Issue 3 | April 2025

ASEAN
BIOLOGICAL THREATS
SURVEILLANCE CENTRE

# DIPHTHERIA

## In the ASEAN Region

## FOCUS REPORT

With Support by:

Korea Disease Control and Prevention Agency

In partnership with Canada

Kemenkes

ASSOCIATION OF SOUTHEAST ASIAN NATIONS

ASEAN
BIOLOGICAL THREATS
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# Editorial



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# Acronyms and Abbreviations

**ABVS** = ASEAN Vaccine Baseline Survey
**ACIP** = National Advisory Committee on Immunization Practices
A**D** = Auto-Disable
**AMS** = ASEAN Member States
**ASEAN** = Associations South-East Asian Nations
**AVSSR** = ASEAN Vaccine Security and Self-Reliance
**BARMM** = Bangsamoro Autonomous Region in Muslim Mindanao
**BenApp** = Bakuna Enumerator Application
**Bru-HIMS** = Brunei Health Information Management System
**CDA** = Communicable Diseases Agency
**CHDs** = Centers for Health and Development
**CPAB** = Children Protected at Birth
**DOH** = Department of Health
**DPT** = Diphtheria-Tetanus-Pertussis
**DPT-HB-Hib** = Diphtheria-Tetanus-Pertussis-Hepatitis B-Haemophilus influenza type b
**DT** = Diphtheria-Tetanus
**DTaP** = Diphtheria, Tetanus, and acellular Pertussis
**DTaP-IPV/Hib** = Diphtheria-Tetanus-acellular Pertussis-Polio-Haemophilus influenza type b
**DTP** = Diphtheria-Tetanus-Pertussis
**DTP-HepB** = Diphtheria-Tetanus-Pertussis-Hepatitis B
**EBS** = Event-Based Surveillance
**EIR** = Electronic Immunization Register
**EPI** = Expend Program Immunization
**EVM** = Effective Vaccine Management
**EWARS** = Early Warning and Response System
**FIC** = Fully Immunized Children
**IA2030** = Immunization Agenda 2030
**IBS** = Indicator-Based Surveillance
**IHR** = International Health Regulations
**IEC** =Information, Education, and Communication
**IPC** = Infection Prevention and Control
**ISS** = Immunization Services Support
**JRF** = Joint Reporting Form
**MOPH** = Ministry of Public Health
**NAIS** = National Adult Immunisation Schedule
**NCIS** = National Child Immunisation Schedule
**NGO** = Non-Governmental Organization
**NIP** = National Immunization Program
**NIR** = National Immunisation Registry
**ORI** = Outbreak Response Immunization
**PCR** = Polymerase Chain Reaction
**PPE** = Personal Protective Equipment
**RBAF** = Royal Brunei Armed Forces
**REB** = Reaching Every Barangay
**REP** = Reaching Every Purok
**RVIP** = Regional Vaccine Implementation Plan
**SDGs** = Sustainable Development Goals
**SGA** = Special Geographic Areas
**SIA** = Supplementary Immunization Activities
**SOPs** = Standard Operating Procedures
**Td** = Tetanus-Diphtheria
**TOR** = Terms of Reference
**UNICEF** = United Nations Children's Fund
**VHVs** = Village Health Volunteers
**VPD** = Vaccine-Preventable Disease
**WHO** = World Health Organizations
**WPRO-WHO** = World Health Organization Regional Office for the Western Pacific
**YATTA** = Youth Advocates Through Theater Arts

# DIPHTHERIA

# Introduction

Diphtheria is a bacterial infection primarily targeting the upper respiratory tract and skin, causing severe complications like heart and nervous system damage. The bacterium produces a toxin that can result in severe complications, including damage to the heart and nervous system. Although diphtheria is preventable through vaccination, maintaining immunity requires a complete primary series and booster doses. Unvaccinated or under-vaccinated individuals remain vulnerable, with 30% of unvaccinated cases fatal without appropriate treatment, especially in young children (WHO, 2024a).

During the 1970s, diphtheria cases and deaths in low- and middle-income countries were around one million and 50,000 to 60,000 deaths were reported annually. However, following the launch of the Expanded Programme on Immunization in 1974, which included diphtheria among its six initial vaccines, significantly reduced the global incidence of diphtheria, with over 90% of reported cases falling between 1980 and 2000 (WHO, 2017a). In 2023, global estimates indicated that 84% of children received the recommended three doses of diphtheria-containing vaccines during infancy, with 16% unvaccinated or incompletely vaccinated, highlighting significant disparities in vaccine coverage across countries (WHO, 2024a). Countries around the world, including ASEAN member states, have a vision and mission to achieve elimination and control on vaccine preventable disease including diphtheria in the WHO Southeast Asia Region by 2026, as outlined in the WHO Southeast Asia Regional Vaccine Implementation Plan 2022-2026.

This report provides an overview of Diphtheria, including its transmission, symptoms, and treatment, as well as current data on incidence and mortality. It also focuses on the regional situation within ASEAN, analysing the impact of the disease and the region's collective efforts to control it through surveillance, rapid response, and public health initiatives. Through this focus, the aim of the report aims to highlight the critical role of prevention and preparedness in reducing the burden of tuberculosis across vulnerable populations.

# Methods

This report employs a comprehensive literature review to explore the global landscape of diphtheria, with a particular focus on the ASEAN region. Data were collected from the established databases, namely PubMed, Embase and Scopus. Furthermore, data on the incidence of disease – including data published by the World Health Organization and ASEAN Member States – diagnostic criteria, preventative measures and policy strategies were collated from official reports and news sources on diphtheria cases. This comprehensive approach enabled a detailed analysis of the current trends, patterns, and challenges associated with the management of diphtheria within the ASEAN region.

# Case Definition and Clinical Features

# Case Definition

A case definition serves as a fundamental component in identifying whether an individual qualifies as having a specific disease or health condition. It provides a standardized framework for consistent assessment of cases, irrespective of the time, location, or the individual responsible for detection (CDC, 2012). The World Health Organization (WHO) outlines in its document *"Diphtheria: Vaccine-Preventable Diseases Surveillance Standards, 2nd Edition – 2018"* that diphtheria cases are categorized based on two primary criteria: the suspected case definition, used for initial case detection, and the final classification, both of which are elaborated in Table 1 (WHO, 2018a).

**Table 1. Diphtheria case definitions and classification**

| Case Definition | Description |
|---|---|
| Suspected case | For case finding, a suspected diphtheria case is defined as an upper respiratory tract infection presenting with clinical features such as:<br>● Pharyngitis, nasopharyngitis, tonsillitis, or laryngitis<br>**AND**<br>● Accompanied by the presence of a firmly adherent pseudomembrane in the pharynx, tonsils, larynx, and/or nasal passages. This pseudomembrane typically appears as a greyish, thick exudate that is tightly attached, ranging from patchy to confluent in distribution. Dislodging the pseudomembrane is likely to cause profuse bleeding.<br><br>In specific contexts, countries may opt to broaden the suspected case definition to include the following:<br>● Mild cases with no pseudomembrane,<br>● Individuals presenting with non-healing ulcers, particularly those with a recent travel history to countries with endemic disease or countries with diphtheria outbreaks. |
| Final Classification | **Laboratory-confirmed case**<br>A laboratory-confirmed case is a person with *Corynebacterium sp.* isolated by culture and positive for toxin production, regardless of symptoms. Confirmation of toxigenicity is must through phenotypic testing using the Elek test. Additionally, Polymerase chain reaction (PCR) can complement surveillance and may be considered laboratory-confirmed after analyzing the epidemiology and clinical characteristics of cases. Laboratory-confirmed diphtheria cases are classified into three subtypes based on the type of surveillance implemented in the country.<br>● Laboratory-confirmed classic respiratory diphtheria refers to cases that meet both the suspected case definition and laboratory confirmation criteria as defined above. |

| | |
|---|---|
| | • Laboratory-confirmed mild respiratory or asymptomatic diphtheria refers to individuals with respiratory symptoms, such as pharyngitis or tonsillitis, without the presence of a pseudomembrane, or asymptomatic individuals (usually identified through contact tracing).<br>• Non-respiratory laboratory-confirmed diphtheria includes cases involving skin lesions or other non-respiratory mucosal infections, where *Corynebacterium* species is isolated and confirmed to be toxigenic. |
| | **Epidemiologically linked case**<br>An epidemiologically linked case is a suspected case that is epidemiologically linked to a laboratory-confirmed case, indicating that a person had intimate contact with a laboratory-confirmed case within 14 days of onset of sore throat. |
| | **Clinically compatible case**<br>This type of case is a suspected case, but lacks both a confirmed laboratory test result or epidemiologic linkage to a laboratory-confirmed case. |
| | **Discarded case**<br>A discarded case is a suspected case that meets either the *Corynebacterium sp.* but negative Elek test (nontoxigenic Corynebacterium) **OR** a negative PCR for the diphtheria toxin gene. |
| | **Classifying asymptomatic or mild cases**<br>During outbreak investigations, individuals with *Corynebacterium* may be identified but not meet the suspected case definition due to asymptomatic or mild disease. These individuals should still be reported as laboratory-confirmed cases, as their treatment and public health response are the same as other laboratory-confirmed cases. |

A single laboratory-confirmed case of diphtheria is sufficient to trigger an immediate public health response. Furthermore, the occurrence of two or more epidemiologically linked cases, occurring within the same time period and geographic location, with at least one laboratory-confirmed case, is classified as a diphtheria outbreak (WHO, 2023a).

# Transmission

Diphtheria is most commonly transmitted through infected respiratory droplets. The primary sources of infection are respiratory secretions from the pharynx and nose, or, in cases of cutaneous diphtheria, from lesions on the skin or the conjunctiva (WHO, 2021a). The incubation period is reported to range from two to five days, although in certain cases, it has been observed to be longer.

Asymptomatic carriage of potentially toxigenic *Corynebacterium* species (*C. diphtheriae, C. ulcerans, and C. pseudotuberculosis*) has been observed during the incubation period, convalescence, and in healthy individuals. Previous studies have indicated that unfavorable environmental conditions may contribute to the development and spread of diphtheria infections.

The basic reproduction number, or R0 (pronounced "R naught"), is used to indicate the transmissibility of a disease. It is a key metric in infectious disease epidemiology and is defined as the average number of secondary cases generated by one infectious individual in a fully susceptible population. When R0 is greater than 1, an outbreak can grow; when it is less than 1, the outbreak is likely to decline and eventually end (Delamater, et al, 2019). For diphtheria, the R0 is estimated to range from six to seven secondary cases (WHO, 2023a)

## Risk Factors and Risk Groups

Since the early 1980s, diphtheria has re-emerged as a global public health concern, evidenced by a steady increase in reported cases. This resurgence is largely attributed to multifactorial challenges, including restricted access to vaccines in conflict-affected regions, areas impacted by natural disasters, and locations experiencing the collapse of public health systems (WHO, 2021a). Low immunization coverage, particularly in underserved and geographically remote communities, has resulted in a substantial proportion of children remaining unimmunized, thereby perpetuating the risk of outbreaks (WHO, 2023a). Although children lacking full vaccination are at the highest risk, adolescents and adults are also vulnerable due to waning immunity in the absence of booster doses. As stated in Ikejezie et al., (2023), the absence of booster vaccination within the past five years, direct contact with confirmed diphtheria cases, sharing of sleeping spaces or utensils (such as cups and glasses), and poor personal hygiene practices, including infrequent bathing, were associated with an increased risk of diphtheria. Beyond immunization gaps, several population groups face heightened exposure to toxigenic *Corynebacterium diphtheriae.* These include international travelers to endemic or epidemic areas, military personnel, healthcare workers, educators, childcare staff, and individuals with alcohol or substance use disorders (WHO, 2009). Additional risk factors involve recent contact with travelers from endemic regions, close proximity to confirmed cases, and exposure to zoonotic sources such as raw dairy products or animals carrying C. ulcerans or C. pseudotuberculosis. Laboratory professionals handling *Corynebacterium sp* are also considered at increased occupational risk (WHO, 2021a)

# Clinical Presentation

Diphtheria typically begins with an insidious onset, with early symptoms that are often mild and non-specific, which may complicate initial clinical recognition. As the illness progresses, the patient's body temperature generally remains below 38.5 °C, further contributing to the subtle presentation. Clinical manifestations of diphtheria differ depending on the anatomical site of infection, such as the pharynx, larynx, or nasal cavity. The primary virulence factor responsible for the disease's pathogenicity is the exotoxin produced by *C. diphtheriae*. This exotoxin inhibits protein synthesis at the cellular level, leading to localized tissue necrosis and the destruction of mucosal epithelium. The resulting accumulation of fibrin, necrotic tissue, and inflammatory cells leads to the formation of a dense, greyish pseudomembrane that is firmly adherent and characteristic of diphtheria. Once absorbed systemically, the exotoxin can disseminate via the bloodstream and produce toxic effects in distant organs, particularly the myocardium, peripheral nervous system, and kidneys (WHO, 2023a).

**Pharyngeal and tonsillar diphtheria**

Pharyngeal and tonsillar diphtheria are the most frequently observed forms of the disease in unimmunized populations. At the initial stage, pharyngeal examination typically reveals no membrane formation. Approximately 24 hours after symptom onset, small patches of exudate begin to appear, which, over the course of two to three days, may spread, coalesce, and develop into a pseudomembrane covering the entire pharyngeal region, including the tonsils, soft palate, and uvula (Fig. 1). Attempts to remove this membrane often result in bleeding due to its firm adherence to the mucosa. Enlargement and tenderness of the anterior cervical lymph nodes are common clinical features. In severe cases, this lymphadenopathy is accompanied by marked inflammation and edema of the adjacent soft tissues, producing the characteristic 'bull-neck' appearance (WHO, 2023a).

*Figure 1 Pseudomembrane*
*(Source: Science Direct*
*(https://www.sciencedirect.com/science/article/abs/pii/B9780323555128000417))*

**Laryngeal diphtheria**

Laryngeal diphtheria represents approximately 25% of all diphtheria cases, with pharyngeal involvement reported in 75% of these. While it can occur at any age, it is most frequently observed in children under four years. The condition typically presents with a gradual onset of hoarseness and stridor. In the absence of pharyngeal signs, diagnosis is often delayed or overlooked. This form is associated with increased morbidity and mortality, primarily due to airway obstruction and enhanced systemic absorption of the diphtheria toxin resulting from extensive pseudomembrane formation (WHO, 2023a).

**Nasal diphtheria**

Nasal diphtheria is typically characterized by a mucopurulent nasal discharge, which may be tinged with blood, and the formation of a white membrane on the nasal septum. This clinical presentation, however, is relatively rare, accounting for approximately 2% of all diphtheria cases. Due to its mild and non-specific symptoms, which closely resemble those of the common cold, isolated nasal diphtheria is often underdiagnosed or overlooked in clinical settings (WHO, 2023a).

*Figure 2. Nasal diphtheria*
*(Source: Science Direct (https://www.sciencedirect.com/science/article/abs/pii/S1341321X18300345 ))*

**Cutaneous (skin) diphtheria**

Cutaneous diphtheria is a slow-progressing skin infection that typically manifests at sites of pre-existing skin trauma, such as burns or open wounds, and may serve as a reservoir for potential respiratory transmission to others. Although this clinical form is relatively rare, it has been primarily associated with nontoxigenic strains of *C. diphtheriae*. Nonetheless, cases caused by toxigenic strains have also been documented. While cutaneous diphtheria is not routinely captured through the JRF, sporadic information is available from published literature (WHO, 2023a).

*Figure 3 Cutaneous diphtheria*
*(Source: CDC (https://phil.cdc.gov/Details.aspx?pid=1941))*

**Complications**

Some complications caused by C.diphteriae that may occur include (WHO, 2023a):

1. Laryngeal diphtheria poses a significant threat due to the potential for respiratory obstruction. The extension of pseudomembranes into the larynx or tracheobronchial tree can result in severe airway blockage or pneumonia, and in some cases, sloughing of these membranes may cause asphyxia and lead to death. Children are especially vulnerable to respiratory compromise due to their narrower airways.
2. In addition to respiratory complications, severe acute systemic toxicity may develop between the third and seventh day of illness, often manifesting as early myocarditis, which is associated with poor clinical outcomes. Electrocardiographic abnormalities, including ST-T wave changes, QTc prolongation, and first-degree heart block, are observed in up to two-thirds of patients. More commonly, late myocarditis presents during the second or third week of illness, typically after the resolution of initial respiratory symptoms. This condition is often characterized by arrhythmias and cardiomyopathy.
3. Neurological complications, particularly toxic peripheral neuropathies, occur in approximately 15–20% of diphtheria cases. These symptoms usually emerge two to eight weeks following the onset of illness. Paralysis involving the ocular muscles, limbs, or diaphragm may occur, with diaphragmatic paralysis potentially necessitating mechanical ventilation.
4. Other recognized complications of diphtheria include pneumonia, otitis media, renal failure, encephalitis, cerebral infarction, and pulmonary embolism.

# Clinical Diagnostic

Diphtheria can be confirmed by collecting clinical specimens and observing bacterial growth and toxin production using immunoprecipitation reactions (WHO, 2018a). Initial examination involves primary culture on blood tellurite medium, followed by selective culture on cystinase medium (Tinsdale agar). Species identification is carried out through screening and biochemical tests, and further confirmation is performed using microbiological methods such as API

Coryne or the VITEK system. Key biochemical tests for identifying *Corynebacterium diphtheriae* include the catalase test (positive), nitrate reduction (positive), acid production from glucose, maltose, and glycogen or starch, and urea hydrolysis test (negative).

The confirmation of Corynebacterium should not be based on direct microscopy of smears from lesions. The results of the specimen examination may be negative in the following circumstances: if the patient has been treated with antibiotics prior to the specimen being taken; if the specimen is of substandard quality; or if there is a delay. The presence of subunits A and B of the diphtheria toxin gene (tox) can be detected by PCR directly on swab material. However, the presence of tox in some cases does not necessarily indicate the production of toxin. Consequently, positive results from a polymerase chain reaction (PCR) test should be confirmed by the Elek test if an isolate is present.

The most common method for determining toxigenicity is the Elek immunoprecipitation test. This method was improved by using a superior Elek medium, which considerably increased the clarity and accuracy of the test. This method underwent further modifications during the 1990s epidemic, resulting in the production of rapid results (16–24 hours) using only a few colonies from the primary isolation plate and reduced volumes of the specialized media (WHO, 2021a).

# Epidemiology

# Global Situation

Diphtheria continues to be a global public health concern. Figure 4 shows the country-level distribution of reported cases from 2014 to 2023. Over this period, more than 121,000 cases were recorded globally (A). In 2023 alone, over 24,000 cases were reported (B), marking over three times the number recorded in 2014, which saw 2,214 cases (C). This figure also represents more than double the cases reported in 2022, which totaled 10,027, and surpasses the previous peak in 2019 when nearly 23,000 cases were reported (WHO, 2025). As illustrated in Figure 4, the number of countries reporting diphtheria cases was higher in 2023 (C) than in 2014 (B), suggesting a broader geographic spread of the disease.

The figure also highlights variations in the geographic distribution of diphtheria cases, with numerous countries experiencing an increase, as reflected by changes in colour. Although China reported no cases in both 2014 (B) and 2023 (C), two cases were documented in 2020. Similarly, Venezuela, which reported no cases in 2014 (B) and only one in 2023 (C), recorded over 1,000 cases between 2014 and 2023 (A). The highest surges occurred in 2017 and 2018, with each year reporting more than 700 cases.

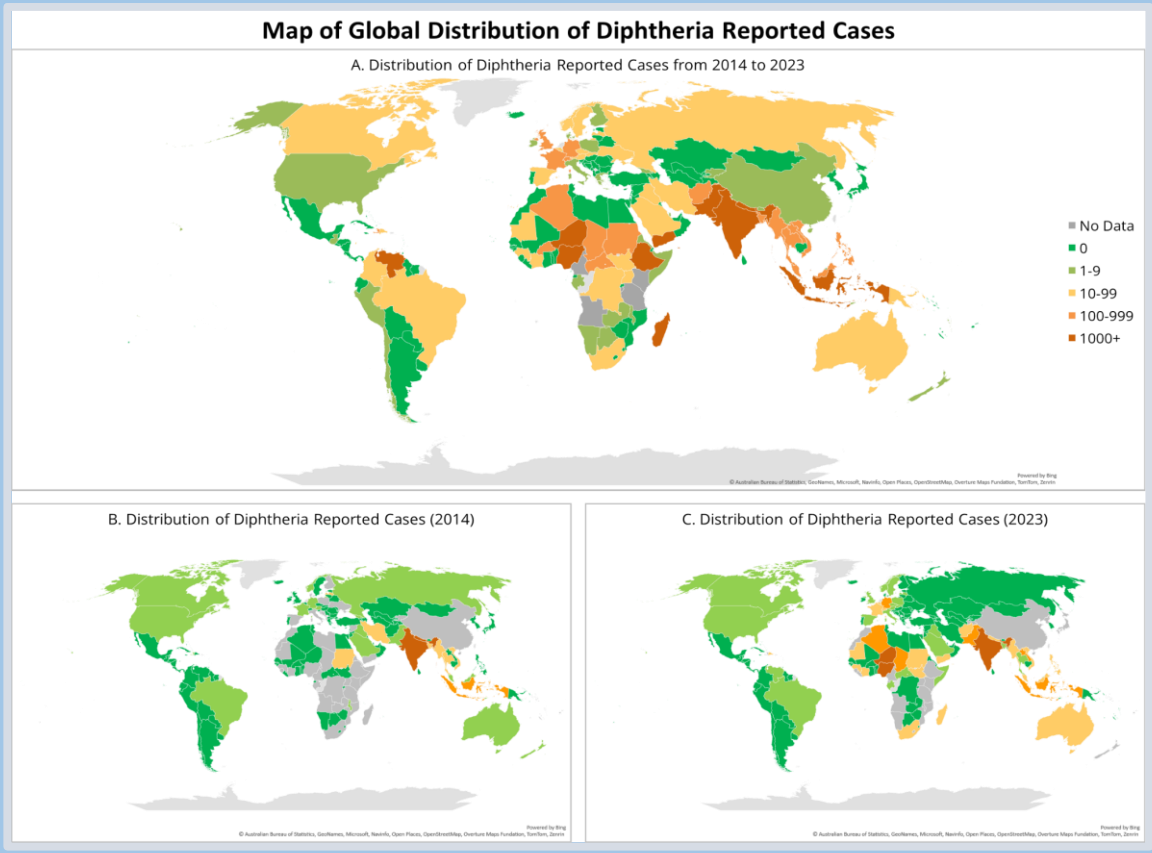



*Figure 4 Number of reported cases of diphtheria by country, 2014 – 2023 (Source: WHO (https://immunizationdata.who.int/global/wiise-detail-page/diphtheria-reported-cases-and-incidence?YEAR=))*

As outlined in the World Health Organization's (WHO) Immunization Agenda 2030, the Global Vaccine Action Plan (GVAP) aims to achieve 90% vaccination coverage for essential vaccines by 2030 (WHO, 2021b). To assess access and performance of national immunization programs, WHO tracks DTP1 (the first dose of diphtheria, tetanus, and pertussis vaccine) and DTP3 (the third dose) coverage. DTP1 (first dose) indicates access to immunization and health services, while DTP3 (third dose) reflects completion of the vaccine series and overall system performance.

Figure 5 presents global and regional trends in diphtheria incidence alongside DTP1 and DTP3 vaccine coverage globally and across the six WHO regions from 2004 to 2023 (WHO, 2025a). Each graph shows the incidence per million population and the coverage rates for the first and third doses of DTP-containing vaccines. Globally, the incidence of diphtheria remained low between 2014 and 2017, followed by a noticeable spike in 2018. After a brief decline, another increase was observed in 2023 (A). During the period, global DTP1 coverage trends remained stable at 86-90%, reaching the 90% target in 2016 to 2019, then gradually decreasing to 86% in 2021 and increasing to 89% in the following years. However, DTP3 coverage is slightly lower than DTP1, ranging from 81-86% during the period (A).

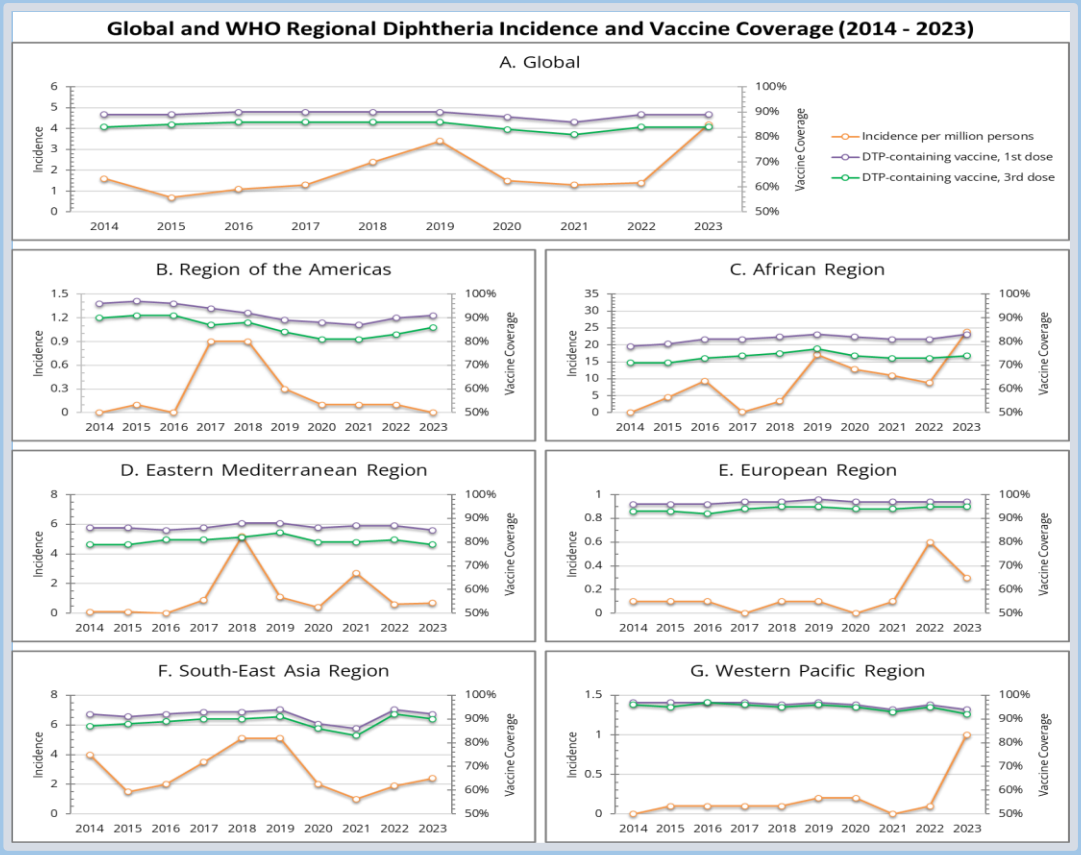



*Figure 5 Global and WHO Regional Trends in Diphtheria Incidence and Vaccine Coverage, 2014–2023 (Source: WHO (https://immunizationdata.who.int/global/wiise-detail-page/diphtheria-reported-cases-and-incidence?YEAR=))*

# Burden of Diphtheria in the ASEAN Region

Diphtheria continues to pose a significant challenge in the ASEAN region, with eight member states reporting cases over the past decade. This is likely due to persistent immunity gaps as well as policy barriers preventing provision of an adequate number of booster doses (WHO, 2023b). This section provides an overview of annual confirmed cases and incidence per million population, based on WHO immunization data (WHO, 2025a).

As shown in Figure 6, the number of diphtheria cases reported varied among AMS. Indonesia led the way with more than 5,000 cases reported throughout the period, followed by Myanmar, the Philippines, Lao PDR, Vietnam, Thailand, and Malaysia with between 144 and 762 cases. Singapore reported only one imported case in 2017, while Brunei Darussalam and Cambodia reported no cases during the period.

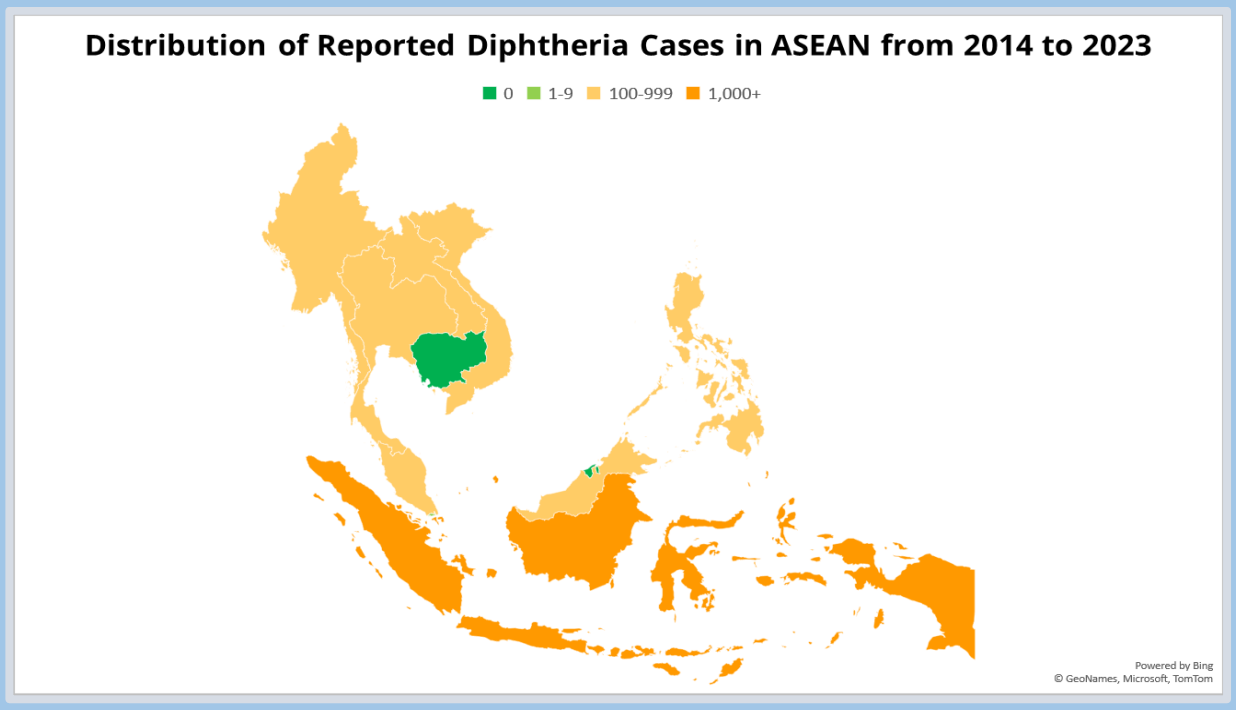
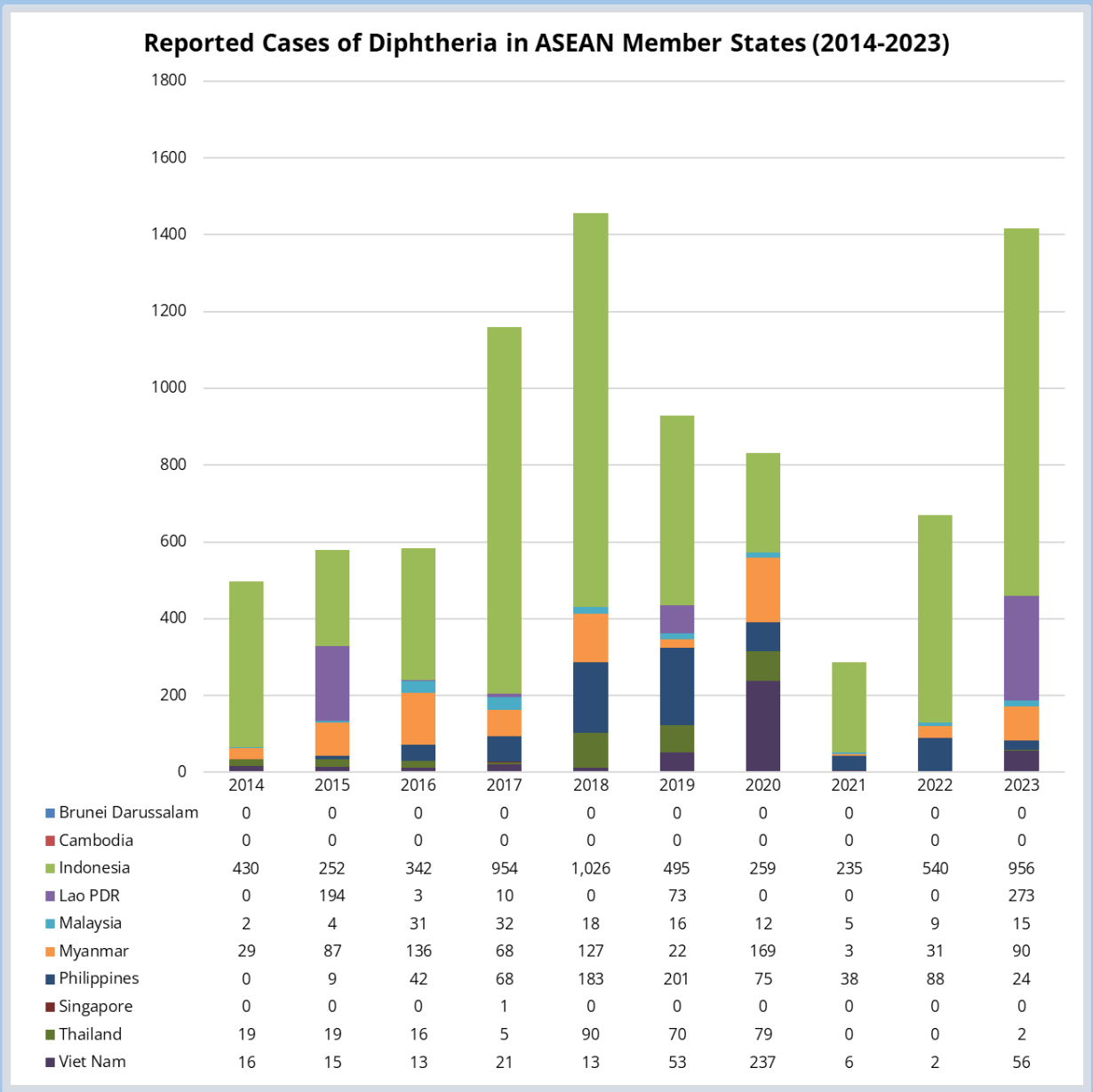



*Figure 6 Distribution of reported diphtheria cases in ASEAN 2014 – 2023*
(*Source: WHO (https://immunizationdata.who.int/global/wiise-detail-page/diphtheria-reported-cases-and-incidence?YEAR=)*)

Figure 7 provides detailed information on the number of reported diphtheria cases in the ASEAN region. The number of reported cases fluctuated during the period, starting from 496 cases in 2014 and gradually increasing to 583 cases in 2016. Cases then peaked in the following years, reaching over 1,400 cases in 2018. After a gradual decline to the lowest level of 287 cases in 2021, cases re-emerged in the following years reaching 1,416 cases in 2023, almost reaching the previous peak in 2018.




| | 2014 | 2015 | 2016 | 2017 | 2018 | 2019 | 2020 | 2021 | 2022 | 2023 |
|---|---|---|---|---|---|---|---|---|---|---|
| Brunei Darussalam | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 |
| Cambodia | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 |
| Indonesia | 430 | 252 | 342 | 954 | 1,026 | 495 | 259 | 235 | 540 | 956 |
| Lao PDR | 0 | 194 | 3 | 10 | 0 | 73 | 0 | 0 | 0 | 273 |
| Malaysia | 2 | 4 | 31 | 32 | 18 | 16 | 12 | 5 | 9 | 15 |
| Myanmar | 29 | 87 | 136 | 68 | 127 | 22 | 169 | 3 | 31 | 90 |
| Philippines | 0 | 9 | 42 | 68 | 183 | 201 | 75 | 38 | 88 | 24 |
| Singapore | 0 | 0 | 0 | 1 | 0 | 0 | 0 | 0 | 0 | 0 |
| Thailand | 19 | 19 | 16 | 5 | 90 | 70 | 79 | 0 | 0 | 2 |
| Viet Nam | 16 | 15 | 13 | 21 | 13 | 53 | 237 | 6 | 2 | 56 |

*Figure 7 Trend of reported cases of diphtheria in ASEAN Region, 2015-2024*
*(Source: WHO immunization data (https://immunizationdata.who.int/global/wiise-detail-page/diphtheria-reported-cases-and-incidence?YEAR=))*

## Brunei Darussalam

Brunei has not recorded any cases of diphtheria in the past 20 years, according to the Ministry of Health. The country is closely monitoring the situation, especially following outbreaks in neighbouring countries (WHO, 2025a; Ministry of Health Brunei Darussalam, 2016)

## Cambodia

As shown in Figure 8, Cambodia has reported relatively few cases of diphtheria over the past two decades. The country recorded four cases in 2004, then zero then increased to seven cases in 2008 (WHO, 2025a). In 2009 and 2010, the country reported three annual cases. No cases have been reported since 2011.

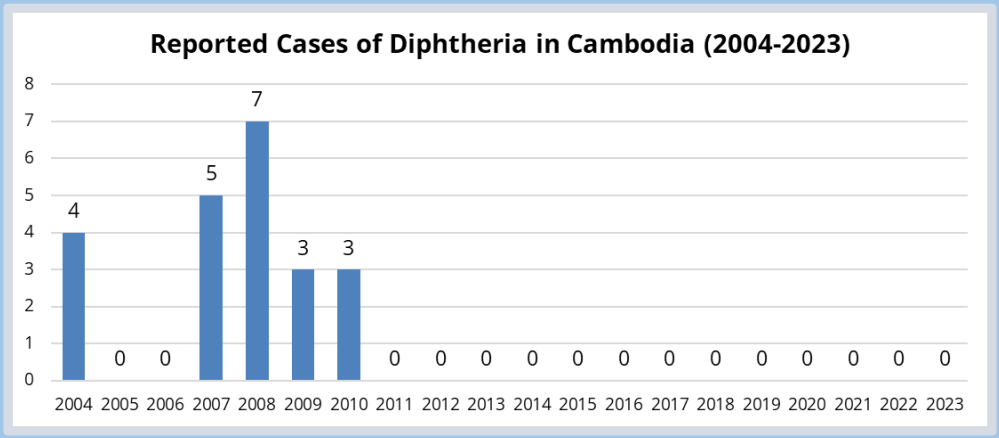



*Figure 8 Trend of reported cases of diphtheria in Cambodia, 2004-2023*
*(Source: WHO immunization data (https://immunizationdata.who.int/global/wiise-detail-page/diphtheria-reported-cases-and-incidence?YEAR=))*

## Indonesia

Figure 9 shows the trend in diphtheria cases in Indonesia. In 2014, the country reported 430 cases, which decreased to 252 the following year (WHO, 2025a). However, cases increased to 342 in 2016, then spiked to 954 in 2017, then to 1,026 in 2018, the highest in the past decade. In 2019, cases decreased to 495 and then continued to decrease, reaching 235 cases in 2021, the lowest during the period. However, cases gradually increased beginning in 2023, when 540 cases were reported, and 956 cases were reported the following year.

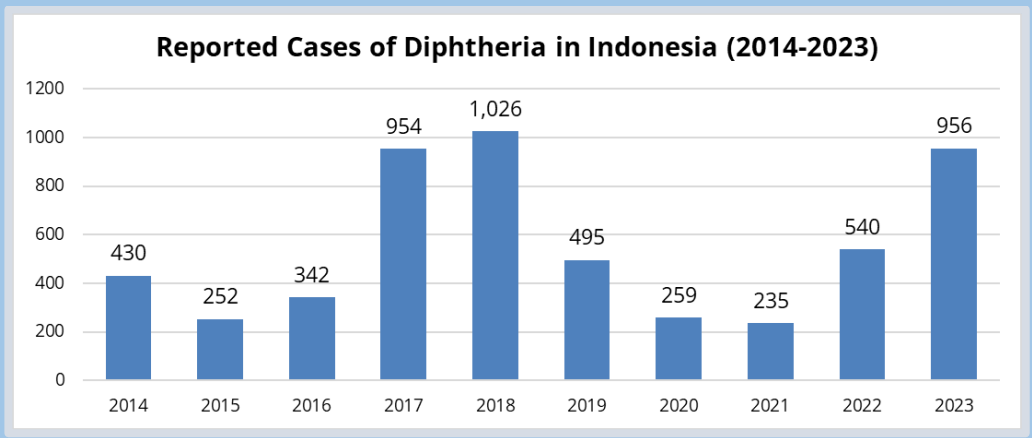



*Figure 9 Trend of reported cases of diphtheria in Indonesia, 2014 – 2023*
*(Source: WHO immunization data (https://immunizationdata.who.int/global/wiise-detail-page/diphtheria-reported-cases-and-incidence?YEAR=))*

## Lao People's Democratic Republic

After no cases were recorded in 2014, Lao PDR reported a spike of cases to 194 in 2015, then dropped sharply to three cases in the following year, and 10 cases were recorded in 2017 (Figure 10) (WHO, 2025a). After no cases in 2018, cases spiked to 73 in 2019, and then no cases were reported for the next three consecutive years. However, the number of cases increased sharply to 273 in 2023.

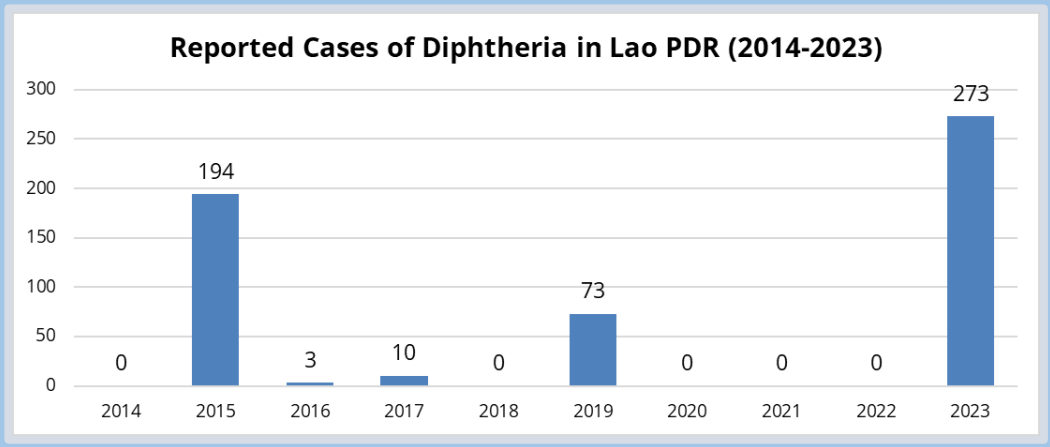



*Figure 10 Trend of reported cases of diphtheria in Lao PDR, 2014-2023*
*(Source: WHO immunization data (https://immunizationdata.who.int/global/wiise-detail-page/diphtheria-reported-cases-and-incidence?YEAR=))*

## Malaysia

As shown in Figure 11, Malaysia reported relatively few cases of diphtheria in 2014 and 2015 (two and four cases, respectively). Cases then increased sharply to more than 30 cases in 2016 to 2017, then gradually decreased in the following years to five cases in 2021 (WHO, 2025a). However, cases rebounded to nine in 2022, then continued to increase in 2023 with 15 cases reported.

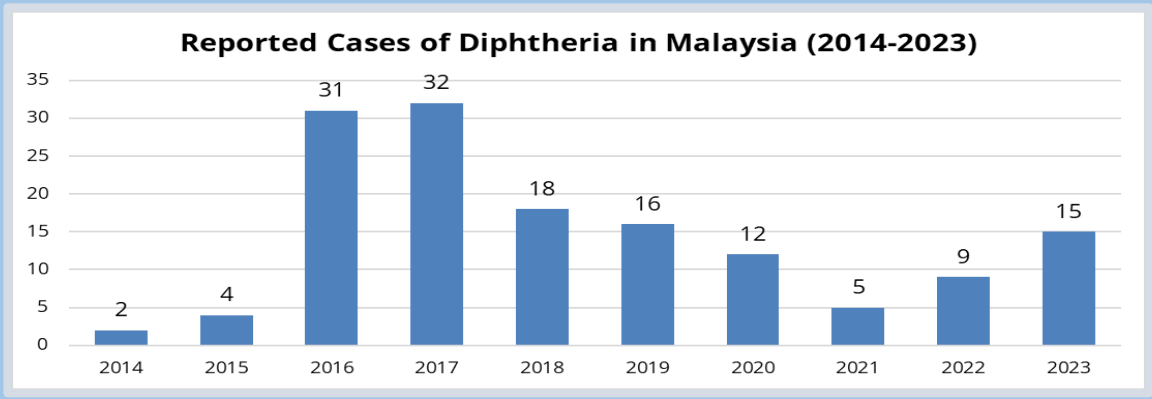



*Figure 11 Trend of reported cases of diphtheria in Malaysia, 2014-2023*
*(Source: WHO immunization data (https://immunizationdata.who.int/global/wiise-detail-page/diphtheria-reported-cases-and-incidence?YEAR=))*

## Myanmar

Figure 12 shows the trend of diphtheria cases in Myanmar from 2014 to 2023. The country reported 29 cases in 2014, then gradually increased to 136 cases in 2016 (WHO, 2025a). After a decline in 2017, cases increased to 127 in 2018, and then decreased to 22 in 2019. The following year, however, cases increased sharply to 169 in 2020, the highest during the period, and then decreased sharply to three the following year. However, cases rebounded to 31 in 2022 and 90 in 2023.

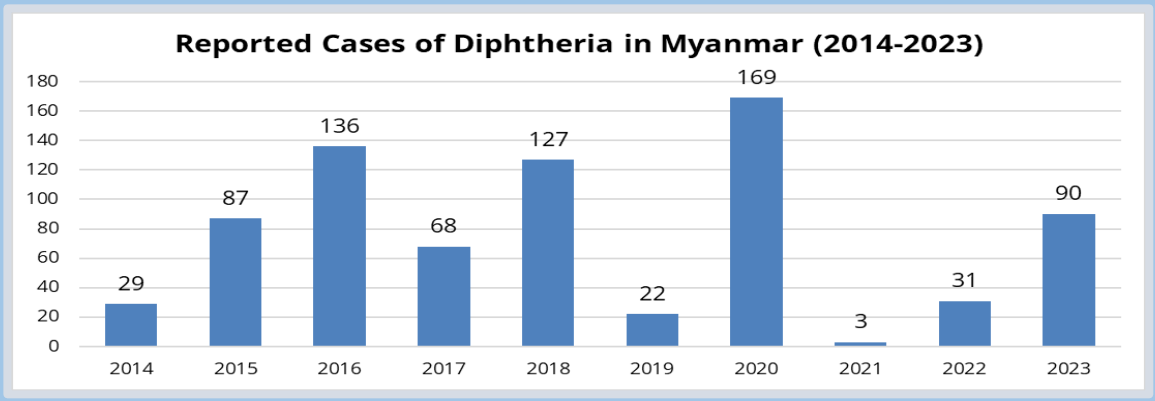



*Figure 12 Trend of reported cases of diphtheria in Myanmar, 2014-2023*
*(Source: WHO immunization data (https://immunizationdata.who.int/global/wiise-detail-page/diphtheria-reported-cases-and-incidence?YEAR=))*

## Philippines

Figure 13 shows diphtheria trends in the Philippines. After zero cases were reported in 2014, the country experienced a gradual upward trend for five consecutive years, reaching 201 cases in 2019, followed by a gradual decline in the next two years, to 75 and 38 cases in 2020 and 2021, respectively (WHO, 2025a). However, in 2022, the number of cases increased to 88 and then decreased to 24 cases in 2023.

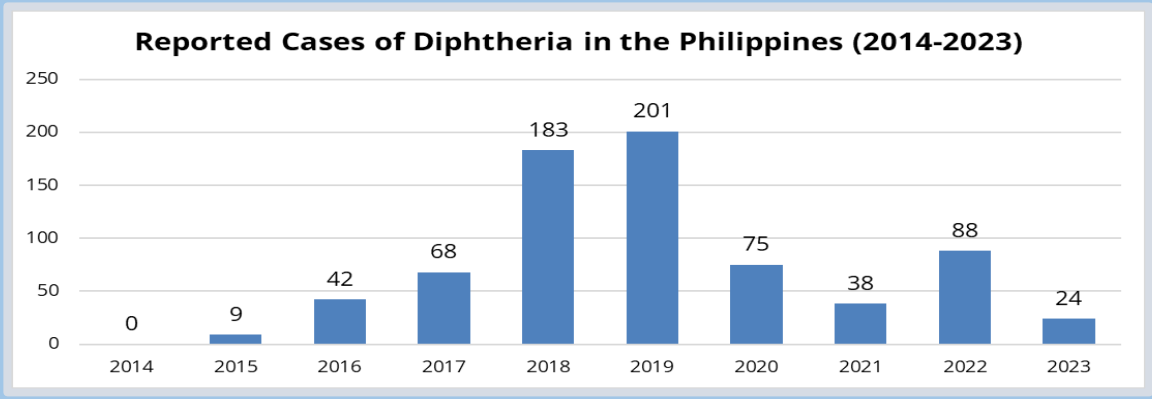



*Figure 13 Trend of reported cases of diphtheria in the Philippines, 2014-2023*
*(Source: WHO immunization data (https://immunizationdata.who.int/global/wiise-detail-page/diphtheria-reported-cases-and-incidence?YEAR=))*

## Singapore

Figure 14 shows reported diphtheria cases in Singapore from 2014 to 2023 (WHO, 2025a). There were no reported cases of diphtheria in Singapore during this period, with the exception of a single case in 2017. This case involved a 21-year-old Bangladeshi construction worker who developed symptoms on July 30, 2017, and died on August 4, 2017 (MoH Singapore, 2017).

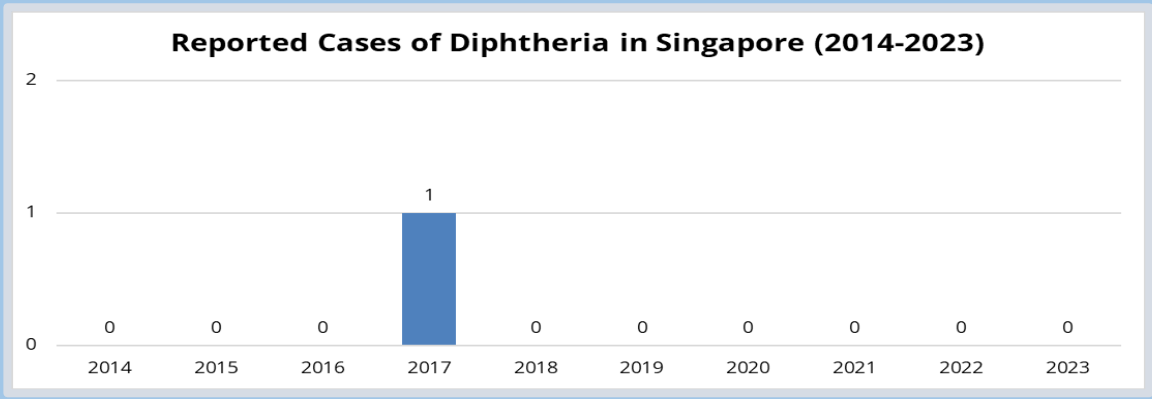



*Figure 14 Trend of reported cases of diphtheria in Singapore, 2014-2023*
*(Source: WHO immunization data (https://immunizationdata.who.int/global/wiise-detail-page/diphtheria-reported-cases-and-incidence?YEAR=))*

## Thailand

Figure 15 shows the trend of diphtheria cases in Thailand: from 2014 to 2015, the country reported 19 cases annually, then gradually declined to five cases in 2017 (WHO, 2025a). However, in 2018, the number of cases increased sharply to 90, then declined to 70 cases in 2019 and 79 cases in 2020. After two years of no reported cases, the country recorded two cases of diphtheria in 2023.

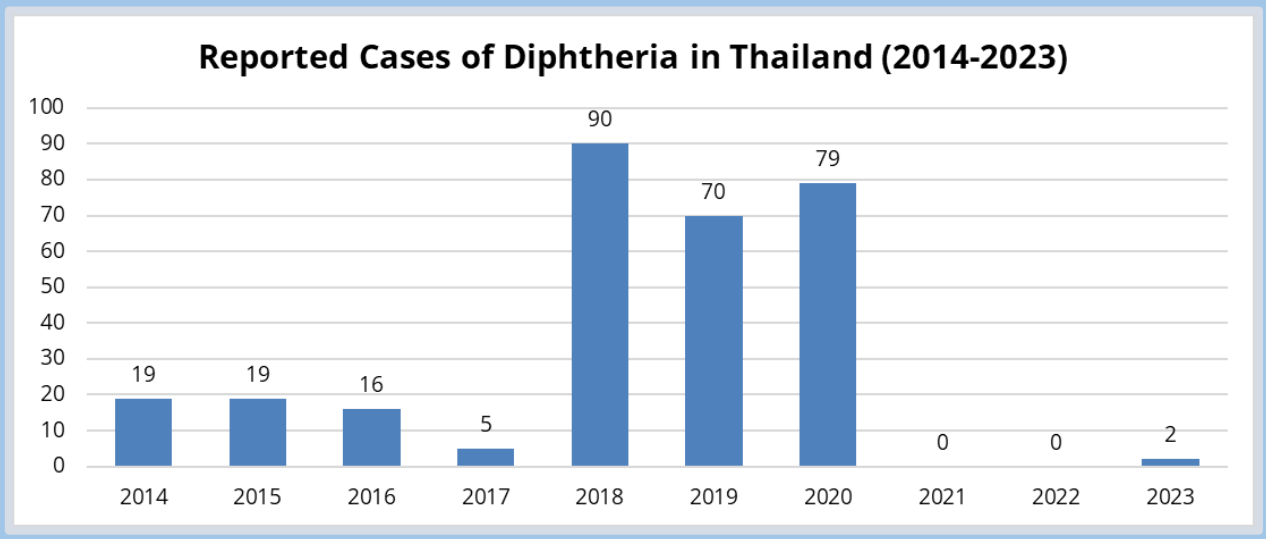



*Figure 15 Trend of reported cases of diphtheria in Thailand, 2014-2023*
*(Source: WHO immunization data (https://immunizationdata.who.int/global/wiise-detail-page/diphtheria-reported-cases-and-incidence?YEAR=))*

# Viet Nam

Vietnam reported relatively few cases from 2014 to 2018, ranging from 13 to 21 cases (WHO, 2025a). In 2019, however, the number of cases increased to 53, then spiked to 237 in 2020, the highest in a decade, before dropping to six in 2021 and remaining low until 2022. However, there is a marked increase in cases in 2023, with 56 cases (Figure 16).

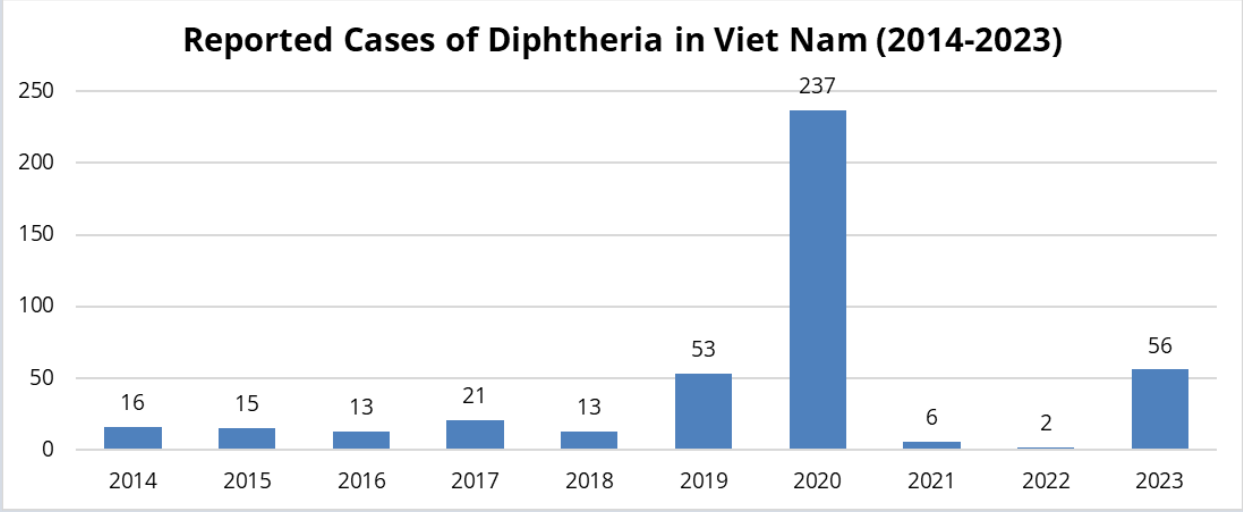



*Figure 16 Trend of reported cases of diphtheria in Viet Nam, 2014-2023*
*(Source: WHO immunization data (https://immunizationdata.who.int/global/wiise-detail-page/diphtheria-reported-cases-and-incidence?YEAR=))*

# Case Management and Prevention

# Case Management

To manage suspected diphtheria cases, the steps are as follows (WHO, 2018a):

1. **Isolation.** Patients diagnosed with respiratory diphtheria should be placed under respiratory droplet isolation to prevent transmission. For those with cutaneous diphtheria, contact precautions are required. Isolation measures should be maintained until the elimination of the causative organism is confirmed through two consecutive negative cultures obtained at least 24 hours apart, following the completion of appropriate antimicrobial therapy. In healthcare settings where proper droplet isolation facilities are not available, physical barriers such as screens should be installed between patients to reduce the risk of airborne transmission. Additionally, efforts should be made to minimize direct contact between the infected individual and other patients within the facility.
2. **Collection of nasal and pharyngeal swabs for culture.** Specimen collection through swabbing should be performed promptly once diphtheria is clinically suspected. Initiation of treatment must not be postponed while awaiting laboratory confirmation, as early intervention is critical in preventing disease progression and complications.
3. **Diphtheria antitoxin (DAT).** The administration of DAT remains effective for diphtheria management. The therapeutic efficacy of DAT is critically time-dependent, with early initiation significantly reducing the risk of severe complications and mortality. Clinical evidence indicates that delays in DAT administration beyond three days from symptom onset are associated with a progressive increase in adverse outcomes. Consequently, in instances where diphtheria is strongly suspected, treatment with DAT should be initiated without waiting for laboratory confirmation. For patients presenting with severe disease, intravenous administration is recommended, while intramuscular injection is considered appropriate for less severe cases. The selection of the DAT dose should be guided by a comprehensive clinical assessment, taking into account the anatomical site of infection, the extent and severity of disease, and the duration between symptom onset and the commencement of treatment.
4. **Antibiotic treatment.** Antibiotic therapy, typically involving penicillin or erythromycin, plays a critical role in the management of diphtheria by eradicating *C. diphtheriae*, halting toxin production, preventing further transmission, and reducing asymptomatic carriage, which may persist even after clinical recovery. The recommended duration of antibiotic treatment is two weeks. Parenteral administration is advised initially and should be continued until the patient is able to swallow comfortably, at which point oral therapy may be considered to complete the treatment course.

5. **Vaccine administration during convalescence.** Recovery from diphtheria does not consistently confer long-lasting protective immunity. As a result, individuals who have recovered from the disease should be administered the age-appropriate diphtheria toxoid-containing vaccine series during the convalescent period to ensure adequate and sustained immunological protection.

# Prevention

Diphtheria can be prevented through vaccination. Diphtheria vaccination is often given together with vaccines for other diseases such as tetanus, pertussis, Hemophilus influenzae, hepatitis B, and inactivated polio. The WHO currently recommends a total of six doses of a diphtheria-containing vaccine, which can be administered from six weeks of age through adolescence. To provide long-term protection, diphtheria vaccination requires a complete primary series and three additional booster doses (WHO, 2024a). A complete vaccine series provides nearly full protection from diphtheria, approximately 97%. However, immunity wanes over time, therefore booster doses are essential to maintain protection (CDC, 2024).


*Figure 17. WHO 5 moment of hand hygiene (Source: WHO (https://iris.who.int/bitstream/handle/10665/376142/WHO-WPE-CRS-HCR-2024.1-eng.pdf )*

**Infection prevention and control for respiratory diphtheria**

The WHO provides IPC guidelines to ensure the safe management of patients with suspected or confirmed respiratory diphtheria (WHO, 2024b). These guidelines outline standard and transmission-based precautions for healthcare workers, patients, and visitors, aiming to reduce the risk of transmission within healthcare settings.

**Health and care worker**

Before interacting with any patient, health and care workers should assess the risk of exposure to infectious agents and take appropriate precautions. This includes performing hand hygiene according to the WHO's five moments, selecting suitable PPE, and ensuring proper patient placement. PPE should be worn before entering the room or when within one meter of the patient. They should wear a well-fitted medical mask and, based on risk assessment, additional PPE, such as eye protection, a gown, and gloves. Healthcare workers should avoid touching their eyes, nose, or mouth with contaminated gloves or ungloved hands, and refrain from contacting surfaces not directly involved in patient care (e.g., doorknobs, light switches, mobile

phones). Whenever possible, use disposable or dedicated patient equipment. After leaving the patient's room, PPE should be removed in the designated area, followed by hand hygiene. Shared medical equipment must be cleaned and disinfected between uses.

**Patient**

Place the patient in a well-ventilated single room. If single rooms are unavailable, group patients with confirmed diagnoses together, ensuring a minimum distance of one meter between them and drawing curtains between beds. Restrict the patient's movement outside the hospital room. When the patient must leave the room and is able to tolerate it, they should wear a medical mask to ensure source control.

**Visitors**

Visitors should be instructed in proper respiratory hygiene and cough etiquette, as well as in the WHO's five moments for hand hygiene. They must also be taught how to correctly put on PPE before entering a room to visit a family member. Visitors should remain in the room and provide care only to their family members. When leaving the room, visitors must be instructed on how to properly remove PPE and perform hand hygiene

# Preparedness and Response for Diphtheria Outbreaks

**Preparedness for Outbreaks**

The main objectives of preparedness for diphtheria outbreaks are: (1) knowing the main areas of risk and take steps to minimize the risk or detect any problems as early as possible; (2) ensuring good preparatory outbreak response coordination prior to the outbreak for timely and effective response; (3) rapidly detecting and assess diphtheria-related events in countries; and (4) understanding antitoxin supply levels, including stockpiles for ensuring rapid and easy access during outbreaks (WHO, 2024c).

To ensure effective preparedness and response to diphtheria outbreaks, it is essential to clearly define the responsibilities of health authorities and service providers at national and subnational levels. Diphtheria surveillance should be national and facility-based, with mandatory case reporting by all healthcare providers (WHO, 2024c). Ideally, all suspected cases should undergo laboratory confirmation, although large outbreaks may limit case-based surveillance due to logistical constraints. Diphtheria surveillance aims to: (1) monitor disease burden and transmission; (2) identify outbreaks for timely response; and (3) determine appropriate national vaccine policy, including the need of booster doses of vaccine formulation change.

To contain outbreaks, guiding tools such as SOPs must be developed to ensure consistent and effective implementation of response activities. These tools should address the following and could be

specific for diphtheria or generic for communicable diseases and VPDs:

1. SOPs for epidemiological analytical methods
2. TOR for an outbreak coordination committee
3. SOPs for sample collection, laboratory procedures and quality assurance
4. SOPs for DAT management
5. SOPs for safe injection practices
6. SOPs for infection control in hospitals
7. SOPs for effective communication and public awareness

Detailed mapping and planning for essential resources is critical to improve the efficiency and targeted allocation of resources in high-risk areas during an outbreak response. This resource mapping should include: (1) availability of antibiotics and other medicines for treatment of cases and contacts; (2) DAT stocks and requirements; (3) sufficient supply of vaccines for outbreak response; (4) routine assessment of stock gaps; (5) availability of trained personnel, including doctors, nurses, public health workers and laboratory staff; (6) financial resources needed for response activities; (7) operational tools, such as case investigation forms, case and contact line-listing formats, and laboratory request forms; (8) IEC materials, such as leaflets and brochures; and (9) referral pathways to advanced health facilities and hospitals.

**Response to Diphtheria Outbreaks**

The main objectives of response to diphtheria outbreaks are: (1) limit and contain the spread of diphtheria cases; (2) reduce complications and fatalities through timely diagnosis, appropriate treatment, and effective case management; (3) support public health personnel in conducting risk assessments; (4) identify high-risk areas and implement targeted public health interventions, including outbreak-response immunization; and (5) enhance community awareness about diphtheria and prevention strategies (WHO, 2024c).

At the onset of a diphtheria outbreak, a risk assessment should be conducted to determine the public health threat and guide response efforts. The assessment should utilize multiple data sources to evaluate the hazard, exposure, and context. These may include case and aggregate epidemiological data, immunization coverage, census and demographic data, socioeconomic and geographic information, and health system capacity. Key indicators for risk assessment include case numbers, DTP1 and DTP3 dropout rates, booster dose coverage, vaccine hesitancy, mobile and ethnic populations, overcrowding, high-risk areas identified in micro-plans, and healthcare access. Following the risk assessment, areas should be categorized by vulnerability to prioritize response efforts and allocate resources efficiently.

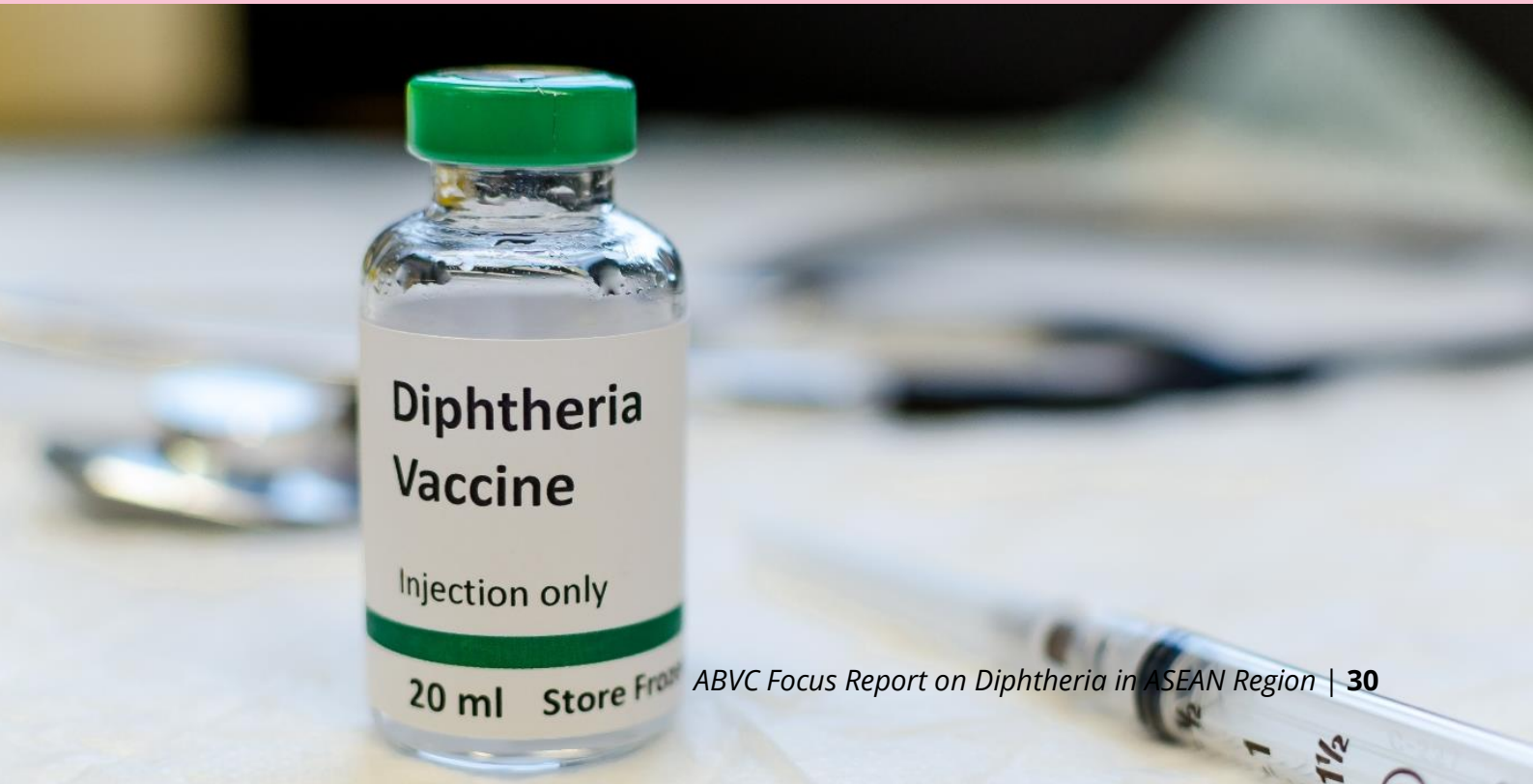
Once an outbreak is confirmed, health-center staff should promptly notify the next administrative level (e.g., district or province) using the fastest available communication method. The report should include the number of cases and deaths by age group, vaccination status, date of onset (first day of sore throat), hospitalization and treatment details (antibiotic and DAT use), outbreak location, and planned response activities. If cases occur near borders, neighboring health authorities should be alerted and information shared.

Case investigations must collect and record critical information, including name, address, age, sex, vaccination history, symptom onset, treatment, specimen collection date, and clinical outcome. This information should be documented in a case investigation form and compiled into a case line list. All close contacts must be identified and recorded in a contact line-list form. Close contacts include:

1. Household members (those who slept in the same house/tent within 5 days before the case's onset),
2. Individuals with direct contact with the case,
3. Healthcare workers exposed to the case's respiratory secretions or wounds.
4. At-risk contacts, regular visitors, classmates, coworkers, and additional healthcare workers, should be assessed individually, considering contact duration and immunization status.

The management of close contacts includes three main components: (1) follow-up monitoring, (2) prophylaxis antibiotic, and (3) vaccination for the unvaccinated or partially vaccinated. Before initiating antibiotics, two specimens (nasal and pharyngeal swabs) should be collected for culture from all close and eligible at-risk contacts.

Surveillance must be intensified during an outbreak to determine its scope and geographic spread. Raising public awareness about risks and protective measures is vital. Strategic communication efforts must be responsive to community concerns and misinformation. Selective vaccination campaigns targeting at-risk populations, including healthcare workers and outbreak responders, should be planned. In high-risk settings with poor vaccination coverage, authorities should assess the feasibility of mass vaccination campaigns. Vaccination strategies should be based on the epidemiology of the outbreak, such as affected age groups or vulnerable populations, and focus on high-risk geographic areas.



# Control Measures Strategy

The Strategic Framework for the South-East Asia Regional Vaccine Action Plan 2022–2030 (Regional Strategic Framework) articulates the regional immunization objectives and operational principles aligned with the global IA2030. It serves as an overarching guide that emphasizes country ownership and promotes the coordination and harmonization of efforts among regional immunization stakeholders. This framework aims to ensure the effective delivery of context-specific support to countries, thereby contributing to the reduction of morbidity and mortality associated with VPDs, including diphtheria (WHO, 2021c). The Region will pursue the seven strategic priorities outlined in the global IA2030 strategy, including (WHO, 2023b):

1. **Primary Health Care and Universal Health Coverage.** Immunization services that are effective, efficient, and resilient are integral to primary health care and play a critical role in advancing universal health coverage by ensuring equitable access for all populations.
2. **Commitment and Demand.** Immunization is recognized and actively pursued by all individuals, while health authorities remain committed to ensuring its availability as a vital component in realizing the highest attainable standard of health, acknowledged as a fundamental human right.
3. **Coverage and Equity.** Equitable access to the full benefits of immunization is ensured for all individuals, irrespective of their geographic location, age, sex, socioeconomic status, ethnicity, or gender-related barriers.
4. **Life Course and Integration.** All individuals receive the full benefits of recommended immunizations across the life course, with services effectively integrated into broader essential health care delivery.
5. **Outbreaks and Emergencies.** Immunization programmes are designed to proactively anticipate, prepare for, and detect outbreaks of vaccine-preventable and emerging diseases, while ensuring a rapid and effective response. They also play a critical role in sustaining immunization services during acute emergencies, including those arising from conflict, natural disasters, and humanitarian crises.
6. **Supply and Sustainability.** All countries maintain a dependable supply of high-quality, appropriate, and affordable vaccines, supported by sustainable financing mechanisms to ensure the continuity and effectiveness of immunization programmes.
7. **Research and Innovation.** Innovations aimed at expanding the reach and enhancing the impact of immunization programmes are promptly accessible to all countries and communities.

The Regional Strategic Framework 2022–2030 will be implemented in two phases through corresponding RVIPs. The first phase, RVIP 2022–2026, is designed as a dynamic document based on lessons learned from previous RVAPs and comprehensive multi-year immunization plans developed at the country level. It addresses regional and national priorities while incorporating new strategies to address emerging challenges and capitalize on opportunities. The integrated approach consolidates previous gains and accelerates progress towards regional immunization goals by leveraging proven interventions and fostering innovation. The RVIP 2022–2026 emphasizes ownership and accountability mechanisms, coordinated planning processes, and a robust regional monitoring and evaluation framework. Additionally, it also includes targeted communication and advocacy strategies. The initial phase focuses on mitigating the COVID-19 pandemic's impact on immunization programs and integrating vaccination efforts into routine systems (WHO, 2023b).

The RVIP 2022–2026 followed key principles outlined in the IA2030 Framework for Action, which serve as the foundation for implementation strategies. One of the key efforts is the recovery of the immunization system following the COVID-19 pandemic. The COVID-19 pandemic years of 2020 and 2021 represented a significant setback for regional immunization coverage, resulting in substantial backsliding. Since 2020, countries across the region have made concerted efforts to mitigate the impact of the pandemic on immunization systems. However, the accumulated number of zero-dose and partially immunized children has contributed to outbreaks of VPDs, including diphtheria. In response, the essential immunization recovery plan has adopted a three-pronged approach, including conducting catch-up vaccination campaigns and utilizing routine immunization services to address missed vaccinations since 2019; restoring immunization services to close the gap between current coverage levels and pre-pandemic coverage from 2019; and strengthening immunization services and PHC systems to enhance overall health system resilience (WHO, 2023b).

## Control Measures in ASEAN Member States

The Regional Strategic and Action Plan for AVSSR 2021–2025 was developed based on findings from the AVBS, literature reviews, outputs from technical workshops conducted over the past five years and inputs from diverse international stakeholders. “Vaccine security” is defined as the sustained, uninterrupted, and timely supply of affordable vaccines of assured quality, while “vaccine self-reliance” refers to the ability of a country or region to adequately provide vaccines for both routine immunization and emergency situations using its own capacities and resources, with minimal external assistance. The vision of the AVSSR is Towards Realising Vaccine Security and Self-Reliance for All,

ensuring a healthy ASEAN through timely and equitable access to affordable, quality-assured vaccines. This initiative is guided by key principles that emphasize regional collaboration and mutual support, including (ASEAN, 2020):

1. **Shared regional vision.** The initiative promotes a collaborative model grounded in the fundamental principles of ASEAN.
2. **Policy alignment**. Efforts are aligned with global and regional frameworks to ensure coherence with broader public health and immunization strategies.
3. **Leveraging existing mechanisms**. The plan builds upon existing regional platforms and structures to enhance efficiency and avoid duplication.
4. **Human rights and equity.** Access to vaccines, biologicals, and scientific advancements is recognized as a basic human right, with a strong emphasis on equitable distribution.
5. **Information and knowledge sharing**. Data, research, and expertise are treated as regional public goods.
6. **Future-oriented and sustainable**. The approach is forward-looking, anticipating future challenges and opportunities while promoting long-term sustainability.
7. **Accountability**. All stakeholders, particularly policymakers and decision-makers are called upon to fulfil their commitments to ensuring universal and timely access to vaccines.

Following a comprehensive review of relevant literature, global and regional policies and plans, as well as the outcomes of technical workshops and consultation meetings with international partners, we have identified key challenges and assessed the feasibility of collaboration across the vaccine development cycle. Based on this analysis, the areas of collaboration have been restructured into five strategic pillars, including (ASEAN, 2020):

1. **Advance AVSSR into global policy level**

   The period from 2020 onwards presents a strategic opportunity for ASEAN Member States (AMSs) to consistently advocate for vaccine security and self-reliance as essential components within the global immunization landscape, particularly in alignment with WHO's Immunization Agenda 2030 and other relevant global policies and strategies. To achieve this expected outcome, the following actions are proposed:

   1. ASEAN may deliver a unified regional intervention to underscore the importance of vaccine security and self-reliance in the Immunization Agenda 2030 and other global frameworks; ***or***
   2. Each AMS may independently highlight ASEAN Vaccine Security and Self-Reliance (AVSSR) priorities within relevant global policy platforms; ***and***
   3. AMSs are encouraged to share their respective positions on specific issues of mutual interest in global or regional policy fora.

2. **Support the effective procurement strategies and establish the regional stockpiling mechanism**

   Vaccine procurement is crucial for immunization programs, impacting

costs and availability. At present AMSs purchase vaccines directly from manufacturers or UNICEF. Factors like order volume, demand predictability, contract duration, product specifications, and market competition influence vaccine pricing. Strategies like regional pooled procurement, multiyear tendering, advanced market commitments, and central bargaining mechanisms can help secure high-quality vaccines at affordable prices and ensure uninterrupted supply. Thorough review and analysis of AMS procurement processes is essential to identify and adopt suitable approaches at national and regional levels, strengthening vaccine security and cost-effectiveness across ASEAN.

3. **Strengthen information sharing platforms to support AVSSR**
   The need for accurate data in program management and decision-making is crucial for countries to achieve global immunization targets. Traditional measurements are not sufficient, especially in low- and middle-income settings. Despite improvements in data quality and use, challenges like poor data quality and limited utilization persist. As part of this Regional Strategic and Action Plan, ASEAN seeks to strengthen and leverage existing information-sharing platforms to enhance evidence-based decision-making and contribute to the overall success of vaccine security and self-reliance in the region.

4. **Strengthen capacity of the key stakeholders to achieve vaccine security in ASEAN**
   Vaccine security is a complex issue that requires coordinated efforts across all stages of the development cycle. Capacity development is a systematic process that involves acquiring, enhancing, and sustaining competencies, tools, infrastructure, and resources for effective performance. This process enables stakeholders to operate at a larger scale, reach wider audiences, and generate greater impact. ASEAN training centers are proposed to strengthen regional capabilities and advance vaccine security and self-reliance.

5. **Establish monitoring and evaluation mechanism for the implementation of the plan**
   Monitoring and evaluation (M&E) is crucial for strategic planning, effective program implementation, and resource allocation. It helps stakeholders make informed decisions, enhancing the efficiency and impact of immunization initiatives. Communication and coordination are key components of the Regional Strategic and Action Plan, enhancing understanding and awareness of vaccine security and self-reliance among ASEAN Member States. The goal is to foster collective commitment and support from all sectors, ensuring unified action under a shared vision and expanding equitable access to quality-assured vaccines for target populations, contributing to improved public health outcomes.

## Brunei Darussalam

Brunei Darussalam has a comprehensive EPI to protect children against ten vaccine-preventable diseases, including diphtheria. Established in 1957, the program is regularly updated to align with WHO recommendations. Immunization services are provided free of charge through 16 clinics, school health services, and government hospitals, with additional services for military personnel through the RBAF medical centers. Mobile clinics and the Flying Medical Service reach remote communities. Immunization coverage is monitored through healthcare facility reports, with records maintained in clinics for children under five. Data collection and reporting are conducted manually via the Bru-HIMS (WHO, 2020).

The diphtheria-containing DTaP vaccine schedule consists of three primary doses administered at 2, 4, and 6 months of age, followed by a booster dose at 5 years. A minimum interval of four weeks is maintained between each primary dose (WHO, 2017b). In alignment with SDG 3.8, the Ministry of Health of Brunei Darussalam set a national diphtheria immunization coverage target of 95% in its 2019–2023 Strategic Plan (Ministry of Health Brunei Darussalam).

Brunei Darussalam has sustained zero reported diphtheria cases over the past decade from 2014 to 2023 (Figure 18), while maintaining consistently high vaccine coverage, with DTP1 and DTP3 rates exceeding 99% throughout the period (WHO, 2025a).

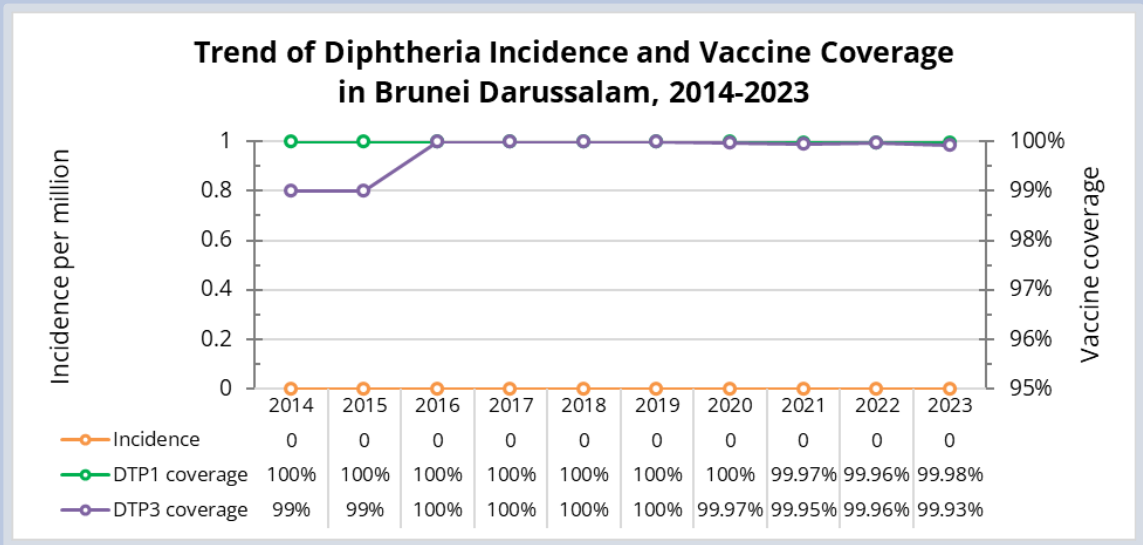



*Figure 18. Trend of diphtheria incidence and vaccine coverage in Brunei Darussalam, 2014-2023*
*(Source: WHO immunization data(https://immunizationdata.who.int/global/wiise-detail-page/diphtheria-reported-cases-and-incidence?YEAR=))*

## Cambodia

In 1986, the Government of Cambodia, with financial support from UNICEF, began implementing the EPI, which successfully reached all provinces across the country since 1998 (Ministry of Health Cambodia, 2008). To support SDGs 3 on health and well-being, the Ministry of Health formulated the Health Sector Strategic Plan 2016–2020 in collaboration with various stakeholders, including government departments, donors, health partners, NGOs, civil society, and private healthcare providers. The strategic plan outlines key strategies for VPDs control and elimination, focusing on five primary objectives (Ministry of Health Cambodia, 2016):

1. **Service Delivery.** Expand immunization coverage nationwide, with an emphasis on reaching high-risk communities and addressing disparities associated with geography and socioeconomic status.
2. **Cold Chain Management.** Strengthen the vaccine supply and logistics system by implementing the recommendations from the EVM improvement plans.
3. **Community Awareness and Demand.** Enhance public awareness and promote increased demand for immunization services through targeted health communication and education efforts.
4. **Surveillance.** Improve the quality and responsiveness of surveillance systems for vaccine-preventable diseases by actively engaging all relevant stakeholders, including healthcare providers, laboratories, and community-level actors.
5. **Management Capacity.** Build and reinforce management and operational capacities at all administrative levels to ensure effective implementation and sustainability of the immunization program.

Cambodia has successfully maintained the incidence of diphtheria at zero over the past decade (Figure 19). During this period, vaccine coverage for both DTP1 and DTP3 has been consistently maintained at over 95% (WHO, 2025a).

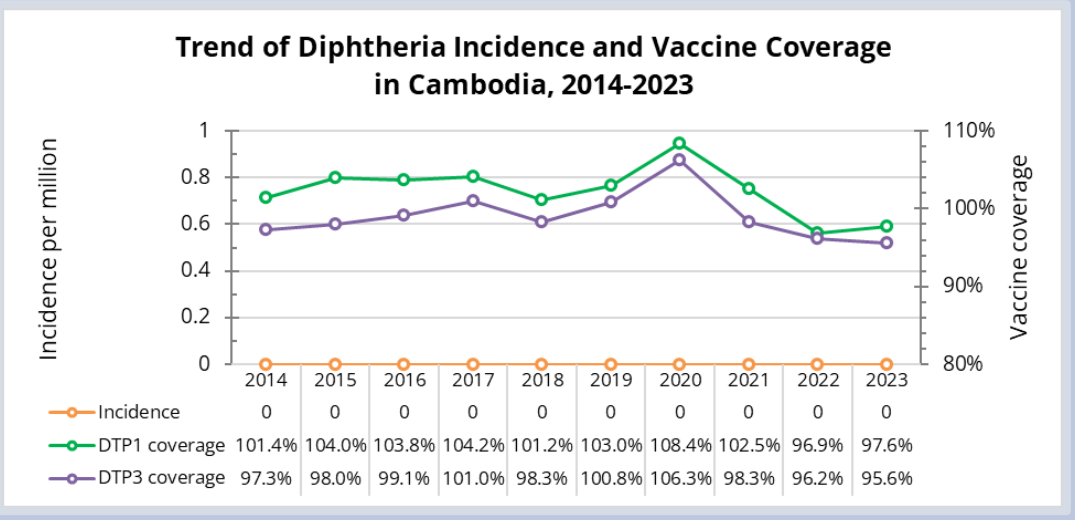



*Figure 19. Trend of diphtheria incidence and vaccine coverage in Cambodia, 2014-2023*
*(Source: WHO immunization data (https://immunizationdata.who.int/global/wiise-detail-page/diphtheria-reported-cases-and-incidence?YEAR=))*

## Indonesia

Diphtheria, a VPD, requires close coordination between surveillance and immunization programs. In Indonesia, diphtheria surveillance follows Indonesia Ministry of Health Regulation No. 45 of 2015 which aims to monitor disease trends, detect outbreaks early, support response efforts, and share health information with relevant stakeholders.

The Indonesian Ministry of Health Regulation No. 12 of 2017 on the Implementation of Immunization stipulates that diphtheria immunization is included in both routine and booster immunization programs. Currently, three types of vaccines are utilized in Indonesia to prevent diphtheria under these programs, including:

- **DPT-HB-Hib** a combination vaccine for Diphtheria, Pertussis, Tetanus, Hepatitis B, and infections caused by *Haemophilus influenzae* type B, such as meningitis and pneumonia;
- **DT** a combination vaccine for Diphtheria and Tetanus; and
- **Td** a combination vaccine for Tetanus and Diphtheria.

Indonesia has outlined eight key strategies for diphtheria prevention and control (Ministry of Health Republic of Indonesia, 2023):

1. Report all suspected diphtheria cases within 24 hours through EWARS, using both Indicator-Based and Event-Based Surveillance.
2. Manage cases according to standard operating procedures.
3. Promptly identify and manage close contacts.
4. Strengthen the diphtheria laboratory network.
5. Enhance healthcare workers' capacity in outbreak investigation and response.
6. Ensure proper case management based on standard treatment guidelines.
7. Achieve at least 95% coverage for routine diphtheria immunization.
8. Strengthen ORI efforts, targeting a minimum 90% coverage during outbreaks.

From 2014 to 2023, Indonesia experienced fluctuating diphtheria incidence, ranging from 0.8 to 3.8 cases per million people (Figure 20) (WHO, 2025a). The highest rates were recorded in 2017 (3.6) and 2018 (3.8), followed by a decline to 0.8 in 2021. However, incidence rose again, reaching 3.4 in 2023. DTP1 vaccine coverage also varied during this period. It met the WHO target of 90% from 2014 to 2017, dropped to 78.8% in 2018, recovered to 90% in 2019, declined to 83% in 2020–2021, rose to 92% in 2022, and fell again to 85.1% in 2023. DTP3 coverage followed a similar pattern but remained slightly lower than DTP1 coverage.

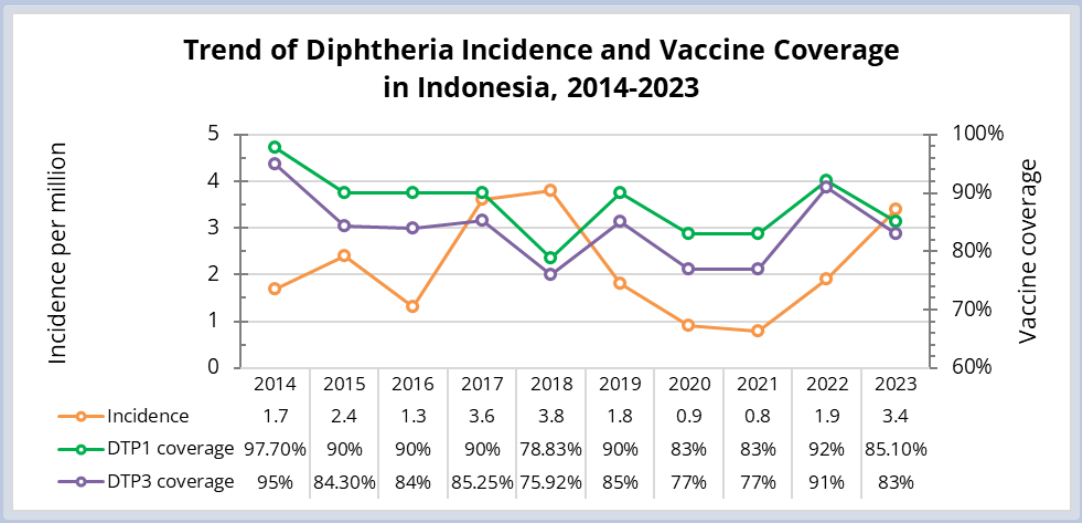



*Figure 20. Trend of diphtheria incidence and vaccine coverage in Indonesia, 2014-2023*
*(Source: WHO immunization data (https://immunizationdata.who.int/global/wiise-detail-page/diphtheria-reported-cases-and-incidence?YEAR=))*

## Lao People's Democratic Republic

The NIP in Lao People's Democratic Republic was formally launched in 1979 as the EPI, with the initial introduction of six vaccines, including BCG, diphtheria, tetanus, pertussis, polio, and measles. The program began as a pilot initiative in two provinces and ten districts, and was gradually expanded to achieve full nationwide implementation by 1989. Since 2002, Lao People's Democratic Republic has received support from the GAVI Alliance through ISS, assistance for injection safety, and the introduction of tetravalent combination (DTP-HepB) vaccine. By 2004, the DTP-HepB vaccine had been implemented across all districts, accompanied by significant improvements in injection safety, including the universal use of AD syringes and the adoption of safe disposal practices (Ministry of Health, Lao People's Democratic Republic, 2007).

Between 2000 and 2005, Lao People's Democratic Republic's immunization coverage remained low at or below 50%. However, in 2006, it increased to 59% due to the implementation of the RED strategy. This strategy improved district performance monitoring, communication with local communities, and data use for informed planning. Despite these improvements, northern provinces lag behind central and southern regions, and underserved rural and urban districts still have low immunization rates (Ministry of Health, Lao People's Democratic Republic, 2007).

Since 2012, Lao People's Democratic Republic has expanded its national routine immunization program, primarily through community health centers and schools. Prior to the COVID-19 pandemic, childhood vaccination coverage ranged from 85% to 95%, with disparities in hard-to-reach and underserved populations and those affected by vaccine hesitancy. However, the pandemic significantly disrupted routine immunization efforts, with a 10% decrease in coverage for one commonly administered vaccine and additional declines across other vaccines (WHO, 2024d).

The Lao People's Democratic Republic's Ministry of Health has launched a 12-month pilot program to improve childhood immunization coverage using text message reminders. The initiative, supported by the WHO, Australian Government, and GAVI, aims to administer second doses of measles-rubella and inactivated polio vaccines to children shortly after their first birthday. The program uses data from the national EIR to send personalized reminders to parents, aiming to reach approximately 50,000 parents in urban areas. The initiative aims to address declines in vaccine coverage observed as children age and integrate technology into public health outreach to ensure higher immunization rates and better protection against vaccine-preventable diseases (WHO, 2025b).

Figure 21 illustrates how diphtheria cases in Lao PDR varied between 2014 and 2023. There were noticeable spikes in 2015 (28.5 cases per million people), 2019 (10.1), and 2023 (35.6) (WHO, 2025a). In the other years, the number of cases stayed low, ranging from 0 to 1.4 cases per million people. DTP1 coverage consistently met the WHO target of 90%, ranging from 95% to 105%. DTP3 coverage was slightly lower, ranging from 88% to 100% over the same period.

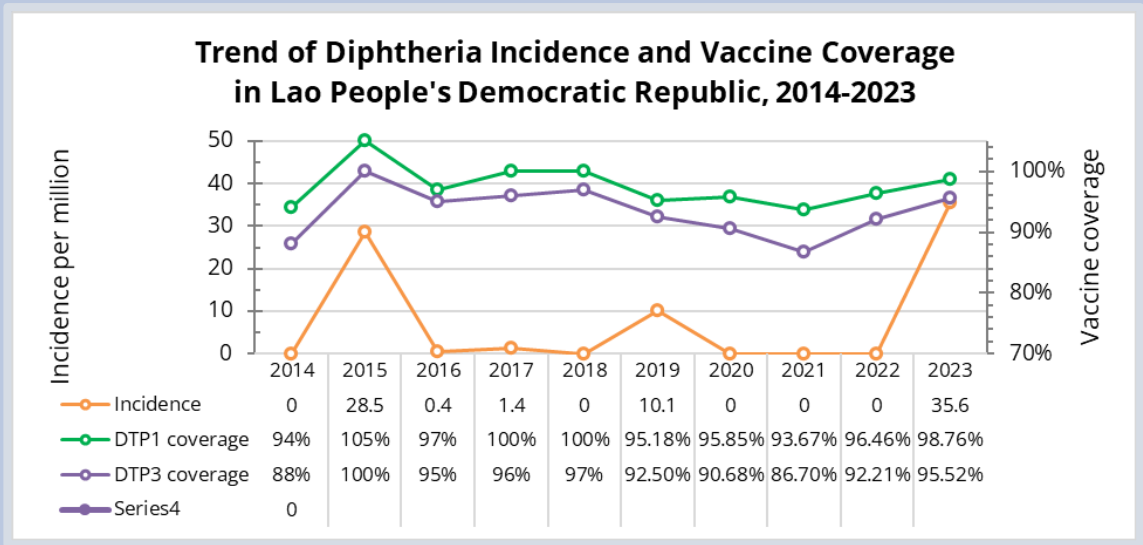



*Figure 21. Trend of diphtheria incidence and vaccine coverage in Lao PDR, 2014-2023*
(*Source: WHO immunization data (https://immunizationdata.who.int/global/wiise-detail-page/diphtheria-reported-cases-and-incidence?YEAR=)*)

## Malaysia

Malaysia initiated its NIP in the 1950s with the mission of protecting children from vaccine-preventable diseases, reducing the burden of endemic infections, and decreasing morbidity and mortality associated with these conditions. Diphtheria immunization was introduced in the mid-1950s through the use of the DT vaccine and was subsequently updated in 1958 with the implementation of the combined DPT vaccine (Ministry of Health of Malaysia, 2017). In 2006, the DTwP-HepB+Hib vaccine was introduced in Malaysia as part of efforts to prevent and control diphtheria (The Kelantan State Health Department, 2010). A circular

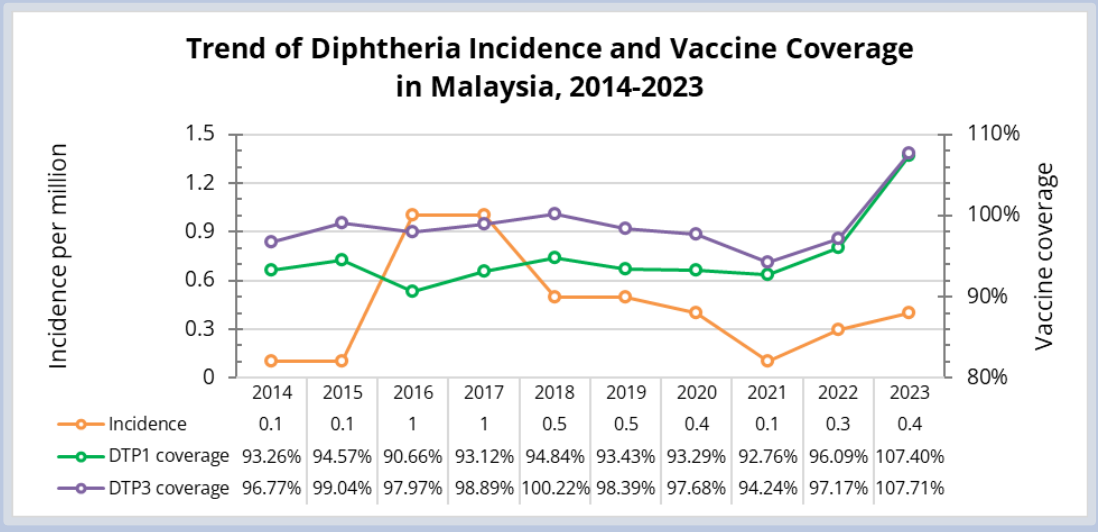
issued by the Director General of Health Malaysia in 2008 announced a revision in the National Immunization Program, introducing the use of the 5-in-1 combination vaccine (DTaP-IPV/Hib), which was officially implemented on October 1, 2008.

The Malaysia Ministry of Health's 2022–2025 Action Plan reports a significant diphtheria deaths cases in 2018, with five deaths cases linked to non-immunization (Ministry of Health of Malaysia, 2021). Malaysia addressing the rise in diphtheria cases was the issuance of Circular No. 16/2016 by the Director General of Health Malaysia, which outlines the enhancement of diphtheria case management (Ministry of Health of Malaysia, 2016).

Malaysia has outlined four core strategies to guide the prevention and control of VPDs, which are detailed as follows (The Kelantan State Health Department, 2010):

1. Saving lives and protecting against life-threatening diseases;
2. Integrated services and improved coverage;
3. Development of more vaccines and innovative approaches; and
4. Reaching vulnerable groups with equity.

From 2014 to 2023, diphtheria incidence in Malaysia remained relatively low, fluctuating between 0.1 and 1 case per million population (Figure 22) (WHO, 2025a). Peaks were observed in 2016 and 2017 (1.0 cases per million), and a slight increase again in 2023 after a dip to 0.1 in 2021. DTP1 coverage ranged from 90.66% in 2016 to 107.40% in 2023. DTP3 coverage remained consistently high throughout the period, ranging from 94.24% to 107.71%, meeting or exceeding the WHO target of 90% each year.




| | 2014 | 2015 | 2016 | 2017 | 2018 | 2019 | 2020 | 2021 | 2022 | 2023 |
|---|---|---|---|---|---|---|---|---|---|---|
| Incidence | 0.1 | 0.1 | 1 | 1 | 0.5 | 0.5 | 0.4 | 0.1 | 0.3 | 0.4 |
| DTP1 coverage | 93.26% | 94.57% | 90.66% | 93.12% | 94.84% | 93.43% | 93.29% | 92.76% | 96.09% | 107.40% |
| DTP3 coverage | 96.77% | 99.04% | 97.97% | 98.89% | 100.22% | 98.39% | 97.68% | 94.24% | 97.17% | 107.71% |

*Figure 22. Trend of diphtheria incidence and vaccine coverage in Malaysia, 2014-2023*
(*Source: WHO immunization data (https://immunizationdata.who.int/global/wiise-detail-page/diphtheria-reported-cases-and-incidence?YEAR=)*)

## Myanmar

The EPI in Myanmar, initiated in 1978, is a national immunization program aimed at preventing 10 vaccine-preventable diseases, including diphtheria. In 2012, the country co-financed immunization efforts, contributing US$1 million towards the introduction of the pentavalent vaccine. Despite a high national average for DPT3 coverage between 2009 and 2012, there are areas with low coverage in border areas, hard-to-reach areas, urban slums, and migrant communities. A comprehensive data analysis showed that 179 townships had less than 80% DPT3 coverage. In 2012, the year of Intensification of Routine Immunization (IRI) was launched to achieve universal coverage of routine immunization. However, the distribution of health services is not equal everywhere due to shortages of basic health workers, lack of cold chain, and inability to reach inaccessible areas like coastal or hill regions (WPRO-WHO, 2014).

The National Vaccine Action Plan of Myanmar is aligned with the WHO Global Vaccine Action Plan, with immunization being voluntary. Vaccine coverage is monitored on a monthly basis by UNICEF and WHO. Immunization services are delivered through four primary approaches: fixed, outreach, mobile, and crash. These services are provided at Maternal and Child Health Centres, urban health facilities, and township hospitals in urban settings, as well as at rural health centres and sub-centres in more remote areas. Approximately 80% of immunization services are delivered through outreach programs (WHO, 2018b).

Myanmar has released a comprehensive plan for immunization from 2017-2021, focusing on strengthening program management, human resources, financing, and service delivery. The plan also aims to improve demand creation, supply chain, vaccine management, and cold chain systems at all levels. It also aims to maintain zero polio cases, Maternal and Neonatal Tetanus Elimination status, and achieve elimination of measles and of IHR Core Capacities of the Republic of the Union of Myanmar control of rubella and congenital rubella syndrome by 2020. The plan also emphasizes strengthening surveillance systems for adverse events following immunization and other priority VPDs, including diphtheria (Ministry of Health and Sports, Republic of the Union of Myanmar, 2016).

In February 2020, the Ministry of Health and Sports of Myanmar introduced a fourth dose of the diphtheria-tetanus-pertussis-hepatitis B-Haemophilus influenzae type b (DTP-HepB-Hib) vaccine into the routine immunization schedule. This additional dose, administered to children at 18 months of age who have completed the initial three-dose series, aims to extend the duration of protective immunity (UNICEF, 2020).

Between 2014 and 2023, diphtheria incidence in Myanmar showed considerable fluctuation. It rose from 0.6 per million population in 2014 to peaks of 2.6 in 2016 and 3.2 in 2020, followed by a significant drop to 0.1 in 2021 (Figure 23) (WHO, 2025a). However, incidence rose again to 1.7 per million in 2023. DTP1 coverage remained stable between 92%–95% from 2014 to 2019, before drastically

falling to 44.87% in 2021. It then partially recovered to 80.97% by 2022. Similarly, DTP3 coverage was above 88% until 2019, but fell sharply to 37.18% in 2021. It rebounded to 75.57% in 2023.

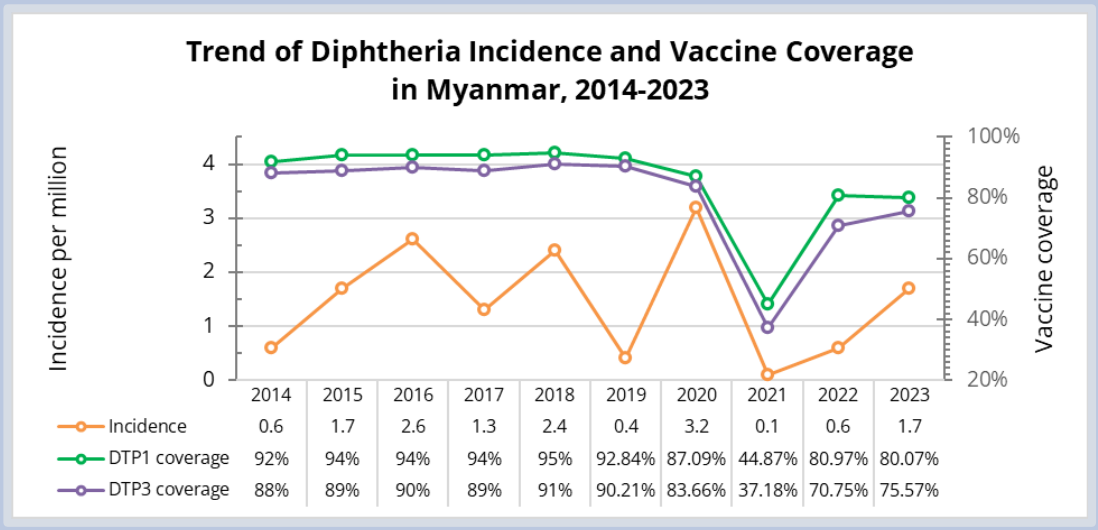



*Figure 23. Trend of diphtheria incidence and vaccine coverage in Myanmar, 2014-2023*
(*Source: WHO immunization data (https://immunizationdata.who.int/global/wiise-detail-page/diphtheria-reported-cases-and-incidence?YEAR=)*)

## Philippines

The EPI, launched in 1976, aimed to provide routine vaccinations for infants, children, and mothers. Initially targeting six VPDs, including diphtheria, 21.3% of children under 14 months were fully immunized, according to the EPI Comprehensive Program Review conducted in 1986. However, the Philippines has shown improvement in vaccination coverage, with FIC coverage increasing by 10%, marking the highest recorded levels in the country's history. This improvement is evident in Demographic Health Surveys of 2003 and 2008 (Department of Health Philippines, 2025).

The EPI in the Philippines aims to decrease morbidity and mortality among children from VPDs, including diphtheria. In alignment with this goal, Republic Act No. 10152, known as the "Mandatory Infants and Children Health Immunization Act of 2011," signed into law by the President in 2010, mandates basic immunization for all children under five years old, including additional vaccines determined by the Secretary of Health. The EPI is implemented through three main strategies, as follows (Department of Health Philippines, 2025):

1. Routine immunization for infants, children, and women using the REB approach;
2. Supplemental Immunization Activities (SIA);
3. Enhancement of surveillance systems for VPDs; and
4. Assurance of the nationwide availability and distribution of high-quality vaccines and essential immunization supplies to all health facilities.

As of Morbidity Week 29 (January 1 to July 22, 2023), a total of 97 diphtheria cases have been reported. Recent surveillance

data indicate a clustering of cases and an emergence of infections in previously unaffected areas, suggesting localized outbreaks. In light of the public health risks associated with low vaccination coverage, the Department of Health has issued guidance to all CHDs, health facilities, and healthcare workers, emphasizing the implementation of the Prevention, Detection, Isolation, Treatment, and Reintegration (PDITR) strategy as part of the diphtheria outbreak response (Department of Education Region VIII, 2024).

The DOH in the Philippines has introduced the National Immunization Acceleration Plan for 2024-2025, aiming to achieve 95% immunization coverage for children. This initiative involves collaboration between government bodies, international partners, civil society organizations, and youth advocates. Regional efforts have been successful, with region 12 receiving PhP 70 million in vaccination funding through coalition-building, Region 3 expanding immunization services in hard-to-reach areas through the REP strategy, Santiago City enhancing its cold chain infrastructure, and General Mariano Trias developing the BenApp to strengthen immunization data systems. Youth engagement initiatives, such as Galing LNC Youth and YATTA, have also supported vaccine promotion. Additionally, religious leaders in the SGA of the BARMM have actively contributed to increasing community-level acceptance of immunization (Department of Health of Philippines, 2025).

Diphtheria incidence in the Philippines gradually increased from zero in 2014 to peaks of 1.7 in 2018 and 1.8 in 2019, before declining to 0.2 by 2023 (Figure 24) (WHO, 2025a). DTP1 coverage fluctuated throughout the period, dropping from 78% in 2014 to a low of 57.49% in 2021, before gradually recovering to 78.02% in 2023. DTP3 coverage followed a similar trend, dipping to 56.62% in 2021 and rebounding to 76.81% in 2023.

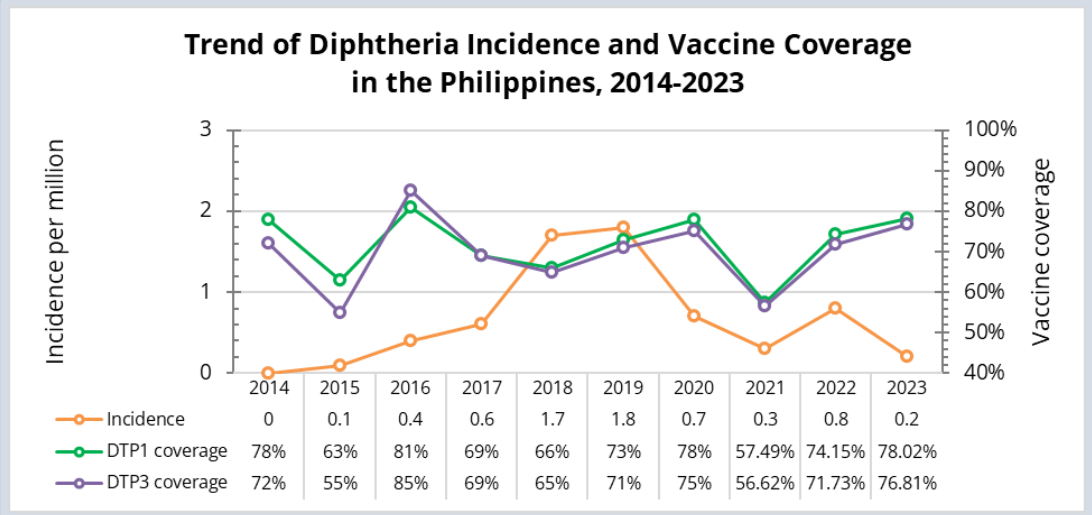



*Figure 24. Trend of diphtheria incidence and vaccine coverage in the Philippines, 2014-2023*
(*Source: WHO immunization data (https://immunizationdata.who.int/global/wiise-detail-page/diphtheria-reported-cases-and-incidence?YEAR=)*)

## Singapore

Singapore mandated the compulsory Diphtheria vaccination in 1977, and vaccination records are maintained through the NIR (NIR of Singapore, 2025a). Healthcare providers are required to report all vaccinations administered under the NCIS and the NAIS. The NCIS covers 14 diseases, including diphtheria, while the NAIS was established in November 2017 who advises individuals aged 18 and above on vaccinations against 11 diseases, including diphtheria (CDA of Singapore, 2025).

Proof of immunization is required for enrolment in childcare centres (under 7 years of age) and registration for primary school (at 7 years of age). As diphtheria vaccines are administered in combination with vaccines for other diseases,these regulations contribute to achieving broad immunization coverage under the NCIS (WHO, 2018c). According to the NCIS, children receive primary immunization with the DTaP vaccine at 2, 4, and 6 months of age, followed by a first booster dose (DTaP) at 18 months, and a second booster dose (Tdap) at 10–11 years of age (Primary V) (NIR of Singapore, 2025a). Additionally, under the NAIS, pregnant women are recommended to receive a single dose of the Tdap vaccine during each pregnancy (NIR of Singapore, 2025b).

The School Health Service, under the Health Promotion Board with the public healthcare system in Singapore ensures an efficient vaccine delivery mechanism that maintains the cold chain throughout the immunization process. Effective procurement procedures and reliable demand forecasting maintain an adequate supply of vaccines. Private healthcare providers receive vaccines from commercial suppliers and are regulated by the Ministry of Health to maintain cold chain integrity. This ensures equitable access to vaccinations for all children in Singapore (WHO, 2018c).

Singapore has effectively kept diphtheria cases at zero throughout the last ten years, except for one imported case reported in 2017 (Figure 25) (MoH Singapore, 2017). Throughout this period, vaccination coverage for the first and third doses of the DTP vaccine has consistently remained above 95% (WHO, 2025a).

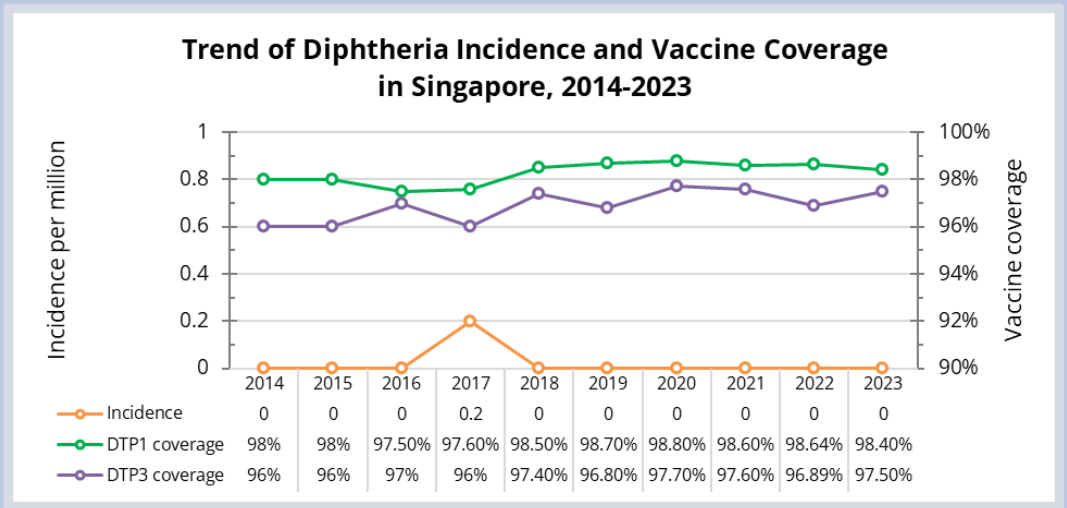



*Figure 25. Trend of diphtheria incidence and vaccine coverage in Singapore, 2014-2023*
(*Source: WHO immunization data (https://immunizationdata.who.int/global/wiise-detail-page/diphtheria-reported-cases-and-incidence?YEAR=)*)

## Thailand

The NIP in Thailand was officially launched in 1977, marking the introduction of the DTP vaccine for infants at 2 and 4 months of age. In 1982, the schedule was expanded to include a third DTP dose at 6 months, followed by a fourth dose introduced in 1991 for children aged 1.5 to 2 years. A fifth dose was later added in 2000 for children at the age of 4 years. Thailand continued to advance its NIP by introducing the DTP-HepB vaccine in 2008, and subsequently, the DTP-Hib-HepB combination vaccine in 2019. Between 2022 and 2023, a pilot project in Phatthalung province began administering the Tdap vaccine to pregnant women beyond 27 weeks of gestation. As of 2023, the national diphtheria immunization schedule under Thailand's Universal Health Coverage scheme includes DTP-Hib-HepB at 2, 4, and 6 months; DTP at 1.5 and 4 years; Td for schoolchildren in Grade VI (12 years); adult booster doses starting at age 20 and every 10 years thereafter; and a Tdap schedule for pregnant women administered at first contact, followed by doses at +1 month, +6 months, and a booster every 10 years (WHO, 2024e).

The ACIP works closely with the MOPH to guide vaccine policy under Thailand's Universal Health Coverage scheme, which includes 11 vaccines protecting against 13 antigens. To sustain and accelerate immunization coverage following disruptions caused by the COVID-19 pandemic, the MOPH developed a strategic plan titled the *"Strengthening Plan for the National Immunization Program in Preparation for the COVID-19 Endemic Phase."* This plan includes directives to all provinces to accelerate vaccine catch-up efforts, particularly for children who missed scheduled doses, and field visits by the Department of Disease Control to monitor progress and share best practices (WHO, 2023c).

Between 2014 and 2020, Thailand reported low diphtheria incidence, peaking at 1.3 per million in 2018 (WHO, 2025a). From 2021 to 2023, no diphtheria cases were recorded (Figure 26). DTP1 coverage remained consistently high, at or near 99% until 2018, but slightly declined thereafter, dropping to 90.5% by 2023. Similarly, DTP3 coverage started above 99% but decreased to 82.78% in 2021, before rising to 87.9% in 2023.

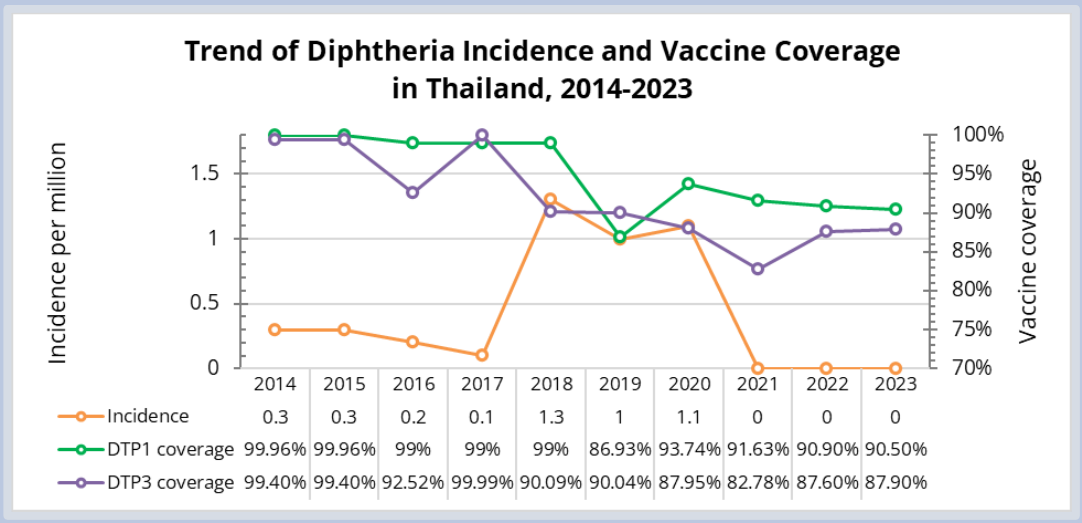



*Figure 26. Trend of diphtheria incidence and vaccine coverage in Thailand, 2014-2023*
(*Source: WHO immunization data (https://immunizationdata.who.int/global/wiise-detail-page/diphtheria-reported-cases-and-incidence?YEAR=)*)

## Viet Nam

Viet Nam's EPI, launched in 1981, has provided free vaccinations against 12 common infectious diseases. With support from the WHO and UNICEF, the program was integrated into Viet Nam's national target health programs by 1986. Initially focusing on six major infectious diseases, the EPI has achieved significant public health milestones, including a significant decline in the incidence of other VPDs like diphtheria (KPMG Viet Nam, 2025).

Vietnam's Ministry of Health has launched the Expanded Immunization Plan for 2025 through Decision 1987/QD-BYT sets a DPT vaccination target of ≥90% and keeps diphtheria incidence below 1 per 100,000. Activities have been implemented include securing vaccine funding, strengthening cold chain infrastructure with UNICEF support, conducting quality inspections across 16 provinces, and enhancing local capacity through training and planning workshops (LawNet Viet Nam, 2025).

Following disruptions of routine immunization work in Viet Nam during the COVID-19 pandemic, the Central Highlands had a rate below the national coverage target, particularly for outbreak-prone diseases like diphtheria. To improve vaccination coverage, Viet Nam launched outreach programs in disadvantaged communes with support from WHO, the European Union, and the Australian Government. By late 2023, these programs reached over 4,400 children across 16 communes, ensuring catch-up doses for those missed during the pandemic. This strategy demonstrates Viet Nam's commitment to reducing health inequities and preventing future diphtheria outbreaks (WHO, 2024f).

From 2014 to 2020, diphtheria incidence remained below 1 per million, except in 2020, when it spiked to 2.4 per million (Figure 27) (WHO, 2025a). No cases were recorded in 2021 and 2022, but incidence rose again to 0.6 in 2023. DTP1 and DTP3 coverage were consistently above 94%

from 2014 to 2017. However, coverage declined sharply in 2018. Coverage of DTP1 rebounded from 2019 to 2020, followed by fluctuations and a notable drop in 2023 to 79.7% (DTP1) and 64.9% (DTP3).

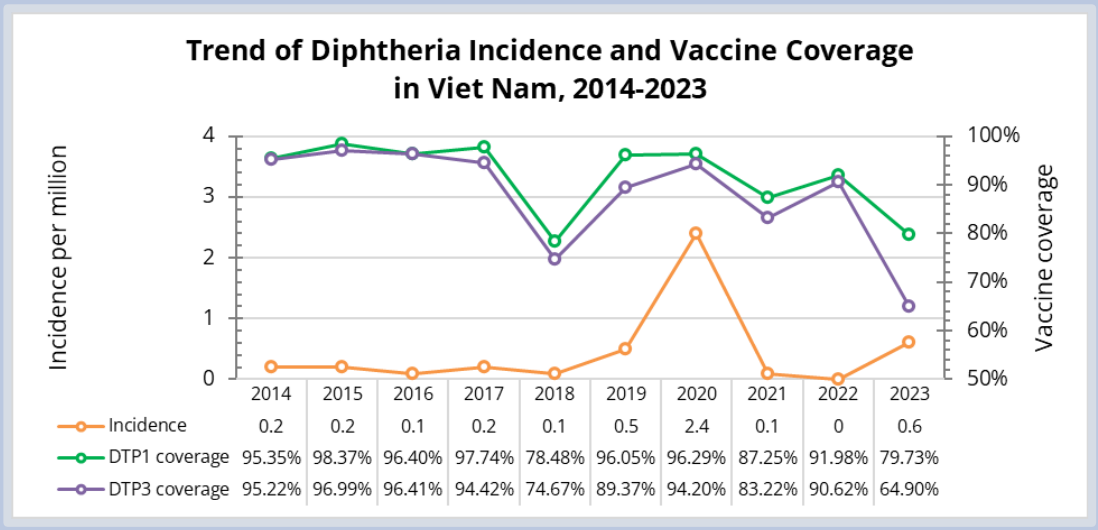



*Figure 27. Trend of diphtheria incidence and vaccine coverage in Viet Nam, 2014-2023*
(*Source: WHO immunization data (https://immunizationdata.who.int/global/wiise-detail-page/diphtheria-reported-cases-and-incidence?YEAR=)*)

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