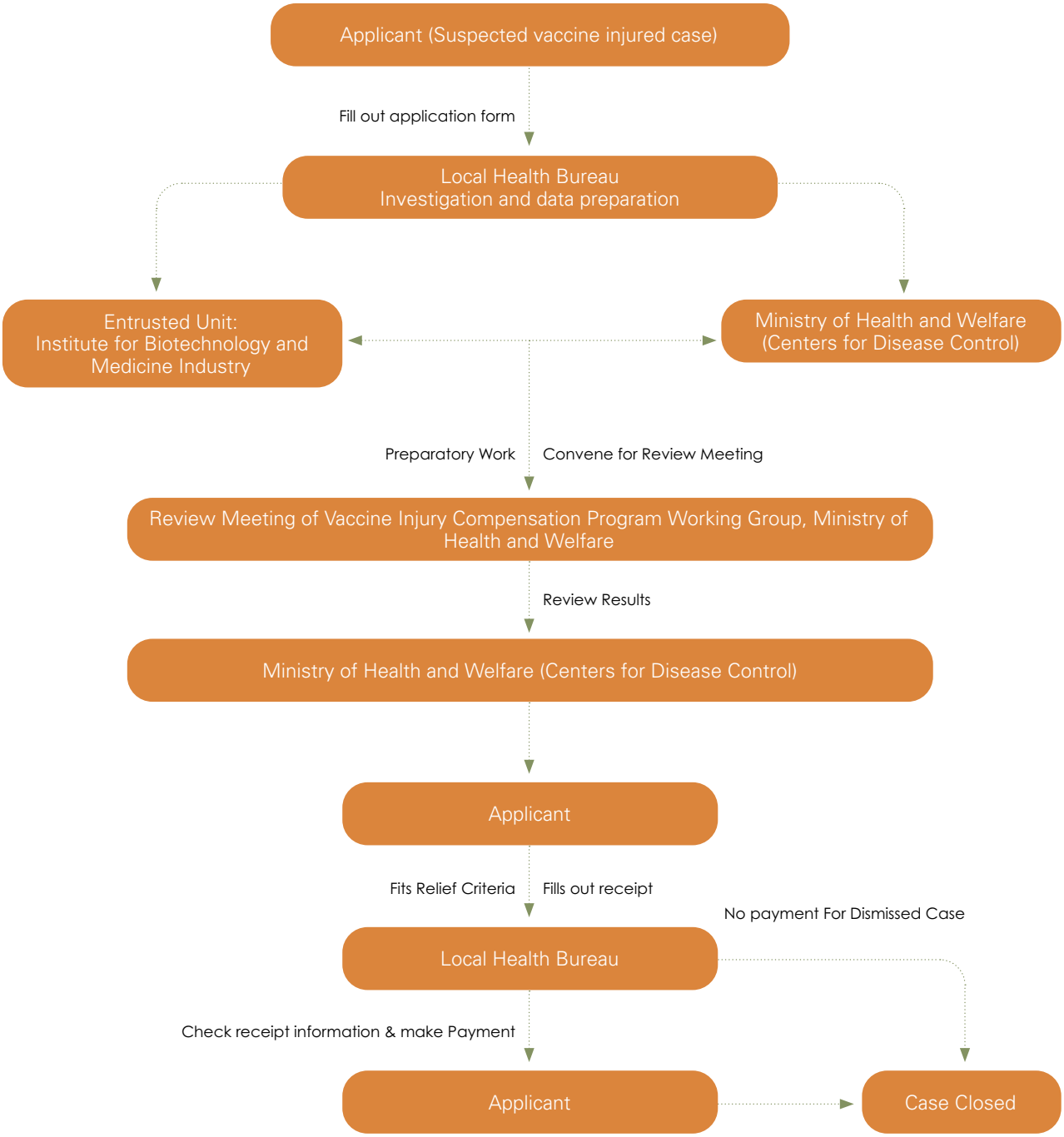
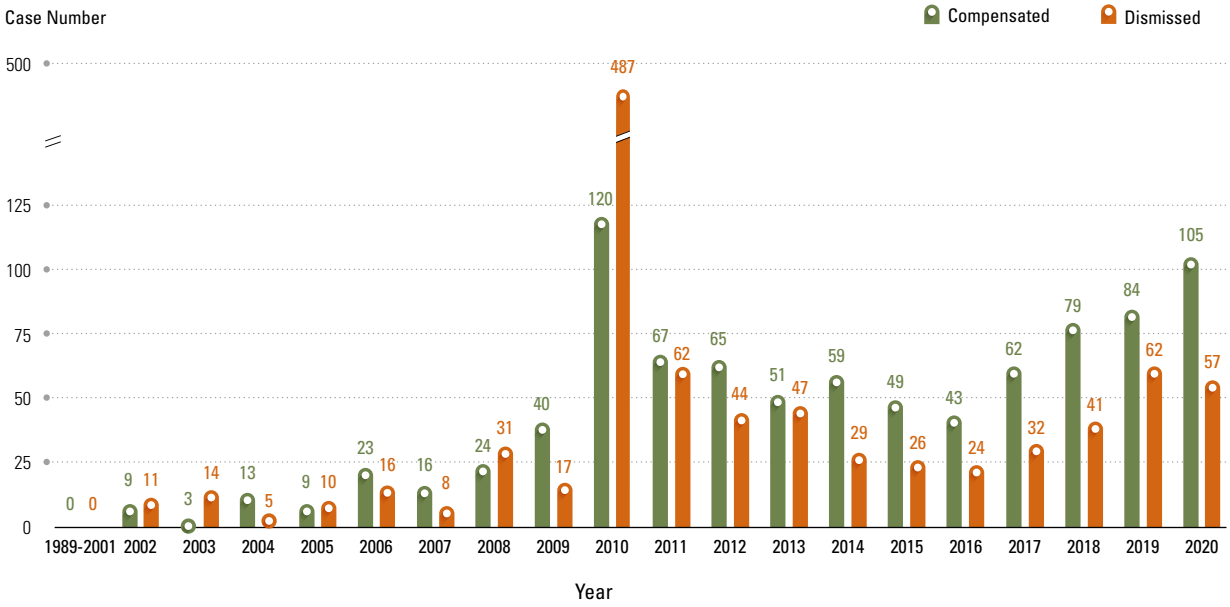


**Figure 3-3 Total Number of Cases Settled Per Year from Program Inception in 1989 to 2019**




# Communicable Disease Surveillance System

## Current Status

Following the reorganization of Taiwan CDC in July 1999, infectious disease surveillance shifted to the National Communicable Disease Surveillance and Response Systems. The systems began with surveillance of notifiable diseases and sentinel surveillance to detect epidemics. Later on, several systems were built to facilitate the collection of timely, complete, and precise information on infectious diseases. Taiwan CDC envisions these systems to monitor national health status and rapidly detect outbreaks by integrating various infectious disease surveillance networks.

The progress includes: (1) Constructing diversified disease surveillance systems; (2) Collecting and monitoring data for disease trend analysis, predictions and alerts; and (3) Providing regular analysis and assessments of global and indigenous infectious diseases.

## Accomplishments

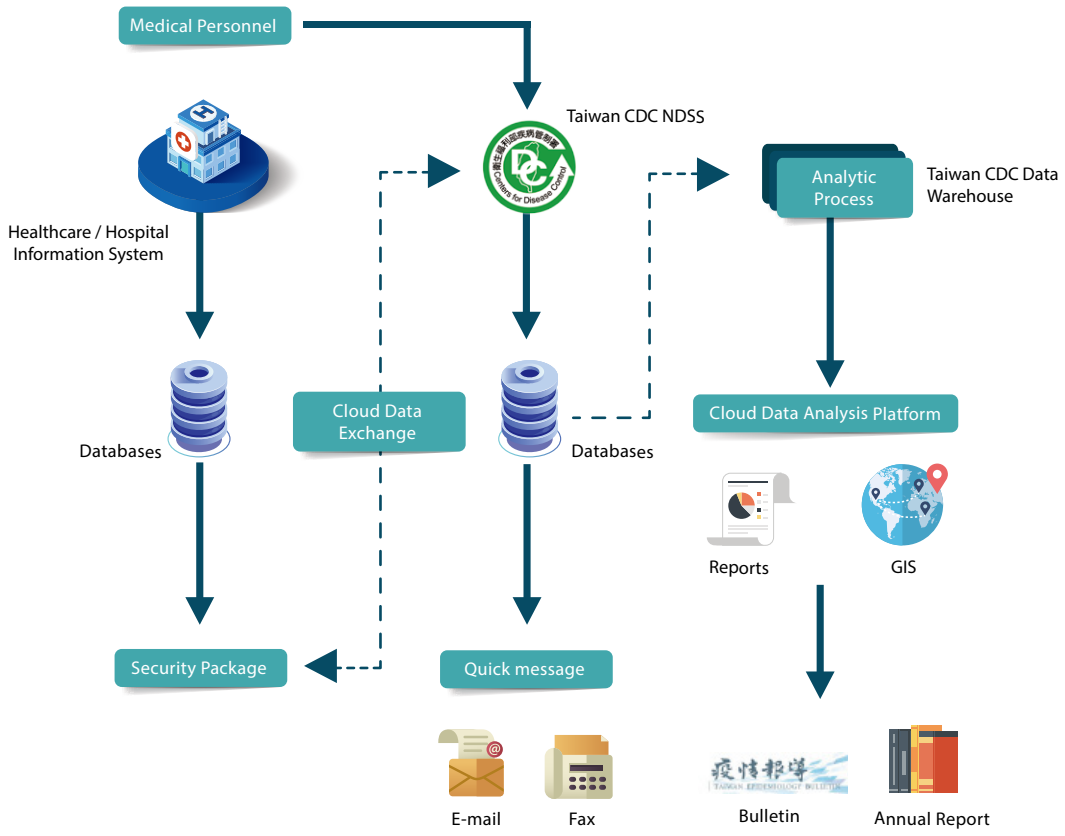
**Notifiable Disease Surveillance System (NDSS)**

If a doctor treats a patient suspected of having a notifiable infectious disease (Table 3-3), the doctor must report the case within a limited time. Taiwan CDC established the Notifiable Disease Surveillance System to give medical personnel across the country a platform for reporting diseases and grasping information related to communicable disease occurrences immediately (Figure 3-4).

## Table 3-3 List of Notifiable Diseases in Taiwan

| Category | Disease | |
|---|---|---|
| I | Smallpox | Plague |
| | SARS | Rabies |
| II | Anthrax | Typhoid Fever |
| | Diphtheria | Dengue Fever |
| | Paratyphoid Fever | Acute Flaccid Paralysis and Poliomyelitis |
| | Meningococcal Meningitis | Amoebiasis |
| | Shigellosis | Measles |
| | Malaria | Enterohemorrhagic E. coli Infection |
| | Acute Hepatitis A | Cholera |
| | Hantavirus Syndrome | Multi-drug Resistant Tuberculosis |
| | Rubella | West Nile Fever |
| | Chikungunya Fever | Epidemic Typhus Fever |
| | Zika Virus Infection | |
| III | Pertussis | Tetanus |
| | Neonatal Tetanus | Japanese Encephalitis |
| | Tuberculosis | Hansen's Disease |
| | Congenital Rubella Syndrome | Acute Hepatitis B |
| | Acute Hepatitis C | Acute Hepatitis D |
| | Acute Hepatitis E | Legionnaires' Disease |
| | Mumps | Syphilis |
| | Invasive Haemophilus Influenzae Type B Infection | Congenital Syphilis |
| | Gonorrhea | Enteroviruses Infection with Severe Complications |
| | HIV Infection and AIDS | Acute Viral Hepatitis Unspecified |
| IV | Herpesvirus B Infection | Leptospirosis |
| | Melioidosis | Botulism |
| | Invasive Pneumococcal Disease | Q Fever |
| | Endemic Typhus Fever | Lyme Disease |
| | Tularemia | Scrub Typhus |
| | Complicated Varicella | Toxoplasmosis |
| | Brucellosis | Influenza Case With Severe Complications |
| | Creutzfeldt-Jakob Disease | Listeriosis |
| | Severe Fever with Thrombocytopenia Syndrome | |
| V | Rift Valley Fever | Marburg Hemorrhagic Fever |
| | Yellow Fever | Ebola Virus Disease |
| | Lassa Fever | Novel Influenza A Virus Infections |
| | Middle East Respiratory Syndrome Coronavirus infections | Severe Pneumonia with Novel Pathogens |

**Figure 3-4 Notifiable Disease Surveillance System Data Flow**




By using the system, medical personnel can make early and informed decisions on assigning manpower and resources to carry out disease prevention and thereby keep diseases from spreading.

The first stage of constructing the Notifiable Disease Surveillance System, finished in July 2001, involved establishing a web-based version that enabled easier and more detailed dissemination of reported information. The second stage, completed in September 2004, strengthened the surveillance system, while the third stage, completed in September 2006, integrated this system. The fourth stage, finished in June 2008, involved building a single reporting gateway and increasing user-friendliness. In order to increase the communicable disease reporting timeliness, Taiwan CDC has developed several new ways of reporting notifiable diseases since 2014. By creating dedicated disease reporting modules within the hospital electronic medical record systems, infection control staffs from 60 regional hospitals or medical centers have substantial workload reduction. Furthermore, Taiwan CDC allowed healthcare workers to login to the Notifiable Disease Surveillance System accountlessly by having their RSA cards issued by the Healthcare Certification Authority (HCA) verified inside the Virtual Private Network (VPN) of the National Health Insurance Administration. An Application Programming Interface (API) was developed for connecting the Healthcare Information System (HIS) of 53 clinics in Tainan and Kaohsiung to the Notifiable Disease Surveillance System. This allows primary medical institutes a convenient way to report the majority of notifiable infectious diseases.

**School-Based Surveillance System**

Taiwan CDC has implemented the School-Based Surveillance System since 2001, in order to monitor epidemic trends, detect possible outbreaks and contain the spread of communicable diseases in elementary schools. Taiwan CDC collects information about school children exhibit symptoms such as influenza-like, hand-foot-and-mouth disease or herpangina, diarrhea, fevers, acute hemorrhagic conjunctivitis, and varicella (chickenpox) on a weekly basis. These data are used to analyze and estimate the scope and magnitude of diseases at the school and regional levels, followed by the dissemination of weekly reports to participating schools as well as educational and public health authorities to stimulate public health action.

As of 2020, a total of 765 elementary schools enrolling students from kindergarten to 6th grade participated in the systems, representing 29% and 99.2% of all number of elementary schools and administrative areas in Taiwan respectively.

**Symptom Surveillance System**

Increased international contact and travel facilitate transmission of communicable diseases across borders and raise challenges for health workers. For example, in the summer of 2008, 10 out of 11 people in a religious group came down with dengue fever on a trip to Myanmar. To prevent the entry of emerging communicable diseases, facilitate early public health monitoring and implement epidemic prevention measures, Taiwan CDC established the Symptom Surveillance System. In 2006, Taiwan CDC integrated several active surveillance systems to enhance the monitoring of travelers at airports and seaports for diseases contracted abroad. These steps strengthened efforts to battle importation of communicable diseases while controlling cluster incidents and launching prompt disease prevention mechanisms.

Disease categories under surveillance include influenza-like illness clusters, fevers of unknown etiology, diarrhea, coughing persisting for more than three weeks, upper respiratory tract infections, varicella, and enterovirus clusters.

The Symptom Surveillance System monitors inbound passengers at airports and seaports to prevent entry of communicable diseases. It enables Taiwan CDC to effectively control epidemic events and quickly launch prevention measures.

**Surveillance System for Populous Institutions**

The Surveillance System for Populous Institutions is aimed at early cluster detection of infectious diseases among institution inhabitants or workers. It applies to elderly homes, long-term care facilities, apartments for the elderly, facilities for the disabled, juvenile protectories, veterans' homes, prisons, nursing homes, outpatient centers for mental rehabilitation, and infant care centers. If an individual or a cluster case with symptoms of respiratory, gastrointestinal disease or fever of unknown origin is found, the facility must file online reports within 24 hours; in addition, the facility must report the number of people under its care weekly. As of 2020, a total of 3,029 populous institutions participated in the system.

**Real-time Outbreak and Disease Surveillance (RODS)**

The ICD-9-CM/ICD-10-CM diagnosis codes from over 180 emergency rooms nationwide are forwarded daily to enable early and immediate analysis of aberrations for various syndromes. RODS also enables routine monitoring of specific disease trends such as influenza-like illness, enterovirus infection, diarrhea, and conjunctivitis.

**Syndromic Surveillance Using National Health Insurance Data**

Daily aggregate outpatient clinic, hospitalization and emergency room data of specific diseases gathered by the National Health Insurance Administration from IC cards have been used to monitor trends of influenza-like illness, enterovirus infections and diarrhea since April 2009. In 2011 and 2014, scarlet fever and varicella were added to the disease watch list respectively.

**Pneumonia and Influenza Mortality Surveillance**

Daily updated death certification reports from the Department of Statistics, Ministry of Health and Welfare were used to identify pneumonia and influenza associated deaths, and monitor trends of pneumonia and influenza mortality. This information provides a reference for influenza prevention and control.

**Laboratory Automated Reporting System**

To immediately monitor disease outbreaks and establish epidemic curves caused by important pathogens, Taiwan CDC has developed the Laboratory Automated Reporting System (LARS) to collect the laboratory data with positive test result caused by any of 20 pathogens via automated submitting of reports from hospital Laboratory Information System (LIS) to the LARS since 2014. LOINC (Logical Observation Identifiers Names and Codes), a universal code system for reporting laboratory and clinical observations, is used as the standardized format for the electronic exchange of laboratory data. The use of LOINC to identify laboratory observations could improve the quality of public health surveillance by reducing data transcription errors and facilitate data sharing of laboratory test results between hospitals and countries.

As of 2020, a total of 67 hospitals participated in the LARS. Recently, more than 15,000 pieces of data are collected weekly and used in monitoring pathogen activity.

**Establishing Support Systems for Disease Management and Data Analysis**

1. Taiwan CDC utilized the capabilities of the Notifiable Diseases Surveillance System, the Geographical Information System (GIS) and other surveillance systems to present and analyze data, and developed a GIS-based prediction model for estimating the distribution of infectious diseases.

2. Taiwan CDC installed multifaceted surveillance systems for data acquisition and analysis.

**Reporting via the Internet**

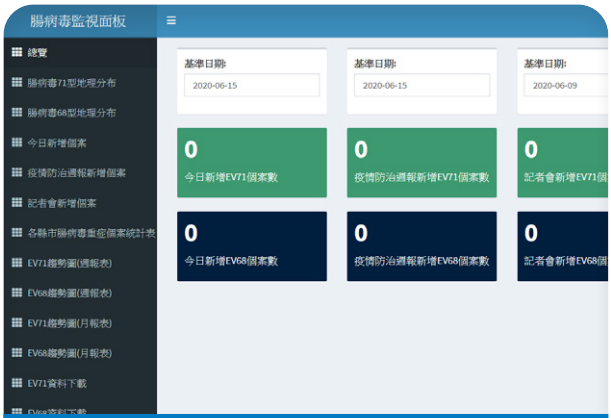
To effectively detect and monitor infectious diseases, all the Taiwan CDC reporting systems are electronic-based for users to upload information.

**Systems Integration**

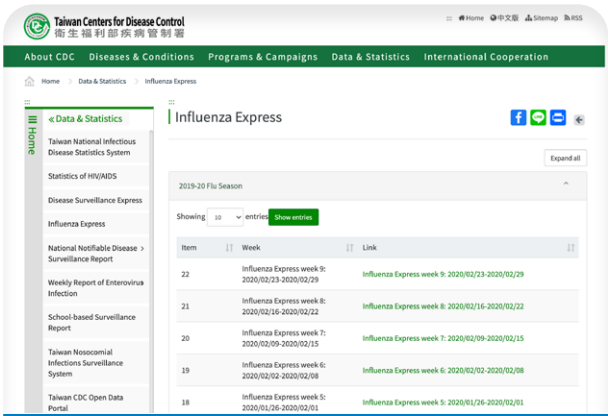
To enhance presentation and application of surveillance systems, Taiwan CDC combined and analyzed information to improve the integration of surveillance systems, including the Notifiable Disease Surveillance System, the Symptom Surveillance System and the Syndrome Surveillance System. This task was completed in September 2006. In 2018, the R system for epidemic statistical analysis was established to use R language to integrate and monitor system data. Visualized data for monitoring communicable diseases are automatically generated every day for public health professionals to promptly obtain information on epidemiological situations across Taiwan.


The R system was developed by open-source softwares.


The R system includes different kinds of visualized graphs, tables, and dashboards.

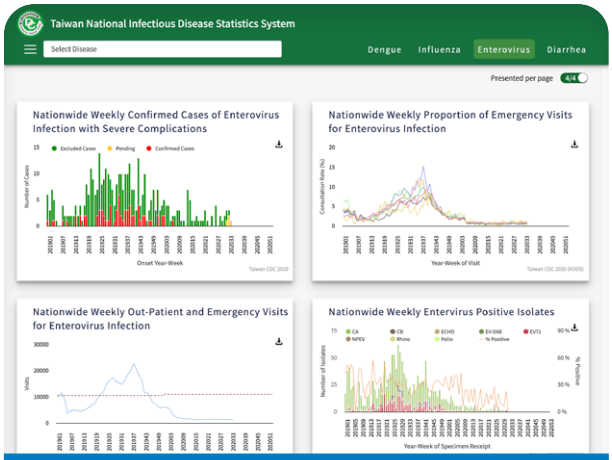



The surveillance dashboard of enterovirus infection.



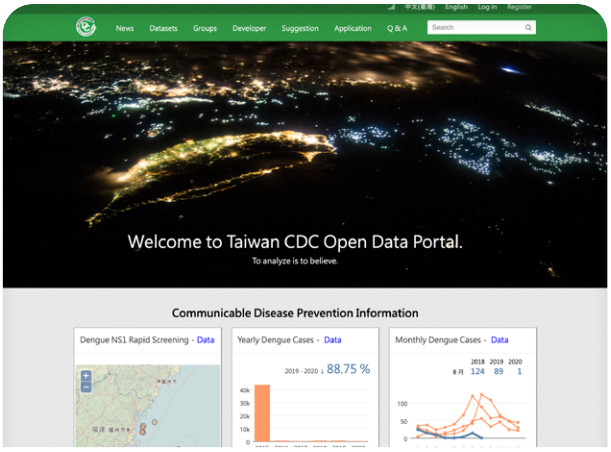

Surveillance reports are published on Taiwan CDC official website.

Source: https://www.cdc.gov.tw/En/Category/MPage/Utv3lzlSnTK-t6inZrBZsw




Taiwan National Infectious Disease Statistics System (NIDSS)

Source: https://nidss.cdc.gov.tw/en/




Taiwan CDC Open Data Portal

Source: https://data.cdc.gov.tw/en/

**Information Sharing**

Taiwan CDC generates the School-based Surveillance Weekly Report, the Influenza Express, the Weekly Report of Enterovirus Infection and other statistical reports of designated communicable diseases which are available online. Daily reports on international epidemics are forwarded to related authorities, while regular collaboration with academics assists with evaluation or development of surveillance systems. Key tasks include collection, evaluation and dissemination of information to the public, local health departments and governmental authorities.

In addition, the website "Taiwan National Infectious Disease Statistics System" (NIDSS) was launched in 2008, which aims at providing the general public, academic researchers, health care providers and public health authorities with an intuitive interface to obtain the latest information on the notifiable and other infectious diseases or conditions in Taiwan. "The Taiwan CDC open data portal" provides more than 300 datasets including numbers of all notifiable disease cases and emergency department visits of selected syndromes, and information on quarantine practices, vaccines, nosocomial infections, etc.

Datasets related to numbers of cases of all notifiable diseases and emergency department visits are updated automatically and daily. Taiwan CDC will keep providing new datasets to make government data available to all.

**Training and Education**

Taiwan CDC offers training workshops on surveillance systems to keep users informed about updated information. In addition, trainings on R and Python basics and applications were carried out from 2017 to 2020 to improve staff's capabilities of managing, analyzing, and creating visualized statistical data.

# Reducing Key Infections

## Tuberculosis

Tuberculosis (TB) has been one of the most severe communicable diseases in Taiwan for decades. Nearly 8,000 TB cases and 450 TB deaths are reported in Taiwan annually. A half-century of hard work by health workers has reduced prevalence of the disease, but when compared with other advanced countries, Taiwan leaves much room for improvement.

TB control in Taiwan faces several challenges such as high population density, population aging, comorbidities, frequent international travel, and foreign spouses and laborers from high TB prevalence countries. All of these factors could make TB control more challenging. To protect the health of the general public, Taiwan has adopted more active and aggressive methods when faced with new challenges for TB control.

### Current Status

1. **Incidence**

   There were 16,472 and 7,823 TB cases in 2005 and 2020, respectively. The incidence rate went from 72.5 to 33.2 persons per 100,000 populations over this time period, declining at an average rate of 5.1% per year. The cumulative reduction between 2005 and 2020 was 54.2% (Table 3-4).

**Table 3-4 Taiwan TB Incidence and Mortality Rate, 2005 - 2020**

| Year | Cases | Incidence | Death | Mortality |
|---|---|---|---|---|
| 2005 | 16,472 | 72.5 | 970 | 4.3 |
| 2006 | 15,378 | 67.4 | 832 | 3.6 |
| 2007 | 14,480 | 63.2 | 783 | 3.4 |
| 2008 | 14,265 | 62.0 | 762 | 3.3 |
| 2009 | 13,336 | 57.8 | 748 | 3.2 |
| 2010 | 13,237 | 57.2 | 645 | 2.8 |
| 2011 | 12,634 | 54.5 | 638 | 2.8 |
| 2012 | 12,338 | 53.0 | 626 | 2.7 |
| 2013 | 11,528 | 49.4 | 609 | 2.6 |
| 2014 | 11,326 | 48.4 | 591 | 2.5 |
| 2015 | 10,711 | 45.7 | 571 | 2.4 |
| 2016 | 10,328 | 43.9 | 547 | 2.3 |
| 2017 | 9,759 | 41.4 | 511 | 2.2 |
| 2018 | 9,179 | 38.9 | 506 | 2.1 |
| 2019 | 8,732 | 37.0 | 546 | 2.3 |
| 2020 | 7,823 | 33.2 | 460 | 2.0 |

Since 2019, the Ministry of Health and Welfare (MOHW) has switched to the Iris automatic system for coding multiple causes of death and for the selection of the underlying cause of death. Due to the above change, TB mortality rate in 2005-2018 requires adjustment before direct comparison with statistics post 2019.

Taiwan became an aged society in 2018 as the proportion of Taiwanese people over 65 years old surpassed 14% of the country's total population. Of the new TB cases, people over 65 years old accounted for more than 50% of the total since 2005, and the proportion amounted to 60% in 2020.

The number of Multi-Drug Resistant TB (MDR-TB) cases was 74 in 2020. The proportion of new TB cases with MDR-TB was 1.1%.

2. **Mortality Rate**
   TB claimed 460 lives in Taiwan in 2020, with a mortality rate of 2.0 per 100,000 population. The cumulative reduction between 2005 and 2020 was 53.5% (Table 3-4).

## Accomplishments

1. **Improving Surveillance and Monitoring**
   National TB Reporting and Management System

   (1) Nationwide real-time surveillance on TB laboratory system and TB drug prescription

   (2) Strengthen monitoring among high-risk groups

   (3) Enhance TB outbreak monitoring by adopting novel strategy of geospatial surveillance

2. **Establishing a High Quality and Rapid TB Diagnosis Network**
   (1) Monitor quality of contracted and authorized laboratories

   (2) Train staff members

   (3) Develop new TB diagnosis techniques

3. **Implementing DOTS Program**
   (1) DOTS coverage rate has been 100% since 2006.

   (2) Treatment success rate for bacteriological positive TB cases was about 70% in the 2018 cohort. It has not increased significantly due to population aging.

4. **Establishing the Drug-Resistant TB (DR-TB) Medical Care System**
   "DR-TB Medical Care System" (established in May 2007)

   (1) Taiwan CDC contributes resources and designated teams to offer patient-centered care according to WHO DR-TB guidelines.

   (2) DR-TB teams actively treat each patient for 9 months to 2 years, and designated health workers provide incentives, allowances and personal care via the DOTS Plus program.

   (3) 97% of MDR-TB cases were managed in the DR- TB system through the end of December 2020, leading to a favorable outcome. About 80% of patients in the 2018 cohort were cured or completed treatment after 24 months.

**5. LTBI Treatment Program**

(1) Initiated "The LTBI Treatment for All Contacts Program" in April 2016

- Provide LTBI screening service and treatment for TB contacts of infectious index cases, such as those with MTBC-positive pulmonary TB. LTBI treatment coverage reached 85% in 2020.
- Provide short course treatment regimens for LTBI, including 3-month isoniazid and rifapentine (3HP), 3-month isoniazid and rifampin (3HR) and 4-month rifampin (4R), as an alternative to the 9-month isoniazid (9H) for LTBI contacts.

Campaign against TB at National Disease Control Forum, Sep. 2-3, 2020

(2) Expand target population of LTBI high-risk groups, including the following: residents of mountainous areas, long-term care facility residents, correctional institution inmates, patients receiving dialysis, people living with HIV, illicit drug users, and poorly-controlled diabetic patients.

(3) In 2020, up to 11,946 TB contacts and people with high risk of TB received LTBI treatment. The DOPT rate reached 98%.

## Future Prospects

Taiwan has a moderate-burden of TB, with an incidence rate of 33 cases per 100,000 population in 2020. The National Tuberculosis Program (NTP) sets out ambitious targets to reduce TB incidence to less than 10 new cases per 100,000 population by 2035. Although the average annual decline rate in Taiwan was more than 2-fold compared with the global average during 2005 to 2020, there are substantial challenges that need to be overcome. To realize the targets, Taiwan CDC will focus on introducing WHO-recommended new diagnostic tools for TB and strengthening active case finding in TB high risk populations, including those in mountainous areas, the elderly in long-term care facilities, and new immigrants. To further reduce the risk of TB infection progressing to active TB disease in these key populations, Taiwan CDC is putting efforts towards increasing access to TB preventive therapy.

# HIV/AIDS

## Current Status

The first HIV case in Taiwan was reported in 1984. By 2020, there were an accumulated 41,022 patients (19,655 of whom had developed full-blown AIDS with 7,289 deaths).

Infections surged in 2005 due to skyrocketing infections among injection drug users. Faced with this dire situation, Taiwan CDC cooperated with other departments in dedicating a tremendous amount of effort and resources to harm reduction programs. Total reported cases dropped in 2006, marking the first trend reversal since 1984. In 2008, the epidemic took another turn, with new infections mainly occurring among men who have sex with men (MSM); however, the epidemic has decreased in 2018.

In terms of age, people in the 25 to 34 age group accounted for 601, or 43%, of new infections diagnosed in 2020, more than any other group. The second largest group was the 15 to 24 age group, numbering 315, or 23%, of all cases. An analysis of risk factors showed that the highest proportion of HIV infections was a result of unsafe sexual contact among MSM, accounting for 83% of all cases. The second largest proportion of infections was heterosexual contact, accounting for 11% of cases (see Figure 3-5). The major transmission modes were sexual contact (MSM and heterosexual) and IDU. Of Taiwanese nationals diagnosed with HIV in 2020, 1,356 people, or 97.6%, were males and 34 people, or 2.5%, were females. The sex ratio of new diagnoses was 40:1.

**Figure 3-5 HIV Infection Risk Factors in Taiwan, 1984-2020**

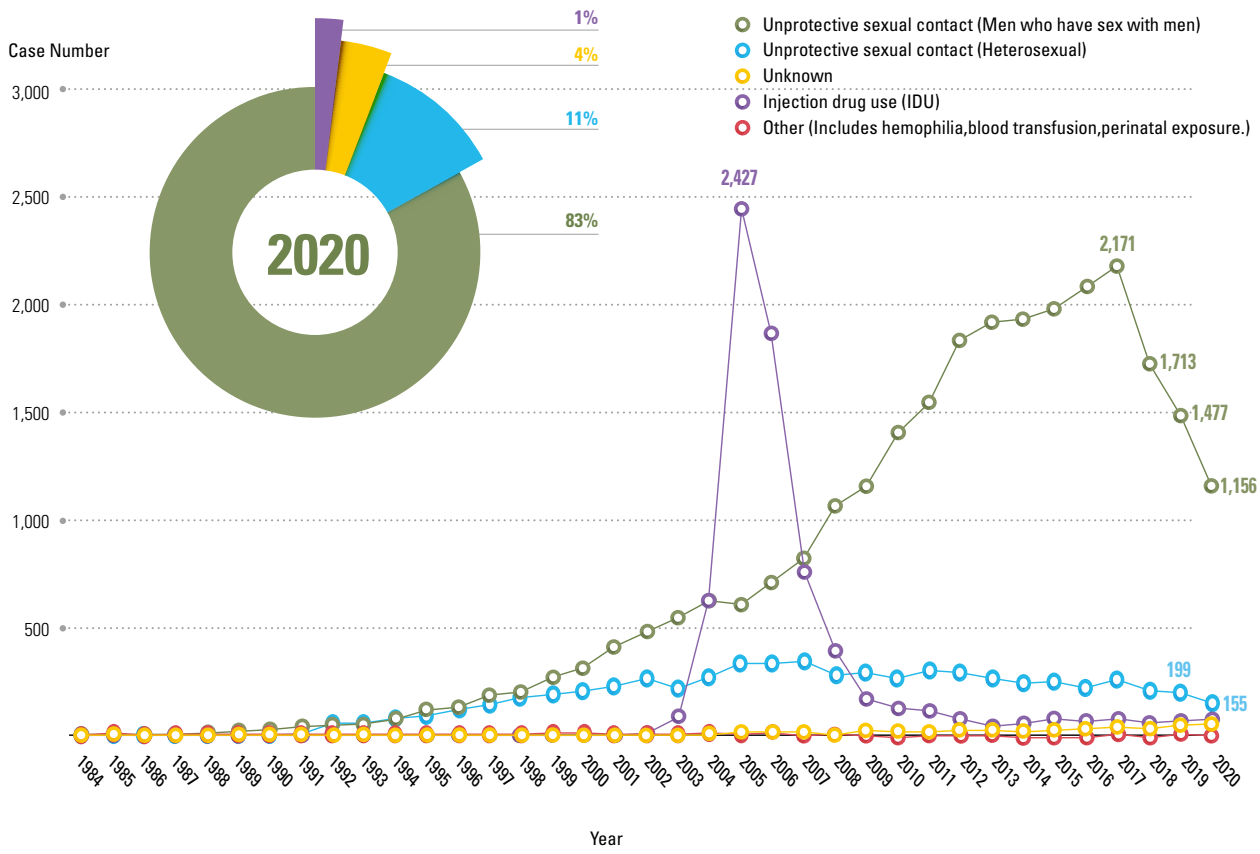
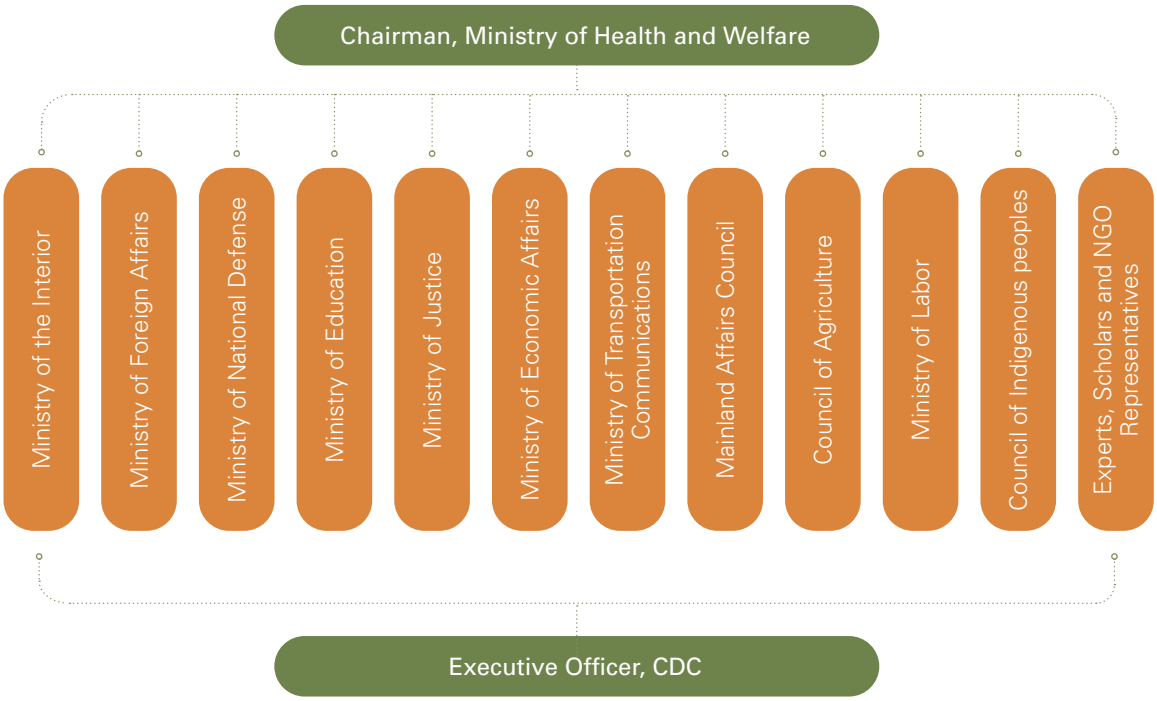


**Figure 3-6 Committee for HIV Infection Control and Patient Rights Protection, Ministry of Health and Welfare, Executive Yuan**




## Accomplishments

1. The Committee for HIV Infection Control and Patient Rights Protection (Figure 3-6) held several cross-ministerial meetings in 2020.

2. To ensure the dignity and rights of people living with HIV/AIDS (PLWHA), the HIV Infection Control and Patient Rights Protection Act was amended in 2015. This amendment canceled all restriction on the entry, stay and residence of HIV-infected non-nationals. For the need of organ transplantations among HIV infected patients, the HIV Infection Control and Patient Rights Protection Act was amended on May 18, 2018, for the HIV infected who are in good health to donate organs to other HIV infected people. Related regulations were amended and announced.

3. The harm reduction program has made significant progress. The reported number of HIV infections among IDUs dropped in 2006. Toward the end of 2010, Taiwan saw an effective reduction in the number of HIV infections, with the largest decline among IDUs. The percentage of all newly reported cases attributable to IDUs fell from a high of 72% in 2005 to only 1% in 2020.

4. Taiwan CDC promotes diversified prevention programs to confront the epidemic among MSM. Initiatives include (1) Establishment of MSM Community Health Centers that provide lesbian, gay, bisexual, and transgender (LGBT) friendly health services. (2) Implementation of health education and intervention services, such as online opinion leaders and HIV testing advertisement on mobile dating apps. (3) Providing voluntary HIV

counseling and testing outreach services at saunas and pubs. (4) Installation of condom vending machines in venues frequented by the gay population. (5) Establishment of a free hotline for MSM to provide immediate and accurate health information and counseling on HIV-related matters.

Taiwan CDC, Taiwan Urbani Foundation and the Ministry of Education jointly held competitions for creative slogans for promoting HIV testing and designs for the exterior of condom/HIV self-screening automatic machines on Nov. 11, 2020.

5. To enhance disease surveillance, Taiwan began to screen blood donors in 1988, draftees in 1989, and prison inmates in 1990. There were 63 hospitals that provided anonymous HIV blood-screening services in 2020. Among them, 13 hospitals provided one-stop HIV screening service, from screening to confirmed diagnosis within 1 hour. They screened 36,883 people, with 439, or 1.2% of people, found to be HIV positive.

6. To prevent mother-to-child transmission, HIV screening has been incorporated into standard prenatal checkups since 2005. All pregnant women in Taiwan are offered HIV screening during the first prenatal screening in the first trimester. Pregnant women found to be HIV-infected are provided with antiretroviral therapy. The exposed infants are provided with free perinatal prophylaxis during intrapartum and the first 4-6 weeks of life. They are also supplied with a breast milk substitute during the first 4 months of life.

7. Moreover, to decrease the barriers for people to know their own HIV sero-status, in December 2018 Taiwan CDC launched a program to distribute HIV self-test kits at NGOs or health stations, through pay-at-pickup services provided by convenience store chains, and through vending machines at LGBT health centers, health stations, and gay saunas.

   Users paid 6 US dollars to get the kits, and could receive full redeem after logging their test results online.

   In 2020, 30,298 kits were sold: 5,877, or 19.4%, through vending machines, 5,880, or 19.4%, distributed by LGBT health centers and health stations, and 18,541, or 61.2%, distributed through pay-at-pickup services provided by chained convenience stores. 0.6% of respondents reported being newly tested HIV-positive.

8. Taiwan offered TDF/FTC as PrEP for people with high HIV risk behavior through government-funded programs since 2016. It was implemented as a pilot program from September 2018 to the end of 2019. HIV-negative youth under 30 years old or people who are HIV serodiscordant couples/partners were enrolled in the integrated program after being evaluated by physicians as eligible. The program provided free medication for one year per person, HIV prevention education, counseling, STD tests, and drug addiction assessment and referral services. The accumulated number of participants enrolled in the PrEP program between 2018 and 2020 was 2,176, of which 1,569 were youths (72%) and 607 (28%) were HIV serodiscordant couples/partners.

9. The Taiwan government has provided HIV/AIDS patients with free medical treatment since 1988 and free highly active antiretroviral therapy (HAART) since 1997. At the end of 2020, 81 designated hospitals, 1 clinic and 54 pharmacies provided HIV/AIDS patients medical services, and over 93% of HIV patients were receiving medical care. Furthermore, to serve the need of long term care in HIV/AIDS patients, the government designated 24 nursing homes and subsidized 28 hospitals to sign agreements with 46 long-term care institutes.


Taiwan CDC cooperated with the Breeze Group to set up a Christmas art installation which included a train and Christmas trees decorated with red ribbons at Taipei Main Station hall, to raise public awareness of AIDS prevention on Nov. 29, 2020.

10. Due to the amendment of the HIV Infection Control and Patient Rights Protection Act, the medical expenses for treatment of HIV patients after two years from confirmed diagnosis and medication initiation have been totally subsidized by National Health Insurance since February 4, 2017. After multidisciplinary medical expense control countermeasures, up to 93% of people living with HIV received HAART and 95% of all people receiving HAART had viral suppression in 2020.

## Prospects

In response to the goal of achieving the "90-90-90" treatment for all in 2020 aims which were proposed by UNAIDS, Taiwan continues to promote various HIV prevention and treatment strategies with three major aspects: prevention, screening and treatment. The efforts of health units and non-governmental organizations led to remarkable results in HIV. The number of HIV-infected new cases has been declining for three consecutive years. We hope that through the participation of relevant units and the implementation of multiple strategies, Taiwan can reach the UNAIDS 95-95-95 target by 2030 and end AIDS in the near future.

# Preparing for Influenza Pandemics

## Current Status

Taiwan began to prepare for potential pandemics since the avian influenza epidemic emerged at the end of 2003. From the experience of SARS in 2003, government agencies were highly supportive and willing to allocate necessary funding for preparations.

In May 2005, the first National Influenza Pandemic Preparedness Plan (hereafter referred to as the 'Preparedness Plan') was approved by the Executive Yuan. In May 2015, the

Executive Yuan approved the Phase III plan as a continuation of the Phase II plan, to engage with all the preparation work.

The influenza pandemic strategic plan in Taiwan is composed of four major strategies and five lines of defense. The four major strategies are as follows: (1) Surveillance and assessment, (2) Interruption of transmission, (3) Antivirals, and (4) Influenza vaccines; and the five lines of defense are defined as follows: (1) Containment abroad, (2) Border control, (3) Community epidemic control, (4) Maintenance of medical system functions, and (5) Individual and family protection. Together, these measures minimize the morbidity and mortality rate, economic losses, and impact of novel influenza viruses.

## Accomplishments

The content of the Preparedness Plan is outlined as follows:

**1. Vaccine Stockpile and Use**

(1) Seasonal Influenza Vaccines

The seasonal influenza vaccination program, which began on October 5, 2020, targeted nine groups of people: 1. Persons aged 50 years and above; 2. Children and adolescents aged 6 months through 18 years; 3. People with catastrophic illnesses; 4. Residents and staff in nursing homes and long-term care facilities; 5. Healthcare workers and public health personnel; 6. Poultry and livestock farmers and animal health inspectors; 7. People who had underlying medical conditions; 8. Pregnant women and parents of infants less than 6 months of age; 9. Kindergarten caretakers, and child-care professionals. The program subsidizes a policy of not charging diagnostic fees for all vaccination groups to lower barriers and increase the willingness of influenza vaccination. Influenza vaccines were given to school-aged students at campus and to other groups at clinics or hospitals.

The Minister of Health and Welfare received the influenza vaccine in a press conference.

(2) Pandemic Influenza Vaccines

In recent years, the emergence of the H5N1, H1N1pdm and more recently, the H7N9 virus has continued to cause more and more human infections, indicating the urgent need for influenza pandemic preparedness. Taiwan CDC now continues to act in accordance with the phase III Pandemic Preparedness plan to ensure that the vaccines are available and sufficient during a pandemic.

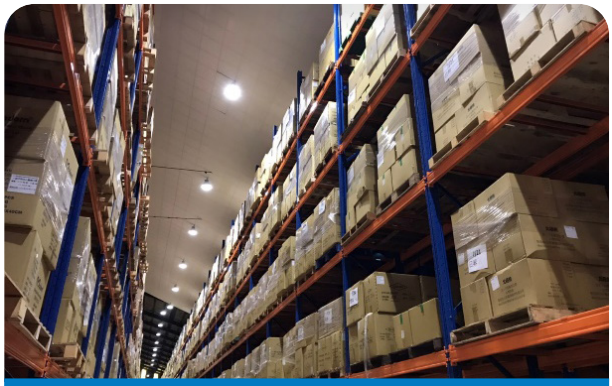
**2. Stockpiling and Use of Antiviral Drugs**

In accordance with the WHO recommendation to maintain a diverse stockpile of influenza antivirals in preparation for a pandemic, Taiwan CDC has established national stockpiles of Tamiflu, Relenza, Eraflu, Rapiacta, and Avigan. These stockpiled antivirals are sufficient to supply at least 10% of the population. In response to seasonal influenza control, as well as the proper use of stockpiled drugs, it followed recommendations from the Advisory Committee on Influenza Control and Prevention to supply antivirals to those who were at increased risks for influenza-related complications such as infants, elderly, and patients with chronic diseases. In addition, during the peak of flu season, usually from December 1 to March 31, Taiwan CDC expands the target population for antiviral drug use and adjusts the duration based on actual conditions. There were more than 4,200 contracted hospitals and clinics to administer government-funded antivirals.

**3. Stockpiling and Management of Personal Protective Equipment (PPE)**

Taiwan CDC established a 3-tier stockpiling framework of PPE. Taiwan CDC, local health authorities, and medical institutions should maintain a minimum stock of PPE (including surgical masks, N95 respirators and coveralls) and ensure a sufficient supply for personnel engaged in epidemic control and health care services during the early phase of an epidemic.

In 2011, Taiwan CDC initiated a stockpile replacement model in order to optimize the PPE stockpiling efficiency. This stockpile replacement model employs a first-in-first-out principle in which the oldest stock in the central government stockpile is regularly replaced and replenished with the same amount of new and qualified products, ensuring the availability and the maintenance of the minimum stockpiles.



Taiwan CDC PPE stockpiles

Since the COVID-19 outbreak, PPE has been used to reduce infection. In order to reach a rational distribution of PPE and ensure enough PPE for medical workers working on the front lines to protect themselves, the Ministry of Health and Welfare requisitioned or purchased medical face masks, surgical masks, N95 respirators, isolation gowns and coveralls produced by domestic manufacturers.


Provide sufficient PPE for use

By using the Epidemic Prevention Supplies Management Information System, information such as purchases, stocking, inventory, collection and re-stocking at all levels of inventory units can be monitored in real time. Furthermore, they can be delivered to local health bureaus and hospitals in a regular cycle, based on the inventory conditions at the local health bureau and hospitals.

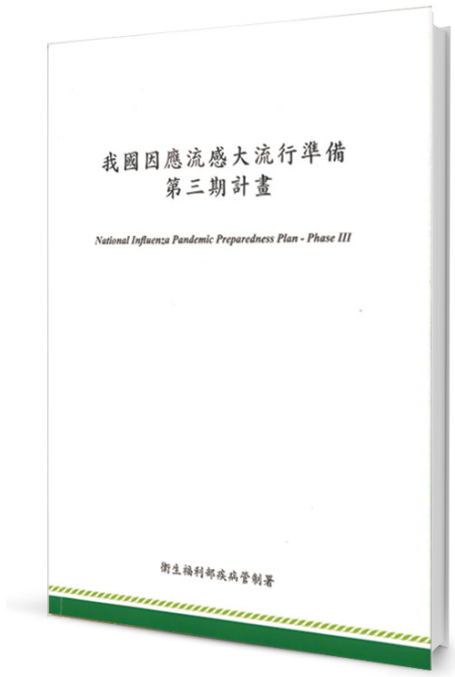
**4. Communicable Disease Control Medical Network Preparedness**

The Communicable Disease Control Medical Network (CDCMN) was set up in 2003 after SARS. It has brought together the medical and public health systems to provide safer, more effective treatments for communicable disease patients, and strengthen Taiwan's capacity to handle contingencies in the prevention and control of communicable diseases. In 2019, the CDCMN with its 6 sub-regions organized 138 designated isolation hospitals for treating communicable disease patients (Figure 3-7).

There are 6 response hospitals for treating patients suspected of having contracted category 1 or category 5 notifiable diseases or emerging infectious diseases. Additionally, 6 designated support hospitals provided medical treatment advice, and local health authorities offered manpower support to response hospitals. To improve staff capabilities, there were 201 communicable disease response training courses and 6 practice drills for response staff. Each sub-region of the CDCMN had a commander and a deputy commander who assisted with area epidemic control and preparedness of response hospitals.

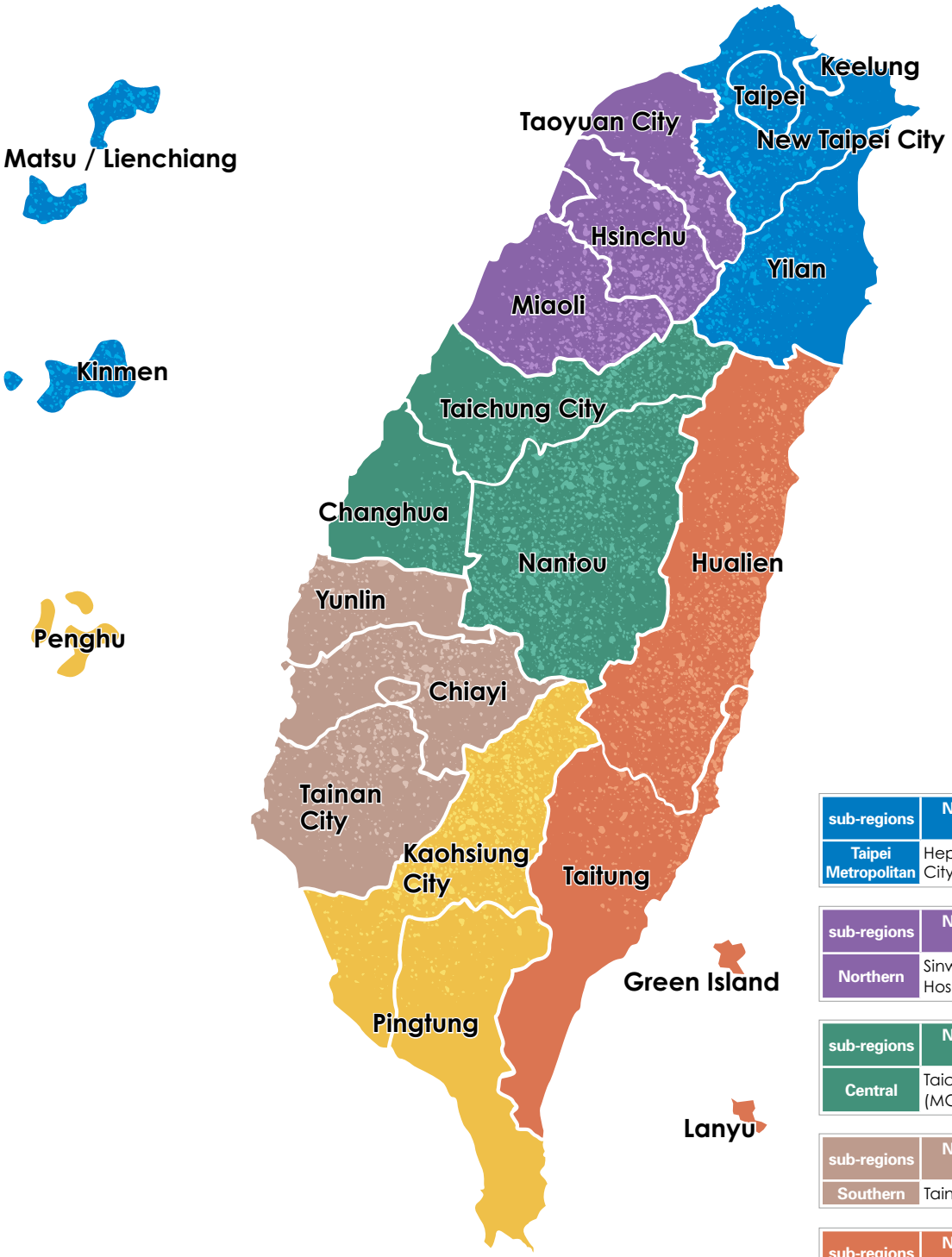
## Future Prospects

Mutation of influenza viruses is still ongoing. We need to continue to prepare for possible pandemics. Therefore, it is important to maximize the use of limited resources in accordance with the Pandemic Influenza Risk Management, which is a guidance released by the WHO in May 2017. Taiwan CDC will put effort in developing and strengthening existing pandemic strategies as well as consolidating a sustainable stockpile of antivirals, vaccines and PPEs. We expect the above actions to pave the way for appropriate responses to possible pandemics in order to ensure people's health.




National Influenza Pandemic Preparedness Plan- Phase III

## Figure 3-7 Communicable Disease Control Medical Network




| sub-regions | Name of Responding Hospital |
|---|---|
| Taipei Metropolitan | Heping Hospital (Taipei City Hospital) |

| sub-regions | Name of Responding Hospital |
|---|---|
| Northern | Sinwu Branch, Taoyuan Hospital (MOHW) |

| sub-regions | Name of Responding Hospital |
|---|---|
| Central | Taichung Hospital (MOHW) |

| sub-regions | Name of Responding Hospital |
|---|---|
| Southern | Tainan Hospital (MOHW) |

| sub-regions | Name of Responding Hospital |
|---|---|
| Eastern | Hualien Hospital (MOHW) |

| sub-regions | Name of Responding Hospital |
|---|---|
| Kaohsiung-Pingtung | Pingtung Hospital (MOHW) |

In the six Communicable Disease Control Medical Network sub-regions there are 132 isolation hospitals, including 6 responding hospitals and 6 support hospitals.

# Dengue Fever

## Current Status

During the first half of the 20th century, there were three island-wide dengue outbreaks in Taiwan (1915, 1931 and 1942). After almost 40 years of dormancy, a DEN-2 outbreak occurred in Liuchiu Township, Pingtung County in 1981, and another DEN-1 outbreak occurred in the Kaohsiung area (1987-1988). Thereafter, dengue outbreaks became more common. Epidemics mainly have occurred in Kaohsiung, Tainan and Pingtung, with several instances in the north. The past ten years have seen an increase in cases of dengue fever and severity level. There were more than 1,000 cases in Taiwan in 2007, 2010, 2011, and 2012. Though the number of cases did not reach 1,000 in 2006, 2009, and 2013, there were still more than 500 cases each year. 2014 and 2015 saw unprecedented outbreaks with more than 10,000 cases. Some 97% of the indigenous cases in 2014 were concentrated in Kaohsiung while indigenous cases were concentrated in Kaohsiung (45%) and Tainan (52%) in 2015.

After suffering the serious dengue outbreaks, Taiwan CDC developed and implemented new approaches. There were few indigenous cases in Taiwan from 2016 to 2020. In 2020, the number of indigenous cases in Taiwan was 73. (Figure 3-8) Severe dengue epidemics in Southeast Asia in recent years have led to an increase in imported cases in Taiwan, reaching 363 in 2016, 350 in 2018, and 540 in 2019. In response to the COVID-19 pandemic in 2020, border controls have been strengthened. In that year, the number of imported cases was 64, the lowest over the previous 10 years. (Figure 3-9)

**Figure 3-8 Indigenous Dengue Cases in Taiwan, 1988 - 2020**

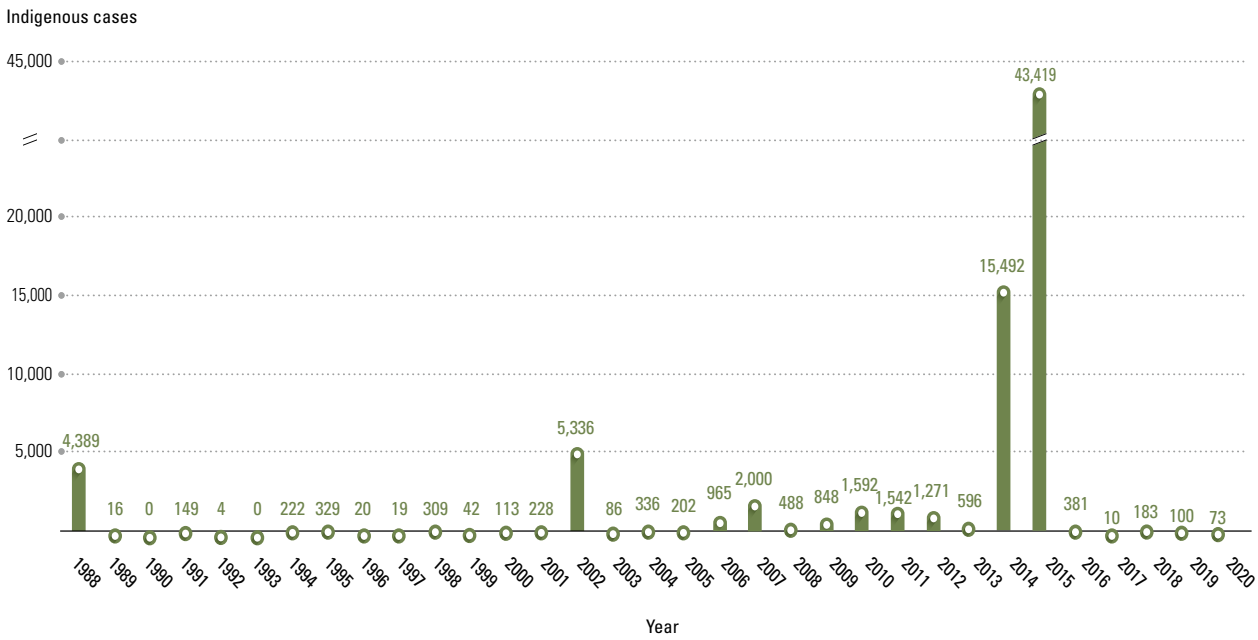
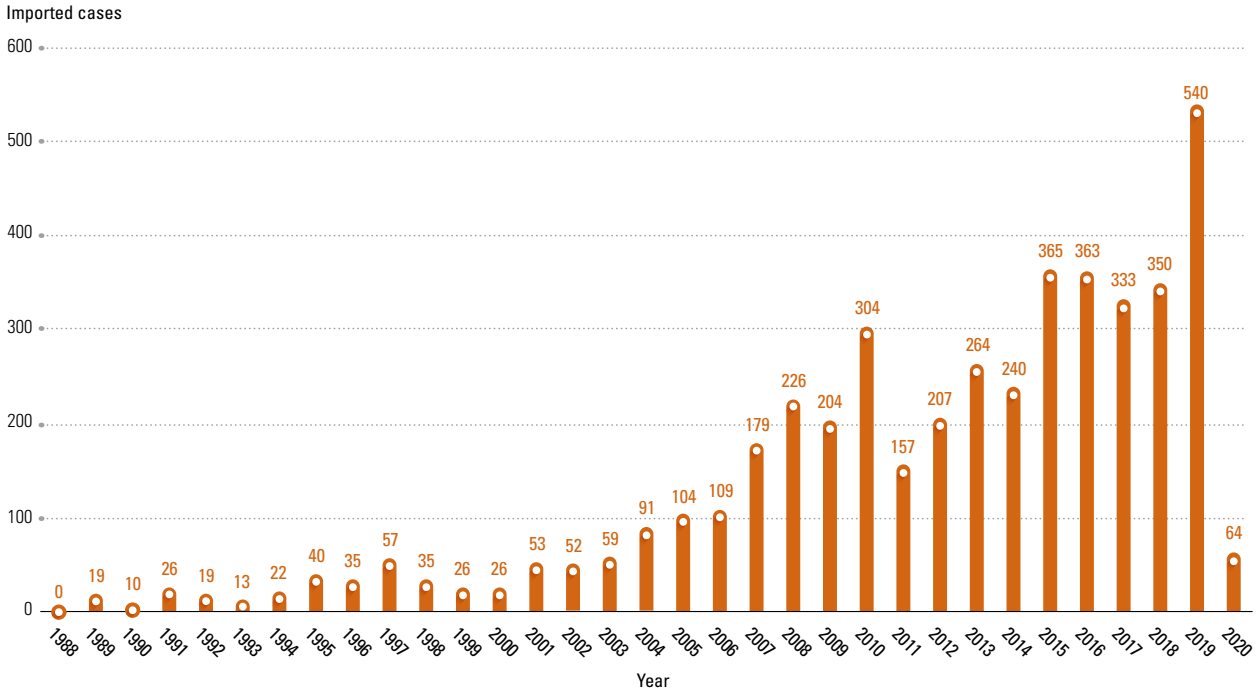


**Figure 3-9 Imported Dengue Cases in Taiwan, 1988 - 2020**




## Goals & Strategies

The main strategies to control dengue in Taiwan are eliminating vector (mosquito) breeding sources and lowering vector density.

Taiwan CDC has devised a three-stage prevention strategy for controlling the dengue epidemic. Primary prevention measures include source reduction and control of the vector population. Secondary measures cover disease surveillance and emergency/contingency mechanisms. Tertiary prevention involves controlling the mortality rate.

**Primary Prevention**

1. Implementing health education through diverse communication channels to promote dengue fever and severe dengue awareness.
2. Involving the community in improving environmental and household sanitation along with reducing vector sources through volunteer training.
3. Encouraging regular inspection and eliminating vector breeding sources by cleaning empty houses, vacant lots, and other potential vector breeding sources, and keeping records for future inspections.
4. Strengthening education and training for disease prevention workers and volunteers.
5. Setting up a vector surveillance mechanism to check places with a high mosquito density probability and promptly wipe out vector sources.

**Secondary Prevention**

1. Constructing a disease surveillance mechanism for prompt control of suspected cases; strengthening disease surveillance and disease trend evaluation through official epidemic reporting systems, emerging disease surveillance, public reporting, and symptom declaration forms.

2. Setting up emergency/contingency mechanisms to promptly investigate suspected transmission sources, spraying insecticide to eliminate those sources, and publicizing the importance of eliminating vector-breeding sites to prevent infection.

**Tertiary Prevention**

1. Establishing guidelines for dengue fever and diagnosis and treatment for severe cases.

2. Organizing continuing education workshops for medical personnel to raise health care quality and lower mortality rates.

## Accomplishments

The following strategies have yielded remarkable results: strengthening border quarantine efforts; improving disease surveillance systems; providing subsidies to support local governments to implement prevention and control programs; periodically convening the Cross-Ministerial Meeting on Measures to Combat Mosquito-Borne Diseases to facilitate communication between the central and local governments; cooperating with the National Mosquito-Borne Diseases Control Research Center. There were only ten indigenous cases in Taiwan in 2017 and 73 cases in 2020, hitting the lowest and second lowest record over the past five years. The aforementioned achievements are remarkable under the conditions of the serious global epidemic of dengue, frequent international interactions, and climate change, which resulted in rapid propagation of mosquito vectors.


Seminars on the Prevention and Control of Dengue Fever, Chikungunya Fever, and Zika Virus Infection were organized for related personnel of Health Bureaus across Taiwan on November 26 and 27, 2020.

**Primary Prevention**

1. Distributed health education and promotional materials, including leaflets, posters, banners, the Combat Manual for Dengue Fever, and VCDs.

2. Produced promotional materials, such as epidemic control programming and newspaper ads, which called on the general public to eliminate breeding sources. These included TV commercials and short films for screening in TV slots reserved for public service announcements.
3. Published the Guidelines for Dengue Control to be the reference for local health organizations.
4. Formulated the Community Mobilization Plan for Cleaning Up Breeding Sources of Vectors. Taiwan CDC encouraged community organizations in southern Taiwan to propose plans to CDC units and organize volunteer teams to exterminate mosquitoes. In total, 1,068 teams of volunteers were recruited. On average, they performed more than 4.5 operations per month.
5. Encouraged experts to conduct studies in insecticide efficiency and mosquito resistance to promote better insecticide use.
6. Promoted dengue fever vector mosquito surveys and the Dengue Fever Control Plan. Implementation was entrusted to the health bureaus of high-risk counties and cities in southern Taiwan (areas infested with Aedes aegypti mosquitos).

**Secondary Prevention**

1. Established an incentive system to encourage physicians to report cases, in turn, enabling early detection of the disease. Medical professionals, including physicians, who reported the year's first indigenous case in each city and county were awarded US$130, and those who reported an imported case were awarded US$80.
2. Continued fever screening at international airports and seaports to limit disease importation. Around 90% of imported dengue cases were detected at ports.

The Minister of Health and Welfare and the Minister of Environmental Protection Administration co-chaired the 50th Cross-Ministerial Meeting on Measures to Combat Mosquito-Borne Diseases on December 16, 2020. The meeting facilitates communication, coordination, and cooperation between the local and central governments.

3. Encouraged clinics and hospitals to use NS1 rapid test to facilitate early diagnosis and implementation of subsequent measures that prevent further transmission of the disease.
4. The Cross-Ministerial Meetings on Measures to Combat Mosquito-Borne Diseases are held monthly not only to enhance communication, cooperation and collaboration between central and local governments, but also to supervise and assist local governments in implementation and prevention efforts for vector born disease.
5. On July 20, 2020, the mobile epidemic prevention team was established. A total of 752 people were dispatched to assist local governments in breeding source inspection, community diagnosis and risk assessment, chemical control supervision, and effectiveness evaluation. On September 18, 2020, the "Dengue Fever Prevention and Control Work Review Conference" was held to provide relevant assistance and suggestions to local governments.

Taiwan CDC, National Health Research Institutes, and Yanping Junior High School held a press conference titled "Let's make a DIY mosquito trap to prevent dengue fever" to introduce DIY mosquito traps to the public.

**Tertiary Prevention**

About 476 clinical physicians attended dengue diagnosis and treatment training courses on July 25, 2020.

## Future Prospects

After Taiwan suffered a serious dengue outbreak in 2015, from 2016 to 2020 Taiwan implemented several prevention and control strategies that have yielded concrete results, which will serve as the foundation for Taiwan CDC to strengthen the cooperation between central and local governments to combat dengue fever. Additionally, Taiwan CDC will continue to strengthen border quarantine efforts, improve disease surveillance systems, raise public awareness through diverse channels, and stay abreast of the technological trends for preventing and controlling communicable diseases in order to respond to upcoming challenges.

## Enteroviruses

Enterovirus belongs to a group of small RNA viruses, including polioviruses, Coxsackie A viruses, Coxsackie B viruses, echoviruses, and other enteroviruses. Enterovirus 71 (EVA71) has significantly higher pathogenicity compared to other known enteroviruses, especially regarding neurological complications. Enteroviruses are found in the gastrointestinal tract (the stool or mouth of infected persons) and respiratory tract (such as saliva, sputum, or nasal mucus). Infections can be produced by direct contact with the secretions of infected persons or with contaminated surfaces or objects.

## Current Status

According to survey data gathered over a period of several years by Taiwan CDC and National Health Insurance Administration (NHI), the number of weekly outpatients and emergency visits for enterovirus infection increases in late March and peaks around mid-June. It decreases after mid-June. There is usually another smaller outbreak when schools reopen in September (Figure 3-10). Many types of enteroviruses exist around the world. Humans appear to be the only known host and source of transmission. The patient is contagious before disease onset, and the infectivity lasts for weeks after the patient is recovered. There are currently no preventive vaccines for non-polio enteroviruses in Taiwan and no known highly efficacious medicines to eliminate the virus once it is inside the human body. Therefore, enteroviruses will continue to pose a threat to human health in the foreseeable future.

The major symptoms of enterovirus infection are herpangina and hand-foot-and-mouth disease (HFMD). According to various surveys, enterovirus infection trends suggest that children under the age of 5 are more prone to critical complications and death. EVA71 is the most commonly seen serotype of cases of enterovirus infection with severe complications (EVSC) in Taiwan. In 2020, Coxsackie A virus was found to be the predominant circulating virus. There were 6 confirmed cases of EVSC infected by EVA71 (5) and Coxsackie A virus (1). No case died. (Figure 3-11)

**Figure 3-10 The Number of Weekly Outpatient and Emergency Visits for Enterovirus Infection in Taiwan, 2010 - 2020**

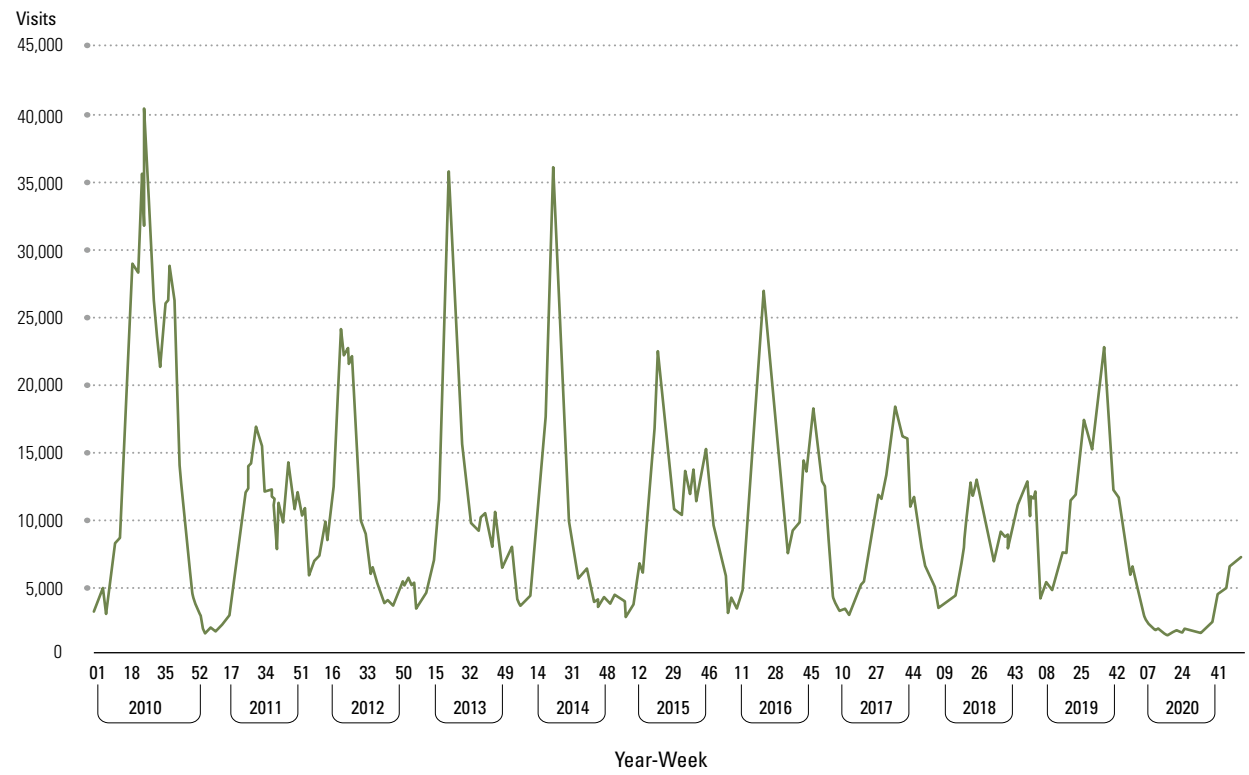
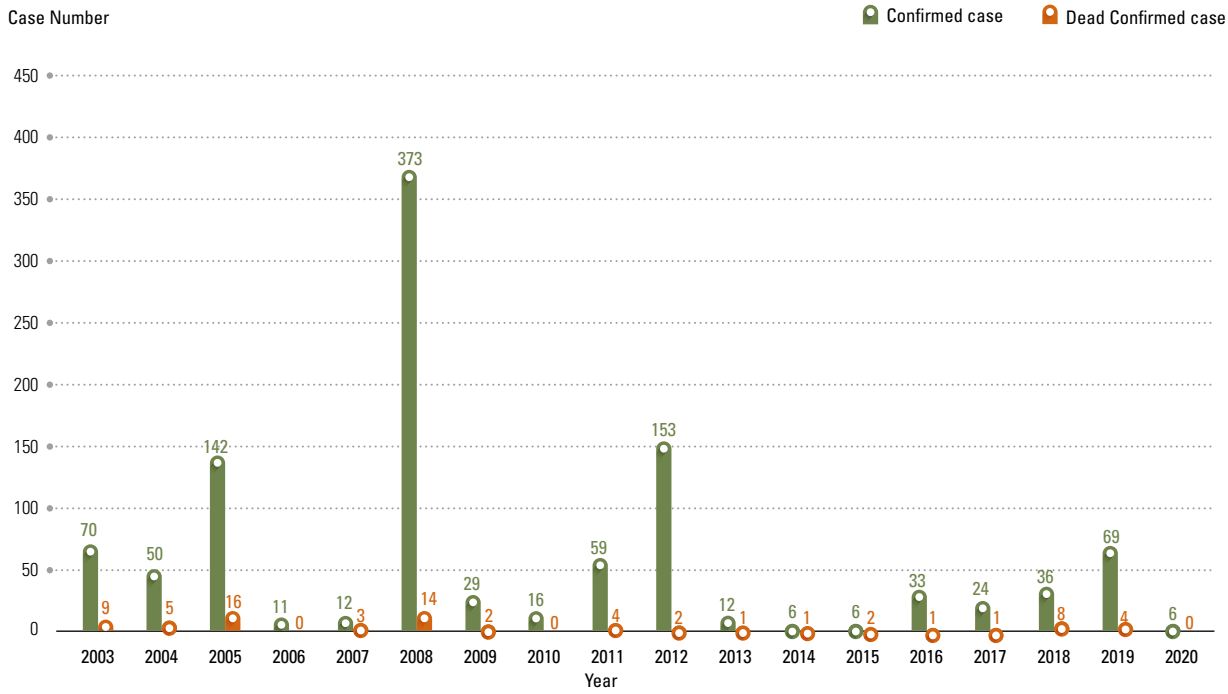


**Figure 3-11 The Volume of Confirmed Cases and Deaths of EVSC in Taiwan, 2003 - 2020**




## Accomplishments

1. Established multiple and real-time surveillance systems for enterovirus infections, covering patients of enterovirus infection (HFMD and herpangina), severe cases, clustering, virus isolation, and typing.

2. Constructed a medical service network, including 6 regional chiefs, 76 responsible hospitals and 9 contracted laboratories. Experts were invited to visit responsible hospitals and provide guidance. Training programs within responsible hospitals and hospitals in their neighborhoods were subsidized.

3. Cooperated with local governments

   (1) Conduct regular inspections for environmental sanitation, provide hand-washing facilities and related prevention measures in schools, kindergartens, baby care centers, hospitals, clinics, postpartum care facilities, and other public gathering places. To reduce the risk of infection, Taiwan CDC strengthened its inspection on kindergartens and nursery homes during the epidemic.

   (2) Enhance health education on enteroviruses prevention and control for the general public and organize training for professionals.

4. Established consultation channels staffed by clinical professionals. The professionals provided clinical health care consultation and guidelines for treating enterovirus complications.

5. "The Manual for Enterovirus Prevention" and "The Handbook for Enterovirus Prevention for Child Care Workers" list all necessary precautions. These materials are provided on the Taiwan CDC website and updated when needed.
6. Workshops are held on the clinical treatment of critical enterovirus complications or neonatal enterovirus infection by hospitals and societies to enhance doctors' skills in treating the disease, raise treatment quality, and reduce mortality rates and sequelae.
7. According to the risk of EVSC clustering, the recommendation of class suspension has been revised for the pre-school education and care institutions, which are high-risk groups.
8. Research and development progress of EVA71 vaccine in Taiwan: After accepting the technology of EVA71 vaccine from the National Health Research Institutes, two domestic biotechnology companies have completed Phase II clinical trials. One of them began the Phase III clinical trials in the 2nd quarter of 2018, and the other one began in the 2nd quarter of 2019.

## Future Prospects

1. **Enterovirus Prevention Enhancement**
   (1) Increase public awareness of hand-washing and not going to school or work when sick.
   (2) Enhance caregivers' awareness of prodromal complications for enterovirus infections with severe complication.
   (3) Raise the awareness of pregnant women, care workers and medical staff for prevention and risk of neonatal enterovirus infection.
   (4) Strengthen the implementation of infection control measures in hospitals or nursing homes to reduce the risk of neonatal enterovirus clusters.
2. **Continuous monitoring of epidemic changes, timely adjustment of prevention and control strategies.**
3. **Follow the development progress of EVA71 vaccine.**

# Emerging Infectious Diseases (EID) Response

## Emerging Infectious Diseases (EIDs) risk surveillance, response and preparedness

In recent years, rapid changes in the global ecosystem and frequent international exchanges have resulted in the occurrence and spreading of many emerging infectious diseases (EIDs), which recognize no geographical borders and spread rapidly.

This has threatened public health, economic development, and even national security. The SARS outbreak in 2003, the MERS-CoV outbreak in 2012, and the Ebola outbreak in 2014 are cases in point. EIDs surely have drawn international attention. In light of this, Taiwan CDC proposed the "Surveillance, Response, and Preparedness Plan for the Risk from Emerging Infectious Diseases", which was approved by the Executive Yuan on the 9th of June in 2015, to effectively prevent and control EIDs. The program started in 2016 and will come to an end in 2021. It aims at maintaining the core capacities at the designated PoEs based on the IHR, expanding the capabilities of testing and diagnosis of emerging pathogens, strengthening preparedness and emergency response, enhancing training and conducting drills to counter possible bioterrorism, and increasing international cooperation.

## Accomplishments

1. Successfully maintained the core capacities at 7 designated PoEs based on the IHR and improved skills for monitoring EIDs and risk assessment.
2. Increased to 15 diagnostic methods for emerging pathogens and advanced diagnostic technology and capacity.
3. Carried out proper maintenance for both software and hardware in the Center for Infectious Disease Control and Prevention, Taiwan CDC. In addition, drills, exercises and multiple channels of training courses were offered for more than 420 persons.

Students from the department of nursing practiced PPE donning and doffing in the Center for Infectious Disease Control and Prevention, Taiwan CDC.

4. Conducted training programs and exercises for the Biohazard Response and Verification Expert Team (BRAVE) and maintained the equipment. More than 80% of BRAVE members obtained certification. These efforts ensured a sufficient capacity for bioterrorism response.
5. A team of experts from the Institute of Labor and Occupational Safety and Health completed inspection and testing of the negative pressure isolation wards of 22 hospitals of the Communicable Disease Control Medical Network (CDCMN), and assisted with improvements.
6. Commanders and deputy commanders participated in 936 CDCMN consultation meetings and COVID-19 international web conferences, provided opinions and shared experience.

# Infection Control and Biosafety

## Healthcare-associated Infection Control

### Current Status

The SARS outbreak highlighted the importance of infection control in hospitals. To improve patient safety and combat nosocomial infections, Taiwan CDC coordinates annual inspection programs, gathers surveillance data on the occurrence of nosocomial infections and antimicrobial resistance, and formulates nosocomial infection control guidelines.

Our goals are:

1. To reduce nosocomial infections through national action plans and compilation of infection control guidelines.
2. To improve the performance of infection control programs in hospitals by boosting the quality of nosocomial infection control inspection programs and sharing nosocomial infection control experiences in on-site audits.
3. To continue promoting hospital participation and strengthening data quality in the Taiwan Healthcare-associated infection and Antimicrobial resistance Surveillance (THAS) system.
4. To promote infection control and reduce healthcare-associated infections in long term care facilities by implementing infection control inspections.

### Accomplishments

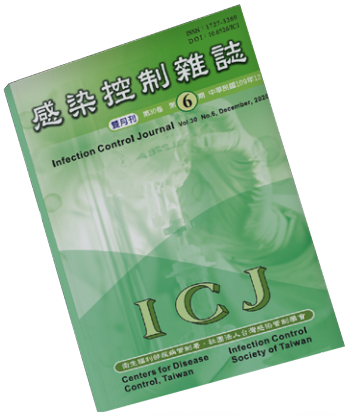
1. **Nosocomial Infection Control Inspections**
   Starting in 2008, Taiwan CDC commissioned the Taiwan Joint Commission on Hospital Accreditation to implement a quality improvement project for infection control inspections. Experienced infection control practitioners and infectious disease specialists joined local health authorities in conducting on-site inspections. Since 2017, the inspection frequency for each hospital was adjusted to at least once in every two years. In 2020, in response to COVID-19 outbreak, the nosocomial infection control inspections was canceled. Instead, Taiwan CDC conducted the unexpected nosocomial infection control inspections. Of 484 hospitals inspected, 66 of them failed to pass the inspections. The pass rate was 86.4%.

2. **Nosocomial Infection Surveillance and Reporting**
   Hospitals may either provide nosocomial surveillance data through web-based entry or convey their data electronically through interchange platform to the reporting system.

More than 484 hospitals enrolled in reporting in 2020. Participating hospitals and health authorities could retrieve feedback reports from the system, including infection densities, most common pathogen for nosocomial infection, their antimicrobial resistance proportions, etc.

3. **Infection Control Journal**
   Taiwan CDC commissioned the Infection Control Society of Taiwan to publish the bimonthly Infection Control Journal, which provides healthcare workers with information on trends and research related to the prevention and control of nosocomial infections.

4. **Infection Control Inspections in Specific Facilities**
   In 2020, in response to COVID-19 outbreak, Taiwan CDC implemented unexpected infection control inspections of correctional institutions, baby care centers and residential long-term care institutions, such as nursing homes, psychiatric nursing homes, puerperium and neonatal care centers, psychiatric rehabilitation agencies, children and youth placement agencies, veterans homes, etc. Local competent authorities inspected 488 facilities in January and 3,653 facilities in March. The pass rate was 90.4% and 94.4%, respectively.




Infection Control Journal was published to provide healthcare workers with information on trends and research related to the prevention and control of nosocomial infections.

## Future Prospects

1. Draft, implement and revise regulations and guidelines on healthcare-associated infection based on recommendations announced by the WHO and leading countries. The information Taiwan CDC gathers from around the world on policies, laws, regulations and implementation results will serve as a reference for policymaking.

2. Revise the nosocomial infection control inspection quality improvement project on an annual basis, according to the implementation experiences from previous years and outside recommendations.

3. Continue to promote hand hygiene and the care bundles that prevent device-associated infections including central line-associated bloodstream infection(CLABSI), ventilator-associated pneumonia(VAP) and catheter-associated urinary tract infections(CAUTI). Thus, enable hospitals to make sustained progress in patient safety and healthcare quality, as well as reduce medical costs by reducing healthcare-associated infections.

4. Continue to improve usefulness, simplicity, and efficiency of nosocomial surveillance system. It is expected that data reported to THAS system will be useful for quality improvement activities.

5. Continue to conduct the infection control inspections of long-term care facilities in order to improve health care quality, reduce healthcare-associated infections and prevent outbreaks.


Taiwan Healthcare-associated infection and Antimicrobial resistance Surveillance (THAS) System

## Antimicrobial Resistance

### Current Status

Antimicrobial resistance (AMR) has become a major global crisis. In response to the increasingly serious threat posed by AMR, Taiwan CDC implemented the National Antimicrobial Stewardship Program, established multi-channel surveillance on multidrug-resistant organisms (MDROs), conducted hospital accreditation and hospital infection control inspection related to the antimicrobial stewardship, carried out coordinated infection control interventions, and implemented appropriate use of antimicrobials to alleviate the AMR crisis. Furthermore, Taiwan CDC proactively created relevant guidelines, e-learning materials and hand hygiene and antimicrobial awareness campaigns to engage public to curb AMR.

Our goals are:

1. To strengthen surveillance of antimicrobial resistant pathogens and to control the spread of carbapenem-resistant Enterobacteriaceae.

2. To conduct hospital accreditation and hospital infection control inspection to request or encourage all hospitals to implement antimicrobial stewardship.

3. To provide a series of e-learning courses for the antimicrobial stewardship to strengthen understanding and awareness among healthcare workers.

4. To hold national campaigns to raise awareness of the public and healthcare workers.

5. To cooperate with human health and animal sectors to combat AMR.

### Accomplishments

**1. Surveillance of Antimicrobial Resistant Pathogens**

Taiwan CDC has conducted AMR surveillance via the National Notifiable Disease Surveillance

System (NNDSS) and the Taiwan Nosocomial Infection Surveillance (TNIS) system for years. To further improve the AMR surveillance efficacy, Taiwan CDC has added a new reporting function, namely the Antimicrobial Resistance Management and Surveillance System, to the TNIS system to collect laboratory testing data of clinical isolates since March 2017. The TNIS system further incorporated tailored visualization reports and formally reformed as Taiwan Healthcare-associated infection and Antimicrobial resistance Surveillance (THAS) System in 2020. Hospitals are encouraged to report cases through Electronic Data Interchange mechanism. More than 170 hospitals enrolled in this module in 2020.

2. **Hospital accreditation and hospital infection control inspection related to antimicrobial stewardship**
   Three indicators have been identified to evaluate the antimicrobial stewardship through the hospital accreditation and hospital infection control inspection system, namely leadership and accountability of antimicrobial stewardship program, surveillance and management mechanism of antimicrobial use, and surveillance and precaution measure of MDROs.

3. **E-learning for the management of AMR**
   Taiwan CDC continued to provide a series of e-learning courses for the antimicrobial stewardship to strengthen understanding and awareness among healthcare workers.

4. **National campaigns**
   To raise awareness of hand hygiene and AMR, Taiwan CDC continued to support the WHO's World Hand Hygiene Day (May 5) and the World Antibiotic Awareness Week (November). Taiwan CDC invited delegates from several relevant government agencies,


Led by Minister of Health and Welfare, health officials of the Central Epidemic Command Center used paint to demonstrate how people should wash their hands to prevent and control infectious diseases, and mark WHO's World Hand Hygiene Day on May 5, 2020.

health professional associations, leaders and healthcare workers from hospitals to attend the launch ceremony and to show the public their commitment to hand hygiene and antimicrobial resistance. Campaign information was also distributed to all healthcare facilities and healthcare workers were encouraged to display their engagements in practicing hand hygiene and tackling AMR.


World Antibiotic Awareness Week Campaign 2020," United to preserve antimicrobials", supporting WHO and increasing awareness of global antibiotic resistance

5. **'One Health' Strategy**
   In response to the first action package of Global Health Security Agenda (GHSA), AMR, Taiwan CDC cooperates with the BAPHIQ, the Ministry of Science and Technology and Academia Sinica to implement a 4-year research project since 2017. The collaboration is under a 'One Health' approach to promote antimicrobial stewardship and reduce the emergence and spread of antimicrobial resistant pathogens in both humans and animals. In addition, the BAPHIQ and Taiwan CDC had compiled the National Action Plan on AMR 2021-2025, and applied PVS Gap Analysis Tool in internal and external evaluation to generate OIE PVS Evaluation Report of the Veterinary Services of Chinese Taipei.

## Future Prospects

1. Promote hospitals to participate in the Antimicrobial Resistance Management and Surveillance System while strengthening surveillance of AMR.
2. Continue to require or encourage all hospitals to implement the antimicrobial stewardship.
3. Continue to strengthen surveillance of antimicrobial-resistant pathogens and promote cooperation between human health and animal sectors to combat antimicrobial resistance.

# Laboratory Biosafety and Biosecurity Management

## Current Status

**Laboratory biosafety in response to the COVID-19 outbreak**

At the end of January 2020, when the COVID-19 outbreak was still uncertain, the Taiwan CDC had planned five measures for laboratory biosafety strategy, including:

1. The development of biosafety norms and guidelines

In mid-January 2020, the Taiwan CDC formulated the "Guidelines on Laboratory Biosafety for Medical Laboratories Handling Suspected COVID-19 Specimens" for clinical testing departments in hospitals, referring to the guidelines on laboratory biosafety for SARS-CoV and MERS-CoV, when the information on the outbreak of unexplained pneumonia in Wuhan, China, was still unknown.

With the epidemic becoming clearer, WHO and developed countries in Europe and the United States have published the latest biosafety guidelines for SARS-CoV-2 laboratories one at a time. Taiwan CDC has revised the "Guidelines on Laboratory Biosafety for SARS-CoV-2" with reference to these guidelines, and provided it to the laboratory staff of clinical testing and medical research for compliance.

2. Require medical laboratories to conduct internal audits
   On January 15, 2020, Taiwan CDC requested the clinical examination departments of hospitals to complete the inspection and improvement of laboratory software and hardware in accordance with the "Laboratory Biosafety Checklist for Medical Laboratories Handling COVID-19 Specimens" within one week.

   With the clarification of the COVID-19 epidemic, global countries have successively invested in SARS-CoV-2 virus research and vaccine development, and high containment laboratories in Taiwan are planning to isolate SARS-CoV-2 virus and conduct related research. For this reason, on February 4, 2020, Taiwan CDC requested 17 high containment laboratories to conduct laboratory self-audit according to the "BSL-3/ABSL-3 Laboratory Biosafety Checklist for Novel Coronavirus 2019" and report to Taiwan CDC by February 10. A total of 11 high containment laboratories in 10 institutions (including 8 BSL-3 laboratories, 2 ABSL-3 laboratories and 1 BSL-4 laboratory) are planned to study SARS-CoV-2 virus.

3. Competent authorities to carry out laboratory biosafety inspections
   The Local Health Bureau conducted on-site laboratory biosafety audits of clinical testing departments in hospitals under its management. 134 hospitals (including 21 medical centers, 75 regional hospitals, and 38 district hospitals) were audited. A total of 114 hospitals (85.1% compliance rate) were initially inspected for compliance, and all 20 hospitals that were not initially inspected for compliance will be improved by February 25, 2020.

   The Taiwan CDC has scheduled high containment laboratories (including 8 BSL-3 laboratories, 2 ABSL-3 laboratories, and 1 BSL-4 laboratory) to inspect the biosafety of 11 laboratories planned to study or isolate SARS-CoV-2 virus. A total of 4 laboratories (2 BSL-3 laboratories, 1 ABSL-3 laboratory and 1 BSL-4 laboratory) were initially checked for compliance, with a compliance rate of 66.7%; the remaining non-compliant laboratories are to be improved by mid-March 2020.

4. Enhancement of COVID-19 spacemen transport capacity and management of SARS-CoV-2 pathogens

Taiwan CDC announced on January 31, 2020 that SARS-CoV-2 virus is classified as a Risk Group 3 (RG3) pathogen for management. The storage, use and transfer of SARS-CoV-2 virus must be approved by the Taiwan CDC prior to external inspection. In 2020, Taiwan CDC approved 11 SARS-CoV-2 applications (including 2 cases of storage and 9 cases of transfer).

Taiwan CDC Director Chou led a team to visit Chung Hwa Post Office in November 2020 to solve the problem of COVID-19 specimen transportation.

In order to improve the transport capacity of COVID-19 specimens in Taiwan, Taiwan CDC Director Chou led a team to visit Chunghwa Post's President Chiang in November 2020. President Chiang agreed to assist local postal systems in the transportion of COVID-19 specimens in accordance with government policy.

5. Using information systems for management
   Taiwan CDC has established the "Laboratory Biosafety Management Information System" for the possession, storage, and use of pathogens and biotoxins above the risk group 2 for the establishment of the management of the file. Every three months, the institution has to maintain the pathogen items and amounts in order to update the information of the system.

**Biosafety Mechanism Registration**

By December 2020, 564 entities have set up biosafety management units and reported to Taiwan's CDC, in which 561 entities have established biosafety committees and 3 entities had a designated biosafety specialist staff. Those 564 entities include 23 government agencies, 158 medical institutions, 56 academic research institutions and 327 other groups.

**Biosafety Inspections of Microbiological and Biomedical Laboratories**

In 2020, Taiwan's CDC has completed the annual laboratory biosafety and biosecurity inspection for 18 BSL-3 laboratories and RG3 pathogens storage facilities. In order to strengthen "Laboratory Biorisk Management" of the entities that possess or use select agents and toxins, Taiwan's CDC has inspection 7 entities in 2020.

## Future Prospects

Taiwan's CDC will amend the infectious biological material management law in 2021, which will require authorities to assign biosafety supervisors to manage the biosafety affairs of the units, and is expected to be formally implemented in 2025. In the meantime, Taiwan CDC expects to complete the training materials for biosafety officers in 2021, conduct fundamental education training for biosafety officers in two periods from 2022 to 2023, and complete the certification system for biosafety officer training organizations in 2024, so that the system of professional management of biosafety officers in Taiwan will be implemented step by step.

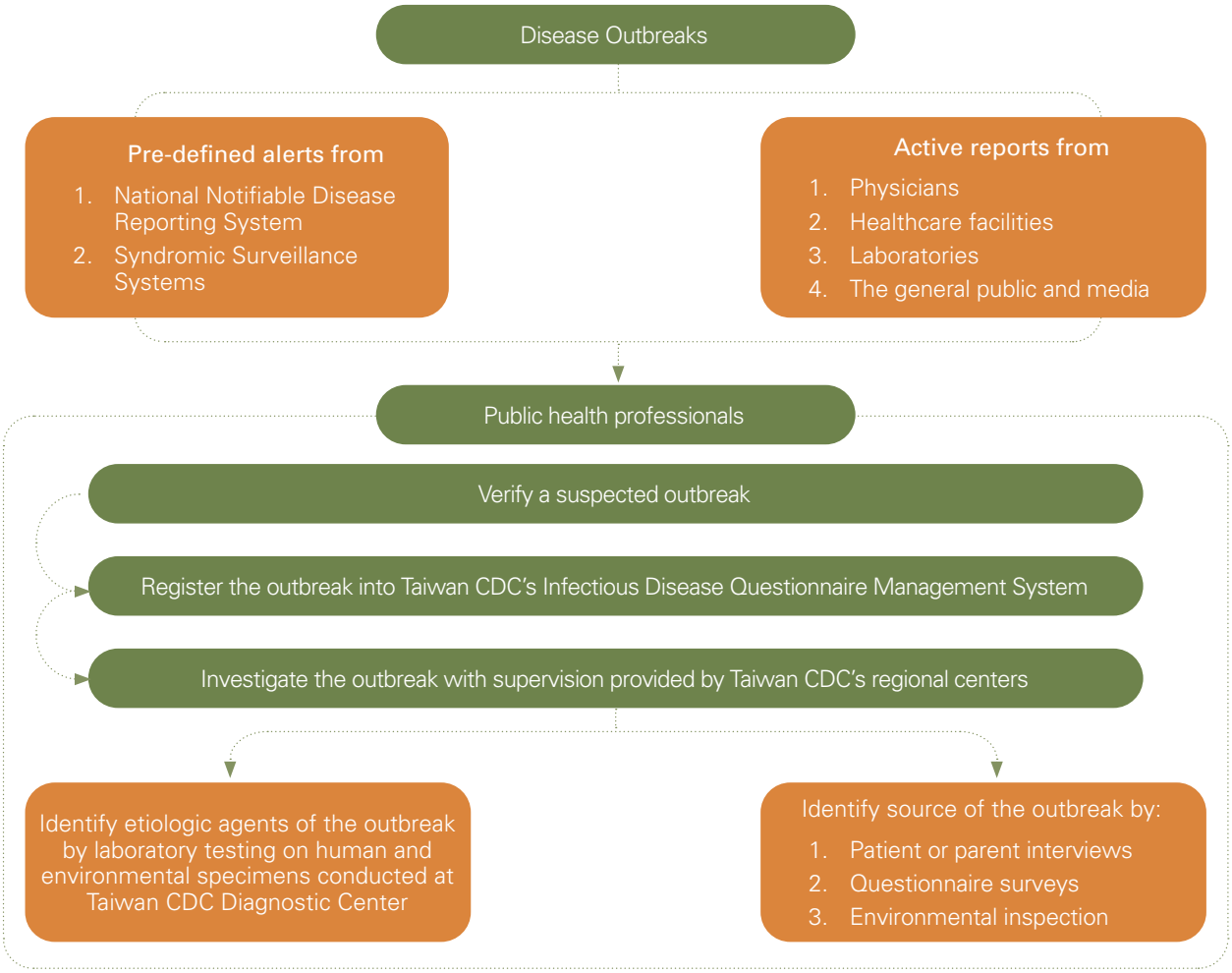
# Outbreak Investigation

## Current Status

One of the core capacities of public health departments is investigating a disease outbreak to institute control and prevention measures. Outbreak investigations are challenging because the cause and source are frequently unknown and could cause public concern and anxiety. There may be hostility and defensiveness if an individual, product, or institution is suspected of being the source of the outbreak. In such pressure-packed settings, public health investigators have to remain calm, professional, and objective.

In Taiwan, outbreaks are mainly detected through pre-defined alerts or activity reports. Public health professionals will verify a suspected outbreak and conduct outbreak investigation and control measures with supervision by Taiwan CDC's regional offices (Figure 3-12).

**Figure 3-12 Flowchart of Outbreak Investigation**



## Field Epidemiology Training Program and Medical Officers

The Field Epidemiology Training Program (FETP) of Taiwan CDC was established in 1984 to train public health professionals as disease investigators. The program is a 2-year on-the-job training focusing on hands-on field investigations and analysis of public health surveillance data. In 2005, Taiwan CDC began to recruit medical officers in preparation for emerging infectious diseases. Since then, the FETP has become a mandatory training program for newly recruited medical officers.

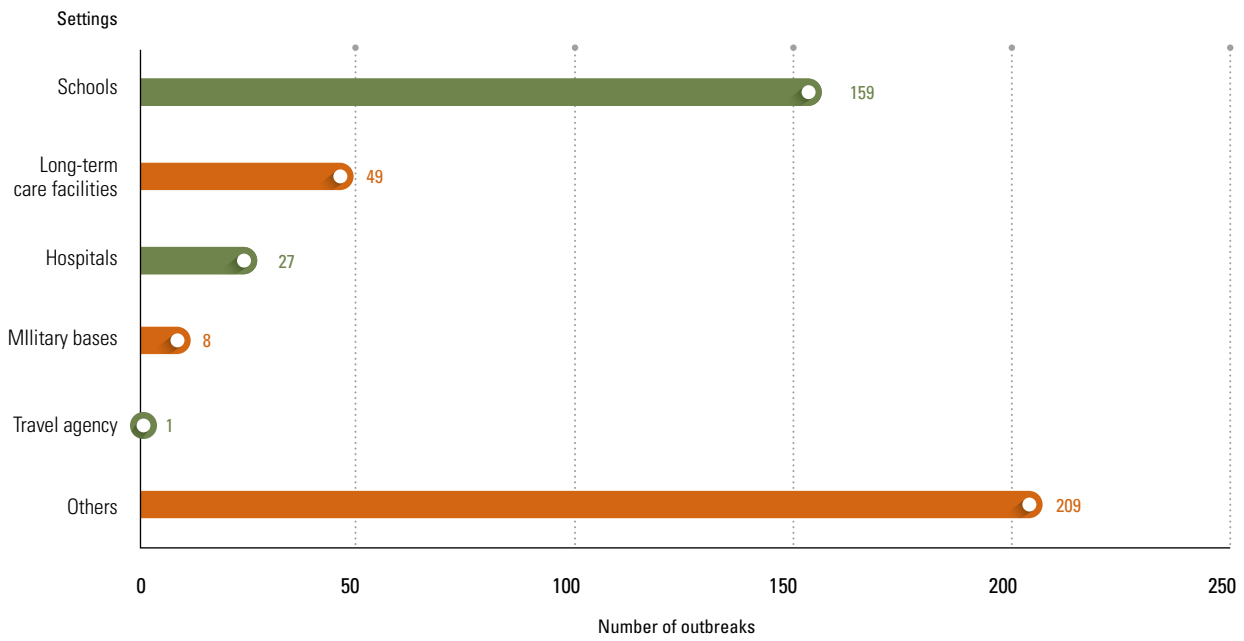
## Accomplishments

1. In 2020, of 977 suspected outbreaks registered into Taiwan CDC's Infectious Disease Questionnaire Management System and investigated by public health authorities, 453 (46%) were confirmed outbreaks.
2. The top four reported diseases/syndromes of confirmed outbreaks were acute diarrhea (n = 263, 58%), acute respiratory infection (n = 61, 13%), influenza-like illness (n = 55, 12%), and varicella/chickenpox (n = 45, 10%) (Table 3-5).
3. The top three outbreak settings were schools (n = 159, 35%), long-term care facilities (n = 49, 11%), and hospitals (n = 27, 6%) (Figure 3-13).

**Table 3-5 Number of Reported Diseases/Syndromes of Confirmed Outbreaks — Taiwan, 2020**

| Reported diseases/syndromes | Total number of outbreaks |
|---|---|
| Acute diarrhea | 263 |
| Acute respiratory infection | 61 |
| Influenza-like illness | 55 |
| Varicella/chickenpox | 45 |
| Enterovirus | 7 |
| Unknown cause of fever | 4 |
| Tuberculosis | 18 |
| Total | 453 |

### 3-13 Number of Outbreaks by Setting — Taiwan, 2020




*Other settings including household, workplace, restaurant and unknown.

4. Special events in 2020 included a gastroenteritis outbreak in a buffet restaurant in Yilan County, and a foodborne illness outbreak among workers at the Environmental Maintenance and Inspection Division in Taoyuan City. In response to the COVID-19 epidemic, Taiwan CDC established a rapid response team to conduct surveillance, risk assessment and communication, outbreak investigation, repatriation missions, case management, and clinical management guidance.

5. By the end of 2020, there were 19 medical officers at Taiwan CDC. Their medical specialties included infectious diseases, internal medicine, family medicine, emergency medicine, pediatric gastroenterology, pediatric cardiology, and pathology.

## Future Prospects

1. Strengthen collaborations with partners, including local health departments, food and agricultural authorities, universities, and other academic institutes.

2. Enroll newly recruited medical officers and public health professionals of interest from Taiwan CDC and local health departments into the FETP.

3. Collaborate with international networks of FETP to enable rapid response in outbreak investigations and to contribute to global health diplomacy.

4. Strengthen workforce building to prepare for and respond to emerging and reemerging public health threats.

# International Health

# 04

# International Cooperation

The COVID-19 pandemic shows again that viruses know no borders and international cooperation is key to controlling infectious disease spread. Therefore, Taiwan CDC has made great efforts to enhance international health exchanges by strengthening bilateral and multilateral relationships, sharing experiences and information with other countries, and participating in or holding online international public health conferences and related workshops. Global cooperation effort is the best way to counter the COVID-19 pandemic.

## Accomplishments

**International Training Program**

1. Virtual Workshop on Preparing for the Second Wave of Novel Coronavirus: Coronavirus disease 2019 (COVID-19) has rapidly spread around the world and caused severe damage in many fields of our society. To prepare for the second wave of COVID-19 infection, the U.S., Japan, Australia and Taiwan co-organized the virtual Global Cooperation and Training Framework (vGCTF) workshop on Preparing for the Second Wave on June 24, 2020. Public health experts were invited to share best practices, lessons learned, and other issues related to preparedness and response for the second wave. The virtual workshop covered the aspects of community preparedness, public health and health care, and surveillance and investigation. Participants of previous public health training programs under the Global Cooperation and Training Framework (GCTF) and experts in charge of COVID-19 prevention and control were also invited. Over 70 experts from 16 countries across the globe tuned in to join the virtual workshop. Through experience sharing and exchanges from the participants and speakers, the virtual workshop provided a platform for participants to improve regional COVID-19 prevention capacity and address the pandemic.

Virtual Workshop on Preparing for the Second Wave of Novel Coronavirus, June 24, 2020

2. Southeast Asia and Western Pacific Bi-Regional FETP COVID-19 Online Scientific Conference: Taiwan CDC and the South Asia Field Epidemiology and Technology Network (SAFETYNET) jointly hosted the conference from November 10 to 12. They invited national Field Epidemiology Training Program members from around the world to discuss the COVID-19 prevention and control and the pandemic situation; their in-flight, border, and community infection investigations; and other topics.

**Bilateral and Multilateral Cooperation Progress Report**

1. Taiwan-Japan Bilateral Cooperation
   Taiwan CDC and Japan NIID held the 17th Japan-Taiwan Symposium via teleconferencing on October 10, 2020. Participants from both sides discussed COVID-19 surveillance, border quarantine, development of COVID-19 vaccines, and laboratory diagnosis of SARS-CoV-2. FETP members from Japan and Taiwan also shared their experiences on COVID-19 outbreak investigation. In addition, the number of joint research projects for infectious diseases between Taiwan CDC and Japan NIID increased from 9 to 11. The new projects are "Antimicrobial resistance in bacterial pathogens for foodborne infections" and "Molecular epidemiology and sequence analysis of influenza viruses in Japan and Taiwan".

2. Taiwan-Palau Bilateral Cooperation
   When Palau discovered suspected cases of COVID-19 among US-national health workers in its country, it implemented the Taiwan-Palau Bilateral Health Cooperation Plan. Staff from Shin Kong Memorial Hospital used teleconferencing tools to advise health care workers in Palau on how to take samples, which were then sent to Taiwan CDC for testing. The test results were negative. Palau President Tommy Remengesau issued a statement on Facebook to thank the Taiwan government, Taiwan CDC, and Shin Kong Memorial Hospital for their assistance.

**New Southbound Policy**

Taiwan CDC is working in conjunction with other government agencies to implement the New Southbound Policy. Taiwan CDC has strengthened cooperation and exchange with New Southbound countries in infectious disease prevention and control, and has established the New Southbound Health Center to build a joint prevention and control network for infectious diseases and prevent cross-border transmission of diseases.

1. Strengthening cooperation and exchange with New Southbound countries:
   Taiwan has close ties with Southeast Asian countries in terms of trade and tourism. Therefore, Taiwan CDC has chosen diseases that are more prevalent in Southeast Asia, namely dengue fever and tuberculosis, as the focus of cooperation in disease prevention and control.

   (1) Exchanges and cooperation of dengue fever prevention and control: Cooperate with Indonesia on the Dengue Prevention and Control Cooperation Program under New Southbound Policy:

      A. In 2020, Taiwan CDC established dengue fever community and school volunteer teams in the Sekejati sub-district of the Bandung city and at SDN 261 Margahayu Raya Elementary School in Indonesia. Taiwan CDC also produced dengue fever prevention and control educational materials and held online training courses on prevention techniques. Besides that, at the request of

the Indonesian Ministry of Health, Taiwan CDC held the Dengue Surveillance Geographic Information System (GIS) Application Workshop.

B. Taiwan CDC held the Result Presentation of Taiwan-Indonesia Dengue Control and Prevention Program online from October 26 to 28. Dr. drh. Didik Budijanto, M.Kes, the director of Prevention and Control of Vector and Zoonotic Infectious Diseases, Health Ministry of Indonesia gave remarks at this event.

(2) Exchanges and cooperation in tuberculosis prevention and control: Cooperate with Vietnam on the Taiwan-Vietnam TB Control Collaborative Project.

A. In 2020, Taiwan CDC joined Quang Ninh, Vietnam in building a bilateral cooperation and connection platform for tuberculosis control. Concerning public health support, Taiwan CDC assisted Vietnam in implementing the eDOTS strategy that applies information technology to tuberculosis prevention and control. Regarding testing support, Taiwan CDC assisted Hospital of Tuberculosis and Lung Disease in Quang Ninh Province in preparing for ISO 15189 certification of TB laboratories, in order to enhance the hospital's tuberculosis testing technology and biosafety quality management. With regard to clinical support, Taiwan and Vietnam jointly discussed diagnosis and treatment of severe cases.

Tuberculosis Care and Prevention International Webinar Under New Southbound Policy, Nov. 5, 2020

B. Taiwan CDC held the "Tuberculosis Care and Prevention International Webinar under New Southbound Policy" on November 5.

2. New Southbound Health Center:
Taiwan CDC provides services such as health education on infectious diseases, counseling, and health care transfers for individuals traveling between Taiwan and New Southbound countries. In 2020, Taiwan CDC renewed the established website that provides a list of recommended hospitals for medical treatment in nine countries, which are Indonesia, India, the Philippines, Vietnam, Thailand, Malaysia, Brunei, Cambodia, Myanmar, as well as recommendations on hospitals in Taiwan; Taiwan CDC also added new information about medical care resources in Singapore and Sri Lanka on the website. In addition, Taiwan CDC provided health care consultation services to overseas Taiwanese nationals unable to return home due to the COVID-19 pandemic. New Southbound Health Center provides online interpretation services in multiple languages, including English, Indonesian, Thai language, and Vietnamese.

**International Exchanges in 2020**

1. Interaction with the WHO and Other Countries in Support of the Global Disease Prevention Network

   (1) Used International Health Regulations (IHR) channels to notify the WHO of confirmed COVID-19 cases. Also, Taiwan CDC shared disease investigation information, contacts, and tracking data with IHR channels and countries around the world.

   (2) Participated in WHO professional meetings, such as global research and innovation online forums, in order to understand research trends and key points relating to viruses, vaccines, and clinical treatments.

2. Interaction with APEC Members

   (1) Attended the 2020 1st and 2nd APEC Health Working Group (HWG) meetings, using these opportunities to share our COVID-19 disease prevention and control experiences with APEC members.

   (2) In 2020, Taiwan CDC proposed the "Digital Tools for Addressing Infectious Disease in the Asia-Pacific Region: Challenges and Opportunities" as a project for APEC. The project passed review by the APEC secretariat and received a subsidy from the APEC Support Fund. Nine countries signed up as co-sponsoring economies: United States, Japan, Chile, Indonesia, Malaysia, Peru, Singapore, Thailand, and Vietnam. The seminar is expected to take place via video conferencing in August 2021.

3. Video Conferencing with Foreign Government Agencies or Parliamentary Bodies to Share Disease Prevention Experiences

   Taiwan CDC conducted video conference meetings with health department officials or parliamentarians from the United States, the Czech Republic, Israel, Japan, South Korea, Thailand, and Australia to share information on our COVID-19 disease prevention policies and experiences.

4. Invitations to Participate in International Meetings to Share Disease Prevention Information

   Taiwan CDC was invited to international meetings held by the Ministry of Foreign Affairs and Taiwan overseas missions, the Academia Sinica, National Yang-Ming University, the European Chamber of Commerce, the US Center for Strategic and International Studies, Rotary International, Harvard University, and Germany's Fraunhofer Institute for Systems and Innovation Research to discuss Taiwan's COVID-19 disease prevention policies and experiences.

## Future Prospects

The fast-spreading COVID-19 around the world has caused a global catastrophe. In order to prevent such a pandemic from happening again, all countries need to have the capabilities to rapidly and effectively detect and respond to infectious diseases and other health threats. As a result, Taiwan CDC will continue to strengthen our bilateral and multilateral cooperation with other countries and international public health institutes. Under the US-Taiwan Global

Cooperation Training Framework (GCTF), Taiwan CDC will continue to provide assistance to its counterparts in the Asia Pacific and Southeast Asian regions to enhance their disease surveillance and diagnosis capabilities and core capacities that are important to detect, assess, report, notify, verify and respond to the threats and challenges presented by emerging infectious diseases. In addition, we will continue to seek more opportunities for active participation in the international arena in order to help ensure a world safe and secure from infectious disease threats and to promote global health security as an international security priority that will be beneficial to us and the region.

# Implementation of the IHR

## WHO International Health Regulations

The WHO International Health Regulations (IHR) are a legal instrument to help the international community to prevent and respond to public health risks that have the potential to cross borders and threaten people worldwide. The main purpose of the IHR is to implement public health responses that can prevent and control the spread of diseases across borders while limiting interference with international transport and trade. The IHR also require that state parties investigate, evaluate and report public health risks and emergencies while reacting promptly to these threats.

Over the years, international transportation has become more convenient, which leads to frequent movement of people and goods. Diseases can spread far and wide via international travel and trade. A health crisis in one country can impact livelihoods and economies in many parts of the world, such as the severe acute respiratory syndrome (SARS) outbreak in 2003. For these reasons, in 2005 the WHO's World Health Assembly (WHA) revised and passed the new IHR, inviting countries around the world to join. The regulations, which took effect in 2007, cover public health incidents and emerging or re-emerging diseases. The WHO has declared six Public Health Emergency of International Concern (PHEIC) events so far. Those events included H1N1 (or swine flu) in 2009, polio in 2014, Ebola in West Africa from 2014 to 2016, Zika from 2015 to 2016, Ebola virus disease (EVD) in the Democratic Republic of the Congo from 2018 to 2020, MERS in 2013, and the ongoing COVID-19 pandemic also constituted a public health threat and crisis worldwide.

Meanwhile, the IHR establish a number of procedures and practices for assessing whether an affected country or region is facing a public health emergency of international concern (PHEIC). The purpose of this model is to prevent an epidemic from occurring in a place where it is not yet confirmed to be a communicable disease. The new IHR also strengthen the National Focal Point (NFP) for each country. The NFP is the state-designated center responsible for communicating with the WHO on public health incidents that have the potential to become an international concern.

Following the IHR, Taiwan CDC, the TFDA, Ministry of Foreign Affairs, Council of Agriculture, and relevant departments and ministries work with the WHO and other countries to conduct prevention and control measures for communicable diseases and other major public health events.

## Operations of IHR Focal Point in Taiwan

1. **Receiving information on epidemics or public health incidents that meet WHO IHR standards for reporting:**
   WHO established the Event Information Site (EIS) for IHR National Focal Points (NFPs) and has granted Taiwan's access in 2009 by the WHO Director General's Office. If an epidemic or public health incident occurs that meets IHR standards for reporting, the WHO uses IHR channels to alert each country, including Taiwan.

2. **Establishing a national, cross-departmental communication channel for forwarding of IHR information promptly:**
   A cross-departmental contact point has been established in Taiwan CDC to facilitate timely correspondence with the WHO IHR on information regarding major public health incidents. Agencies with available counterparts include departments within the Ministry of Health and Welfare, the Taiwan Food and Drug Administration, the Ministry of Foreign Affairs, the Ministry of the Interior, the Ministry of Transportation and Communications, the Bureau of Animal and Plant Health Inspection and Quarantine, local health departments, and related authorities. This channel ensures prompt reporting, communication and responses to related events.

3. **Case referral and reporting diseases or public health events meeting IHR standards:**
   The Taiwan IHR focal point serves as a point of single contact for international referral of communicable disease cases (each country's IHR NFP is the counterpart of case referral). Through the IHR channel, relevant countries are informed of follow-up investigation results to facilitate attending and monitoring referred cases. If a PHEIC occurs, Taiwan immediately informs the WHO IHR contact point, relevant country IHR focal point partners, and international public health organizations.

## Accomplishments

Owing to its experience with the SARS epidemic in 2003, Taiwan vigilantly kept track of information about cases of atypical pneumonia when they were reported in December 2019. On December 31, 2019, Taiwan sent an email to the WHO IHR focal point, informing the WHO of its understanding of the disease and also requesting further information. Given the lack of clarity at the time, as well as the many rumors that were circulating, Taiwan's aim was to ensure that all relevant parties remained alert, especially since the outbreak occurred just before the Lunar New Year holiday, which typically sees tremendous amounts of travel. The actions mean that this channel serves not only as the contact point for emerging public health events but also as an early warning correspondent.

In 2020, Taiwan CDC referred and acquired over 700 items of public health risks of international importance through the NFP and EIS mechanisms. Among the referrals and received items, the majority were investigation collaboration and assistance

requests for tuberculosis cases and contacts, followed by measles, rubella, Hansen's disease (leprosy), Zika virus disease, and dengue fever. Furthermore, as a member of the global village, Taiwan devotes itself to contributing towards health safety in international society.

# International Ports Quarantine Activities

## Current Status

Situated in a subtropical zone with thriving international tourism and trade sectors, Taiwan is highly vulnerable to tropical diseases. To detect the import of disease early and ensure public health, the government established quarantine offices at airports (Songshan, Taoyuan, Taichung and Kaohsiung), seaports (Keelung, Suao, Taipei, Taichung, Mailiao, Kaohsiung, and Hualien), and the three terminals (Kinmen, Matsu and Makung) of the "Mini Three Links" with Mainland China.

To meet WHO's International Health Regulations (IHR, 2005) and prevent the import of diseases by aircraft and ships, Taiwan CDC revised the Regulations Governing Quarantine at Ports. These authorize quarantine units to take all necessary quarantine measures against inbound ships and aircraft together with their crew and passengers for national security and public health protection. Revisions included:

1. Improved Information Management: Enhanced the one-stop information system for quarantine operations. Made the quarantine process and information management more efficient.
2. Streamlined and Standardized Operations: Called for timely revision and standardization of operational procedures in response to the latest epidemic information and historical events.
3. Quarantine Procedure Follow-up: All inbound aircraft and ships, including their crew and passengers, are subject to quarantine to prevent disease importation. After quarantine, follow-up health checks may be performed.
4. IHR Core Capacities at Designated Points of Entry (PoE): Strengthens and maintains core capacities at designated PoEs.

## Accomplishments

1. **One-Stop Information Service**
   Establishing the one-stop information system for all information regarding quarantine operations. This included quarantine operations for aircraft and ships, ship sanitation certificates, vaccinations, fee collection, and online statistics.

**2. Aircraft and Ship Quarantine:**

(1) Any aircraft with crew or passengers exhibiting communicable disease-like symptoms or death must notify Taiwan CDC and document the event. Taiwan CDC will take appropriate measures.

(2) Any ship arriving at a port in Taiwan must declare the state of its sanitation and passengers' health via telegraph, telex, fax, mobile phone or e-mail before arrival. Permission to enter port is granted after the report is reviewed.

(3) Possible scenarios for onboard quarantine:

A. For aircraft: According to the event or emergency, Taiwan CDC may decide to execute aircraft onboard quarantine or other control measures.

B. For ships: In the following cases, quarantine officers may board a ship to implement quarantine measures.

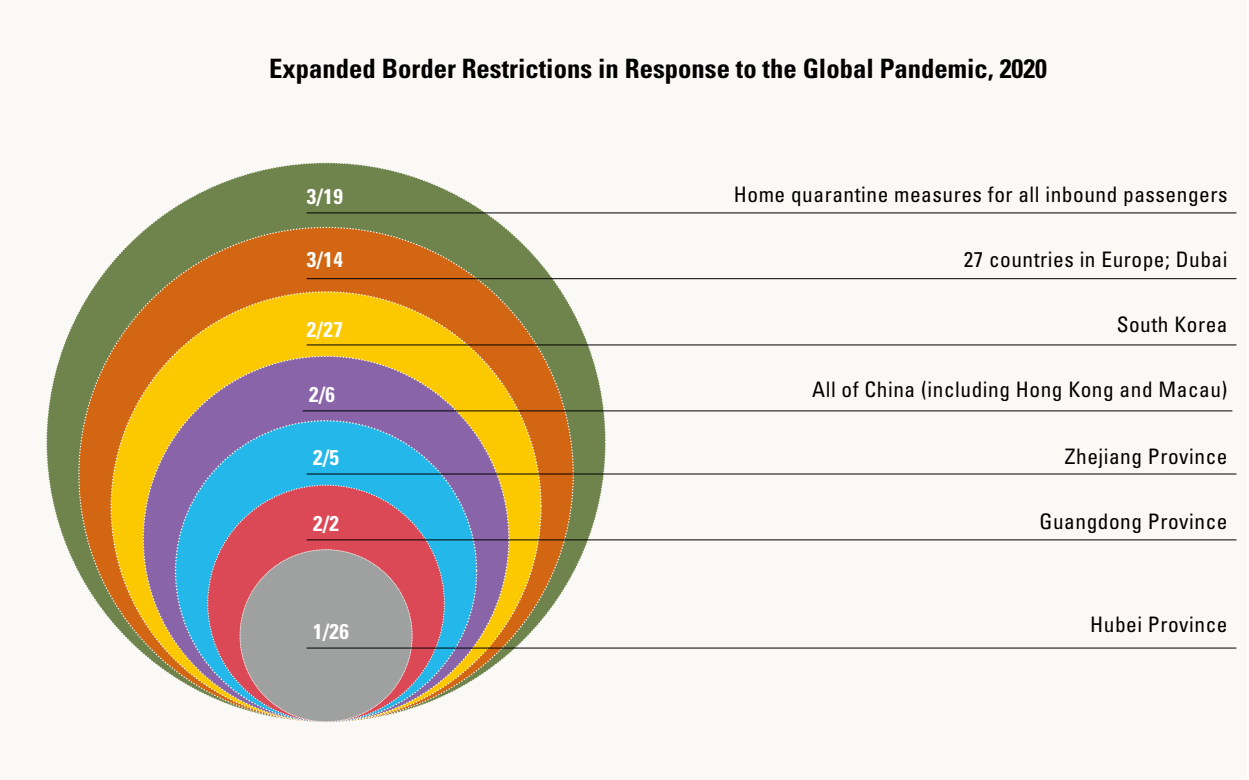
a. The inbound ship failed to apply for quarantine reinspection.

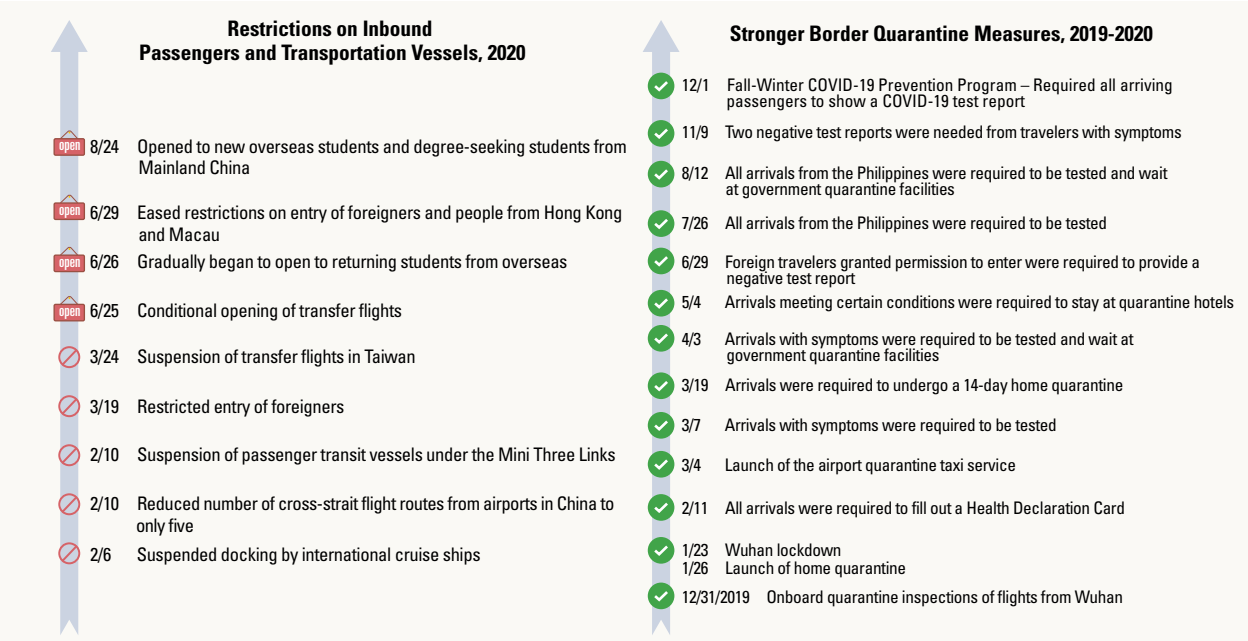
b. The inbound ship applied but failed to meet quarantine requirements.

c. There were animal deaths of unknown reasons on the ship.

d. There were deaths or patients of communicable diseases on the ship.

The following diagram shows the state of quarantine in 2020:






## 3. Crew and Passenger Inspection and Quarantine

All arriving passengers are required to have their body temperature measured using infrared thermometers for early detection and prevention. Passengers showing symptoms are required to fill out the Communicable Disease Survey Form. Depending on the severity of symptoms and travel history, symptomatic passengers are required to offer on-site specimen and subject to hospitalization and/or submit to follow-up tests by local health authorities.

Arriving passengers who became ill after entry are encouraged to seek medical advice and inform their doctor of recent travel history. Of the 3,972,399 passengers who arrived in Taiwan in 2020, 17,804 showed symptoms and were put on the local quarantine follow-up list. Among all symptomatic passengers, 236 COVID-19 cases were confirmed, 39 cases were diagnosed with dengue fever, and 2 cases with chikungunya fever.

## 4. Results of COVID-19 Border Control Response

(1) Key Border Quarantine Measures

A. Health Declarations Provide Advance Information on Inbound Travelers' Health

Starting from January 24, 2020, Taiwan distributed COVID-19 Health Declaration Cards to passengers on inbound flights from China, Hong Kong, and Macau. Passengers were asked to fill out their personal information, travel history, and health status. From February 11, the measure was extended to all inbound passenger flights. In addition, in response to new home quarantine measures for inbound passengers, from February 3, Taiwan CDC merged the Health Declaration Card and the COVID-19 Home Quarantine Notice into the COVID-19 Health Declaration and Home Quarantine Notice. Besides health information, travelers were asked to provide their address and cell phone number for home quarantine. The additional information aided follow-up care and tracking by health administration and civil administration officials.

B. Expanding Tailored Entry Control Measures and Strictly Managing Border Risks
Starting from March 19, 2020, various ministries and commissions used their authority to expand restrictions on entry of foreign nationals. All people who received permission to enter were required to subject to a 14-day home quarantine. Quarantine measures were strengthened for people coming from key high-risk countries.

C. Strengthening Fever Screenings and Health Assessments to identify Travelers with Symptoms
Health monitoring of arriving passengers included the use of infrared thermal imaging cameras to measure body temperatures. Passengers who had an abnormal temperature and those who declared symptoms were asked additional questions on their travel history, occupation, contact history, and cluster information. They were also screened for distinct COVID-19 symptoms, such as abnormal sense of taste or smell, and subjected to required specimen collection, testing, and health treatment measures as determined by the port quarantine staff directives.

D. Emergency Treatment of Suspected COVID-19 Patients to Reduce Community Transmission
Following rigorous, standardized procedures, health officials sent patients with a fever or other symptoms directly to contracted hospitals for diagnosis and treatment while implementing isolation measures to keep the patients away from the public. These mechanisms ensured that suspected patients can immediately receive treatment and be brought under the watch of community disease prevention units, which supported follow-up tracking and management.

(2) Enhanced Quarantine Measures for Airport and Aviation Operators

A. Onboard Quarantine Inspections of Passengers on Direct Flights from Wuhan Stop People with Symptoms
Taiwan CDC implemented onboard quarantine inspections of people on direct flights from Wuhan between December 31, 2019, and January 23, 2020. When aircraft arrived on the airport apron, officials immediately boarded to give health-related instructions, assess passenger health, and announce rules. Passengers and crew were dispersed into two groups: those with symptoms and those without symptoms, for disembarkation and temperature screening. People with symptoms were subjected to follow-up hospital referral procedures. These measures uncovered Taiwan's first case of COVID-19 on January 20.

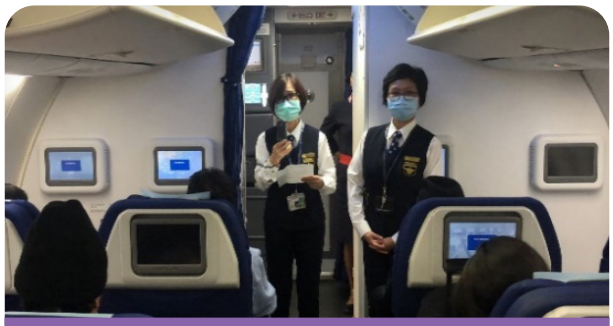
B. Airport Testing Stations and Government Quarantine Facilities to Wait for Results Reduce Risk of Community Transmission by Passengers with Symptoms
Airports in Taoyuan, Kaohsiung, Songshan, and Taichung established onsite specimen collection and testing stations on February 6, February 26, and October 16, 2020, respectively. Passengers with mild symptoms had their nasopharyngeal swab samples collected, in order to separate passengers into groups based on their risks and maintain hospital capacity. Starting April 3, passengers were required

to wait at a government quarantine facility after undergoing specimen collection. Based on their test results, they could then go home for home quarantine or to a quarantine hotel. In addition, from September 1 all airport testing was changed to deep-throat saliva testing.

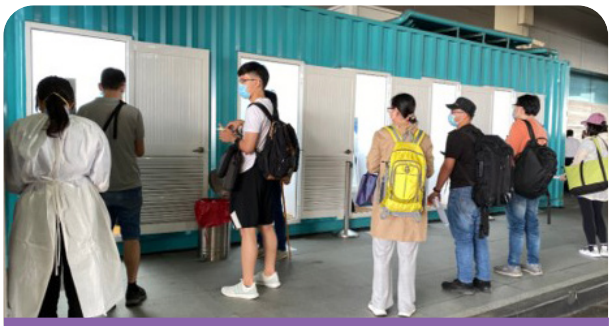
C. Charter (Private) Flights and Anchorage Quarantine Procedures Arranged for Repatriation of Citizens from High-Risk Areas to Strengthen Infection Risk Management
Using chartered and private flights, Taiwan repatriated Taiwanese nationals stranded in high-risk situations, including passengers on the Diamond Princess cruise ship and people in affected locations such as Wuhan or India. Upon arrival at Taoyuan International Airport, the passengers were subject to initial quarantine measures on the aircraft followed by disembarkation procedures that included passenger diversion, temperature screenings, and health evaluations by a doctor. Passengers without any symptoms were transported to a government quarantine facility while those suspected of being infected were hospitalized, in order to strengthen management over high-risk individuals.

D. The Fall-Winter COVID-19 Prevention Program strengthened border quarantine measures. Starting from December 1, 2020, the program required all international arrivals at Taiwan's airports and all transit passengers passing through Taiwan's airports to provide a COVID-19 RT-PCR test result issued within three days prior to boarding the flight to Taiwan.

E. Ensuring Safe Working Conditions for High-Risk, Front-Line Workers by Providing Protective Equipment, Disease Control, and Health Management
Front-line workers at seaports and airports, including sea and flight crews, frequently come into contact with international travelers. Taiwan CDC therefore created health monitoring guidelines for health workers and other personnel involved in quarantine, specimen collection, and other procedures. The Civil Aeronautics Administration (CAA), under the Ministry of Transportation and Communications, also set regulations governing protective equipment for crews and safety and protection measures for passengers, in order to ensure safe working conditions.



Quarantine personnel conducted onboard quarantine inspections that included health-related instructions, passenger health assessments, and rules announcement.



Taoyuan International Airport converted shipping containers into specimen collection and testing stations for use with arriving passengers who exhibited symptoms.

For long-haul crew members, the CAA established the "Operational Principles for R.O.C (Taiwanese) Airlines Air Crewmembers to Implement Health Control Measures for Epidemic Prevention," which airlines shall follow to manage stays and transportation at outstation, onboard personal protection, and quarantine measures of crew members upon returning to Taiwan. The measures sought to balance disease prevention and health management of air crews with the necessity for Taiwan to maintain air transport services.

Anchorage quarantine procedures for chartered and private flights used to repatriate Taiwanese nationals stranded in high-risk situations.

(3) Strengthened Quarantine Measures for Seaport and Shipping Operators

A. Stricter Health Declaration Requirements for Ships Entering Ports, Including Immediate Boarding and Quarantine for Irregularities Followed by Medical Evaluation
Besides the normally required Maritime Declaration of Health, from May 4, 2020, ships entering Taiwan from foreign waters were required to provide a Health Status Declaration of Crew Members on Board. When a suspected COVID-19 case was reported, Taiwan CDC boarded the ship to conduct quarantine procedures and sent people suspected of having COVID-19 for medical evaluation.

B. Guidelines for Management of Ships, Ports, and Crew Members During the Pandemic
In May 2020, Taiwan CDC implemented quarantine measures and crew health monitoring guidelines for ships docking at Taiwan's ports during the COVID-19 pandemic. These included reporting by ships that enter Taiwan, notification regarding any health abnormalities among crew members, disease prevention measures taken by ship operators (captains), and responses when there is a suspected case of COVID-19. In July 2020, additional guidelines for disease prevention on transport ships during the pandemic provided disease prevention measures for at-risk crew members who needed to sail. In October 2020, Taiwan CDC implemented principles for the emergency medical treatment of ship crew members passing into Taiwanese territory through international waters or under the Mini Three Links during the pandemic. The measures included telemedicine channels for crew members with injuries, chronic diseases, or other non-communicable conditions, so they could receive needed treatment without putting themselves or others at risk of disease transmission. Notification mechanisms made ports, health agencies, and hospitals aware of how to handle crew members who left their boats for medical treatment.

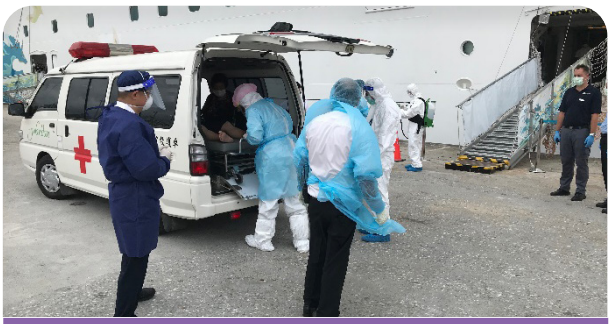
C. Establishment of Quarantine Mechanisms for Ships and Entry Standards for Crew Members, with the Aim of Balancing Industrial Operations and Controlling Against Disease Risks

Considering the diverse operational modes and industrial needs of ships, as well as the varying degrees of disease risks, Taiwan CDC meets with the competent authorities in charge of ships and the shipping industry to assess disease prevention standards for merchant ships, cruise liners, yachts, offshore wind turbine vessels, deep sea fishing boats, live fish carriers, and other types of seafaring vessels. Mechanisms include whole ship quarantines and entire full crew replacements, as well as rules governing the changing of crews in Taiwan's harbors and the option for seafarers to depart Taiwan within three days of arrival via designated quarantine channels.

D. Joint Mechanisms Involving Transportation, Immigration, Quarantine, and Police Agencies to Strictly Manage Ports and Borders

People who leave their ship and enter Taiwan were subject to 14-day home quarantine. The Maritime Port Bureau, Taiwan CDC, National Immigration Agency, and National Police Agency jointly built inspection mechanisms that use cross-departmental information sharing and identity checks of people who enter port areas to prevent entry into Taiwan without undergoing quarantine and to solidify port and border restrictions.

E. Rolling Adjustments to Docking Restrictions and Quarantine Measures for Cruise Ships and Other High-Risk Passenger Vessels



A passenger suspected of having COVID-19 was sent to a hospital for specimen collection and testing. Officials boarded the ship for quarantine inspection.

A quarantine official conducted hygiene inspections on the ship.

Cruise liners posed a high risk of transmission due to their high passenger densities and the frequent numbers of ships sailing under the Mini Three Links policy. As the pandemic developed, Taiwan CDC conducted rolling reviews and adjustments to quarantine measures for cruise ships. Temperature screenings began in January 2020. Passengers were required to fill out health declaration cards, and those who had traveled to a pandemic zone within 14 days before arrival were prohibited from leaving the ship. Restrictions gradually tightened. Cruise ships that called at Mainland China, Hong Kong, or Macau within 14 days before arrival or those that had a confirmed or suspected case of COVID-19 on

board within 28 days before arrival were not allowed to dock in Taiwan. As the pandemic situation began to ease in June, Taiwan began to allow some ships to enter harbor areas for refueling and replenishment of freshwater and supplies. In July, cruise ships that followed required quarantine measures were able to sail domestic routes and navigate into the high seas. However, direct cross strait passenger routes governed by the Mini Three Links were suspended beginning from February 10.

(4) Using the Quarantine System for Entry to Support Connected Community Disease Prevention

A. Border quarantine policies were based on surveys of front-line needs, rapid establishment of a system framework, and the health status of people entering Taiwan. When travelers checked in at the airline counter at their point of origin, they used mobile phones to scan a QR code that brought them to the Quarantine System for Entry website. While waiting at the foreign airport, they could then use the system to complete a health declaration. When their flight arrived in Taiwan, their health declaration passes and quarantine forms were sent via text message to their phones. Having these documents in advance enabled travelers to receive faster immigration clearance.

B. Taiwan CDC further publicized the online health declaration system by encouraging passengers to follow the four steps: scanning, data entry, text message receipt, and text message display. The usage rate of the system was already over 99%.


Using the Quarantine System for Entry to enhance passenger data collection, accelerate customs clearing, and connect community disease prevention efforts

C. To support system linking and integrated information flow, Taiwan CDC used the National Immigration Agency's Advance Passenger Information System to compare and confirm traveler identity. Related information, such as travel history and symptoms, were linked to the Smart Quarantine Multifunctional System to reduce repeated entry of data by quarantine officials. The system also has a disease tracking system that enhances community disease prevention effectiveness and supports data sharing.

**5. Control of Disease Vectors in Ports**

To control vector density (i.e., any infectious disease carrier such as rats or mosquitoes) at ports and prevent the spread of communicable diseases, Taiwan CDC adopted the following measures:

(1) Rat Surveillance and Control:

A. Putting out anticoagulant baits in places where rats are rampant. Baits are replenished every 10 to 15 days to ensure efficacy.

B. Examining captured rats for parasites and testing blood serum for *Rickettsia typhi*, plague, and hantavirus.

(2) Mosquito Surveillance and Control:

Mosquitoes are vectors of several communicable diseases, including yellow fever and dengue fever. The mosquito population density is closely related to the development of an epidemic. To understand the variety and quantity of mosquitoes, the following methods were adopted:

A. Discovering and Eliminating Breeding Sources of Dengue Fever Vectors: Empty containers that are prone to retain water (bottles, jars, tires, etc.) are checked monthly to prevent vector breeding.

B. Setting Ovitraps: Traps are placed around the port/airport for mosquitoes to lay eggs. The inside of the traps are laid with pieces of coarse cloth moistened with Temephos to kill the larvae after they hatch. The traps are replaced monthly, and the number of eggs laid was used for calculating the mosquito population density in the port areas.

C. Surveying Adult Mosquitoes: Lamps are hung in selected places for trapping mosquitoes to identify their species and track their activities.

(3) Organizing International Port Sanitary Groups: Members consist of port authority personnel and stakeholders, including customs, immigration, Taiwan CDC regional centers, animal and plant quarantine, the National Security Bureau, representatives of airline companies, cargo terminal, and other relevant organizations. These representatives meet every three to six months to coordinate action plans and implement policies concerning port security and sanitation.

**6. IHR Core Capacities at Designated PoE**

Taiwan has 7 designated PoEs (4 airports and 3 seaports). These PoEs meet the requirements of IHR (2005) core capacities and are able to cover over 96% of passengers and 78% of cargo movements in order to ensure national health and safety. To ensure that these designated PoEs are able to maintain core capacities and coordinate infrastructure operations, under supervision of Homeland Security Office of the Executive Yuan, an external evaluation is required every 5 years and annual self-assessment is conducted. In 2020, the self-assessment results of the 7 designated PoEs were all full marks.

**7. Other Sanitation Control Measures**

(1) Shipboard Sanitation Control: To prevent the spread of diseases on ships on international routes, Taiwan CDC imposes ship control measures in accordance with IHR (2005) and the Regulations Governing Quarantine at Ports.

A. Implementation of IHR (2005) on June 15, 2007, included issuance of required sanitary documents for international shipping such as the Ship Sanitation Control Exemption Certificate and the Ship Sanitation Control Certificate. Taiwan CDC granted these documents a six-month period of validity. On these documents, shipping crew must identify and record all areas of ship-borne public health risks, and required control measures were conducted.

B. To prevent rats from running to shore along mooring cables, rat guards must be hung on every cable. Ships that fail to do so would be immediately reported and put on record for quarantine reference the next time they call on the port.

(2) Since direct voyage routes between several authorized fishery ports in Taiwan and China were permitted, local health authorities began to conduct additional quarantine work to prevent transmission of communicable diseases.

**8. Promoting Travel Health**

A total of 32 travel clinics, distributed across the country, provide pre-travel preventive medicine, vaccines and consultation for measures to prevent disease during travel. At the same time, Taiwan CDC established the Training Center for Travel Medicine to promote related education and research, and it provides people with the latest international travel health information via Taiwan CDC's official website.

The "2020 International Travel Medicine New Vision Workshop" was held in Taipei on September 11, 2020. Dr. Lin Hwei Chen, president of the International Society of Travel Medicine (ISTM), was invited to give a speech at the opening ceremony, and Taiwan CDC's medical officers and experts shared their international travel medical expertise and the latest developments. Professional medical personnel from travel clinics and related workers were invited to participate in the discussion to enhance the professional knowledge of travel medicine.


2020 International Travel Medicine New Vision Workshop, September 11, 2020

9. **Reinforced Border Quarantine and Cross-Border Collaboration for Disease Prevention-Phase I Project (2018-2022)**
   In addition to continuing to strengthen existing quarantine practices, the establishment of the Smart Quarantine Network, the improvement of quarantine personnel quality and quantity, the promotion for the concept of travel medicine, and the active sharing of experiences with other countries have all contributed to an increase in Taiwan's capabilities for border quarantine at its international ports and emergency preparedness. This has improved domestic disease prevention by preventing infectious diseases from spreading into Taiwan.

## Future Prospects

1. With limited manpower and equipment, Taiwan CDC aimed to strengthen quarantine capacities and effectively execute quarantine measures to prevent any import of disease.
2. Cultivate professional quarantine personnel, encourage the development of new quarantine techniques, and improve quarantine officers' performance.
3. Further eradicate vectors on ships and monitor rat and mosquito populations in port areas to avoid the spread of communicable diseases.
4. Continue to maintain and strengthen core capacities at the seven designated PoEs based on the IHR (2005) in order to extensively improve response capabilities of our international ports and prevent the spread of disease in our nation.
5. In response to the COVID-19 pandemic, Taiwan strictly managed border risks. Passengers were required to declare their health status and undergo health monitoring and quarantine upon entry. At the same time, we monitored international disease risks and our border management, and community disease prevention capacity. By adopting rolling reviews and adjusting our strategies, we prevented disease spread and kept people safe.

# 05

# Scientific Research and Development

# Research, Development and Manufacturing

## Current Status

Taiwan CDC is the competent authority governing laboratory testing for communicable diseases and development of testing technologies in Taiwan with three major focuses: 1. Laboratory testing for communicable diseases, the establishment of testing standards, and training of professionals; the establishment, analysis, and application of a biorepository and pathogenic microorganism genome database; the appointment, commission, and approval of institutions for laboratory testing; the planning and execution of regulations governing laboratory biosafety and quality assurance; 2. Development and transfer of laboratory testing technologies; 3. Planning and execution of policies governing the manufacturing of anti-snake venom serum and vaccines.

In addition, facing emerging and re-emerging communicable diseases, Taiwan CDC puts great emphasis on international collaboration with a focus on information exchange, experience sharing and laboratory technology advances.

## Accomplishments

**The National Laboratory System for Public Health in Taiwan**

Taiwan CDC supervises quality management of the National Laboratory System conducting diagnostic testing of major infectious diseases, which includes 87 COVID-19 designated labs, 11 Novel Influenza A virus infections designated labs, 16 commissioned labs, 268 authorized labs, and 1 anatomical pathology lab. All of the indicators, including laboratory testing for detection of 10 priority diseases, specimen referral and transport system, effective modern point of care and laboratory-based diagnostics, as well as laboratory quality system, were verified to have sustainable capacity and thus reached the full-score level. In 2020, Taiwan CDC national laboratories conducted 138,741 tests and were accredited by TAF according to ISO 15189 from December 26, 2017, to December 25, 2020.

**National Influenza Center (NIC)**

1. During the COVID-19 pandemic in 2020, the influenza activity was low in Taiwan and globally. In Taiwan, 78 A/H1N1pdm09, 6 A/H3N2 and 31 Influenza B viruses were antigenically characterized. Of them, 17 (21.8%) A/H1N1pdm09, 6 (100%) A/H3N2 and 28 (90.3%) Influenza B viruses were inhibited poorly by post-infection ferret antisera raised against vaccine strains. Influenza A/H1N1pdm09 and A/H3N2 viruses were found to have an increased viral genetic heterogeneity.

2. In 2020, 63 A/H1N1pdm09, 4 A/H3N2 and 22 Influenza B viruses were tested for oseltamivir resistance. Of them, no virus was resistant to oseltamivir.

**Viral Respiratory Diseases Laboratory**

1. Developed real-time reverse transcription polymerase chain reaction (real-time RT-PCR) test with high sensitivity and specificity for detection of SARS-CoV-2.

2. Established a national laboratory network of SARS-CoV-2 with a capacity of 11,019 real-time RT-PCR tests per day, comprised of 90 laboratories.

3. Performed multiplex real-time PCR reactions, which targeted Influenza A and B, human adenovirus, RSV, coronaviruses (229E, OC43, NL63, HKU1, MERS), human metapneumovirus, bocavirus, parainfluenza type 1-4, Enterovirus, Rhinovirus, Parvovirus B19, HSV1, HSV2, CMV, VZV, *Legionella pneumophila* and *Mycoplasma pneumoniae*, for diagnosis of unexplained severe pneumonias and respiratory disease clusters.

4. In 2020, no measles case was confirmed from 169 reported cases and the other pathogens that caused febrile and rash were detected by using real-time PCR reactions. Among them, Varicella zoster virus (n=6), human parvo B19 virus (n=6), and adenovirus (n=1) were found from these reported cases. No rubella cases were confirmed from 40 reported cases in 2020. Among them, one was found to be infected by human parvo B19 virus.

**Viral Enteric and Diarrhoeal Diseases Laboratory**

1. Norovirus was the major cause of acute gastroenteritis (AGE) outbreaks in Taiwan. In 2020, 232 (42.1%) of 551 AGE outbreaks were laboratory diagnosed as Norovirus. Among them, GII.2 accounted for 91 (39.2%) and became the major genotype causing norovirus outbreaks in Taiwan.

2. Established and evaluated the application of NGS direct sequencing for real-time pathogens detection of notifiable diarrhea syndrome clusters and foodborne-related outbreaks.

**HIV and Emerging Diseases Laboratory**

1. Continued HIV drug resistance surveillance survey among treatment naïve patients. The overall drug resistance rate for any class of anti-HIV drugs was around 11.9% in 2019.

2. Assessed the algorithms of HIV laboratory diagnosis in Taiwan for the HIV prevention policy. By integrating all these measures, we expect that more HIV infections can be detected earlier to reduce further HIV spreading.

3. Four cases of suspected transfusion-transmitted HCV infection in Taiwan were analyzed in 2020. No HCV nucleic acid was detected among the donated blood. There have been no cases of acute hepatitis C infection or HIV due to blood transfusions in Taiwan since 2015.

4. An EV detection kit (48 tests /box) was developed and currently used by authorized EV detection laboratories. It uses Pan-EV real-time RT-PCR for rapid EV detection. Advantages of Pan-EV real-time RT-PCR include high specificity, a shorter process time (approximately 2.5 hours), and completion without sequencing or electrophoresis.

**Vector-Borne Viral and Rickettsial Diseases Laboratory**

1. Developed a rapid immunochromatographic test for dengue, chikungunya and Zika viral infections to provide correct clinical treatment and control measures in public health.
2. Developed a rapid multiplex nucleic acid assay for scrub typhus and murine typhus to provide medical diagnosis and control measures of the diseases.
3. In 2020, a total of 140 dengue cases, 3 chikungunya cases and 2 Zika cases were identified. Virus genome sequences provided essential information on the global expansion and genetic evolution of vector-borne viruses.
4. In 2020, a total of 426 scrub typhus cases, 25 murine typhus cases and 40 human anaplasmosis cases were detected by a laboratory-based surveillance project. The results provide essential epidemiological information for disease control.

**Bacterial Respiratory Diseases Laboratory**

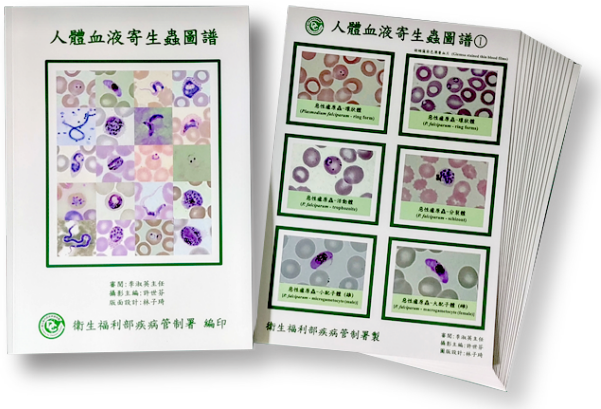
1. In 2019 and 2020, a total of 675 cases of invasive pneumococcal disease (IPD) were notified. The incidence was 1.4 cases per 100,000 population, and the case fatality rate was 7.4%. Among invasive *Streptococcus pneumoniae* strains, the most prevalent serotypes were 23A, 15A, 19A, and 3. Toward penicillin, cefotaxime, and erythromycin, 65%, 79%, and 15% strains were susceptible, respectively.
2. In 2019-2020, a total of 607 cases of Legionnaires' disease were laboratory-confirmed, including 489 male and 536 cases older than 50 years.

**Bacterial Enteric and Emerging Diseases Laboratory**

1. Analysis and comparison of carbapenem-resistant *Enterobacteriaceae* by next generation sequencing.
2. Establishment of multiplex real-time RT-PCR for detection of pathogens that cause encephalitis. Pathogen detection rate was 13% in 2020.
3. Employed high-throughput sequencing for unknown pathogen discovery.

**Parasitic Diseases Laboratory**

1. Diagnosed imported malaria cases and identified *Plasmodium* to the species level by rapid test, microscopic and molecular methods.
2. Conducted amoeba and toxoplasma diagnosis in high-risk populations.
3. Published printed and online "Atlas of Human Blood Parasites" as diagnostic references for medical technicians and health care workers.




Atlas of Human Blood Parasites

4. Intestinal and blood parasite smears were made and sent to about 40 hospitals in 2020 to improve the competence in parasite microscopy of medical technicians and increase the detection rate.

**Mycotic Diseases Laboratory**

1. Conducted diagnostic assays and molecular epidemiology studies of fungal and sexually-transmitted pathogens.
2. Performed *Candida haemulonii* species complex identification to monitor *Candida auris* infections in Taiwan.
3. Carried out G-NICE (gonococci-National Isolate Collection for Epidemiology) for the surveillance of resistance trend and molecular epidemiology study on *Neisseria gonorrhoeae*. In 2020, 0.7% of isolates were decreased susceptibility to third-generation cephalosporin (cefixime MIC≥ 0.25 mg/L, ceftriaxone MIC≥ 0.125 mg/L); 1.3% of isolates were resistant to azithromycin (MIC≥ 2 mg/L).

**Tuberculosis Research Center and Mycobacterial Disease Laboratory**

1. Implemented a routine whole genome sequencing (WGS) genotyping algorithm to efficiently delineate TB transmissions for outbreak investigations.
2. Adopted the One Health approach to establish a bovine tuberculosis (bTB) surveillance program. The burden of bTB in Taiwan was 1%. 100% bTB isolates were resistant to pyrazinamide and 30.2% were concurrently resistant to isoniazid.

An Annual Workshop on Tuberculosis Diagnosis

3. Participated in international collaboration with Germany, Japan, South Korea, the United Kingdom, the United States, and Vietnam on diagnosis of tuberculosis and genomic analyses of drug-resistant tuberculosis.
4. Organized an annual workshop on tuberculosis diagnosis for 120 participants; focused on updating new technologies and sharing experiences, including quality assurance, biosafety and best practices.

**Vector Biology Laboratory**

1. Conducted ectoparasite identification of rats from harbor-airport surveillance.
2. Performed data analysis of dengue vector surveillance weekly.
3. Conducted species identification of mosquitoes collected from malaria vector (*Anopheles minimus*) surveillance and harbor-airport mosquito surveillance.

4. Carried out virus detection on *Culex* vectors of Japanese encephalitis and *Aedes* vectors by request.

**Establishment and Application of a Pathogen Genome Sequence Database in Taiwan**

Taiwan Pathogenic Microorganism Genome Database (TPMGD) – is accessible to the general public online. Any user can apply for an account to browse the website and perform a comparative analysis with over 44,000 Taiwanese pathogen sequences, containing simple epidemiological information. In the comparative analysis of databases, bioinformatic tools are available online, such as blast with Taiwan local virus gene database. Furthermore, the WHO-recommended composition of influenza virus vaccine strains was updated over time. A new version of the database (https://genin.cdc.gov.tw/TPMGDWeb/Default.aspx) has been designed and will be released to the general public in 2021.

**Manufacturing of Serums and Vaccines**

1. Production of Bio-Products

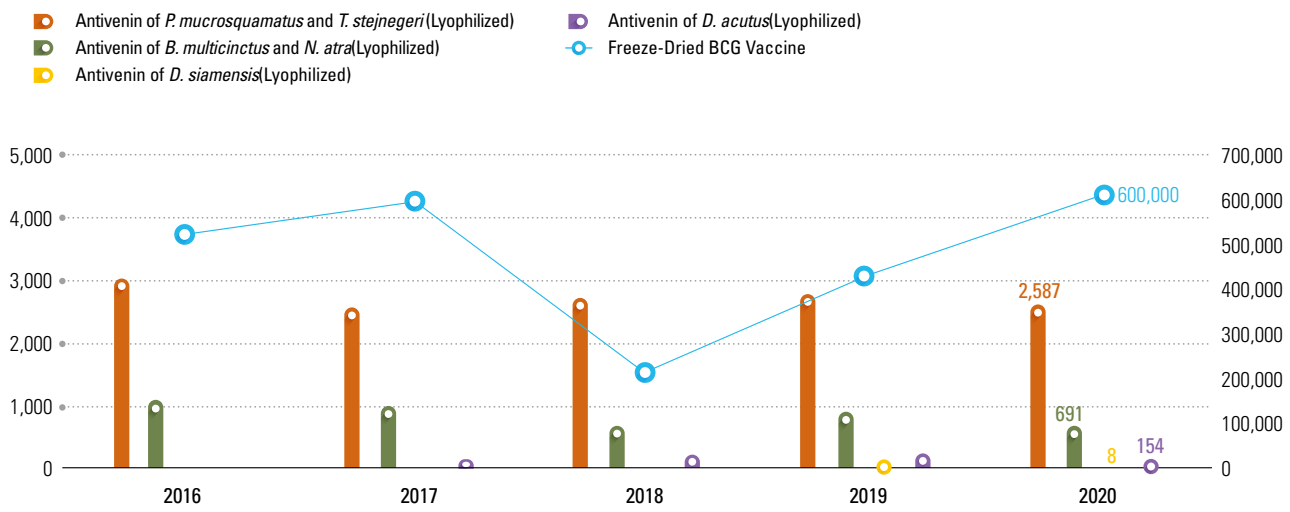
   (1) A total of 275 liters of antivenom immunoglobulins was separated from the blood of hyperimmunized horses in 2020.

   (2) A supply of 603,440 doses of vaccines and antivenoms was available in 2020 (Figure 5-1). Income from the sales of these biologics totaled about US$3.02 million.

2. Contract manufacturing

In 2020, a total of 4,400 doses of antivenin and 600,000 doses of BCG were supplied by the contract manufacturer, operated by the bioproduction plant of the National Health Research Institutes.

**Figure 5-1 Biologics Supplied by Taiwan CDC in 2016~2020**




# 06

# Marketing and Publications

# Marketing and Publications

## Current Status

To improve public awareness about communicable diseases and related policies, as well as public support for Taiwan CDC's efforts, the agency created a health marketing program. The program aims to promote disease prevention among the general public through a series of interactive events.

## Goals

To strengthen risk communication with the public, improve public awareness, and involve everyone in efforts against epidemics.

## Accomplishments

1. **Media Monitoring and Timely Response**
   A news monitoring and alert mechanism was set in place to enhance communication of communicable disease control policies. In 2020, a total of 65,599 pieces of related news were reported in response to public concern over matters related to disease control. Competent authorities voluntarily held press conferences and issued press releases to keep the public informed and intensify policy communication. Moreover, 346 press conferences were held and 763 press releases were issued.



2. **Integrated Marketing of Disease Prevention**
   Each year Taiwan CDC selects specific diseases to focus on. Through focusing on specific diseases, Taiwan CDC aims to spread key messages related to disease control and increase public health awareness. In 2020, Taiwan CDC's major focuses were COVID-19, AIDS, seasonal influenza, and tuberculosis.

   (1) Press conferences: When announcing disease prevention measures and new communicable diseases, Taiwan CDC holds press conferences to improve awareness about major policies and achievements. To echo the World AIDS Day and its theme for 2020 "Global solidarity, shared responsibility", Taiwan CDC held a special event " on November 29 at Taipei Main Station, a renowned landmark in Taipei.




Facing potential human health threats posed by influenza, every year Taiwan CDC promotes measures for preventing influenza and the importance of vaccination through different channels before the influenza season begins. A total of two events were organized to help different groups of people to understand the benefits of the influenza vaccination. A total of three press conferences were held to give updates on the outbreak along with press releases. Additionally, on Taiwan CDC's 1922 Facebook fan page, we shared 40 educational posts to promote measures for preventing influenza.

(2) Creative Promotional Materials: To promote disease prevention concepts, Taiwan CDC makes creative, stylish and useful promotional materials available online for use.

**3. Communicable Disease Reporting and Consultation Hotline: 1922**

To provide a convenient channel for communicable disease reporting and consultation, Taiwan CDC has operated the easy-to-remember, toll-free hotline "1922" since 2003. By calling 1922, users can access 24-hour case reporting service, communicable disease counseling service, prevention policy promotion, and control measure information all year round.

In 2020, the 1922 hotline received 1.83 million calls and made 54,405 referrals. 85% of users said they were satisfied.



(source: https://www.cdc.gov.tw/)

**4. Social Marketing Media**

To reach different groups of target audience, Taiwan CDC is constantly looking for new marketing channels. In 2020, besides continuing to improve the existing marketing strategies via traditional channels such as print media and TV, Taiwan CDC also developed interactive digital marketing strategies.

Marketing channels include:

(1) The Internet: The Internet's influence is far-reaching and powerful, and it has become an important marketing tool for Taiwan's media. Taiwan CDC also focused on the Internet as a marketing channel.

(2) Featured Multimedia and Tools: Responding to Internet trends, Taiwan CDC uses popular online social media tools to promote healthy living and disease prevention. Taiwan CDC established an online disease prevention community on


(Source: Taiwan CDC LINE@)

Taiwan CDC 1922 Facebook fan page

Facebook, LINE@, and Instagram. These sites promote communicable disease control and act as a bridge for Taiwan CDC to communicate with people over the Internet.

The Taiwan CDC 1922 Facebook fan page already has more than 640,000 followers. Besides daily epidemic information, the page offers lifestyle news such as weather reports along with epidemic prevention information, comics, and themed activities to interact with fans. Taiwan CDC also posted creative videos on YouTube which attracted more than 21.503 million views in 2020.

Taiwan CDC LINE@ issues at least two push notifications to share the latest information on disease prevention every week. Taiwan CDC LINE@ already has more than 9.44 million followers. Additionally, Taiwan CDC launched LINE @ chatbot - the Disease Control Butler, an AI "chatbot" jointly developed by HTC Corp., on September 28, 2017. LINE @ chatbot - the Disease Control Butler, has been providing basic consultations on influenza vaccination since its launch.

LINE users can also use the chatbot to access phone consultations as well as ask information about contracted healthcare facilities for further consultations. The chatbot is responsive, significantly shortening the time required for people seeking consultations.

**5. Correspondence Letters**

To provide up-to-date information on communicable diseases, clinical treatments, and disease prevention policies, Taiwan CDC sends special correspondence letters to the healthcare community. In 2020, Taiwan CDC sent out 55 medical correspondences and reached 24,156 regular subscribers.


Correspondence Letters

**6. Corporate Cooperation**

Taiwan CDC cooperates with private companies and foundations that are also involved in disease prevention to maximize resource efficiency, creativity, and marketing opportunities and improve awareness of related issues.

To promote public awareness about influenza vaccination, Taiwan CDC has proactively cooperated with HTC Corp. and PX Mart Co., Ltd. to develop the LINE @ chatbot - the Disease Control Butler and provide the public with convenient access to influenza vaccination.

Many people in Taiwan travel during summer vacation. To prevent people from contracting communicable diseases during their trips and create a safety net to combat epidemics, Taiwan CDC cooperated with Watsons, a health care and beauty care chain store, to urge people to prepare travel kits to protect against infectious diseases. Campaign materials for elevating public awareness were available at some 550 Watsons stores in Taiwan with staff pharmacists advising people about things that need to be considered before, during, and after a trip.

Corporates are encouraged to pay more attention to disease prevention and to cooperate with the government to prevent communicable diseases.

## Future Prospects

Taiwan CDC will continue to promote disease prevention, develop new marketing channels, and improve risk communication concerning infectious disease to ensure the health and wellbeing of the people in Taiwan.

**Educational materials on Health and Sanitation:**

**CF**

(https://www.youtube.com/user/taiwancdc)

COVID-19, AIDS, and Dengue fever




**Poster and Flyers**

(http://www.cdc.gov.tw)

COVID-19, Influenza, and Novel influenza A virus infections



# Periodicals and Books

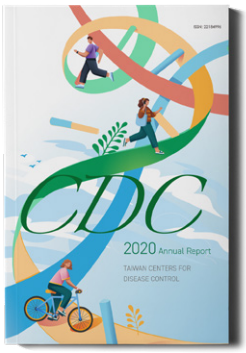

Guidelines for Dengue / Chikungunya Control(13E)


CHELSEA AND FRIENDS 2020


Creutzfeldt-Jakob Disease and Other Human Prion Diseases: Manual for Management and Infection Control


Combat Manual for Dengue Fever/ Chikungunya Fever(3E)

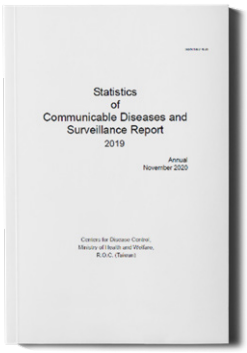

Taiwan Epidemiology Bulletin



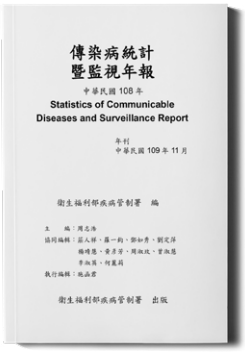

CDC Annual Report


Infection Control Journal


Taiwan Tuberculosis Control Report 2019




Statistics of Communicable Diseases and Surveillance Report 2019 (English version)

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