NATIONAL PUBLIC
HEALTH ORGANIZATION

Directorate of Epidemiological Surveillance & Prevention of Communicable Diseases

Department of Vaccine Preventable and Congenital Diseases

EPIDEMIOLOGICAL DATA FOR PERTUSSIS IN GREECE, 2004-2025

(MANDATORY NOTIFICATION SYSTEM)

Key Points

- Pertussis is a vaccine preventable disease, yet it continues to be a public health issue both in our country and globally.
- The existence of unvaccinated pockets within the population combined with the waning of natural immunity following infection and the immunity provided by vaccination, contributes to the emergence of new pertussis cases. The clinical presentation in adolescents and adults may be mild and is often not recognized, which contributes to bacteria circulation in the population.
- According to data from the 2004–2025 period, cases of the disease are reported in all age groups but are most frequent in the 0–4 age group (particularly in children under one year old). In the 65+ age group, few cases are consistently recorded, but it is estimated that there might be potential underdiagnosis and underreporting.
- During 2021 and 2022, there were no cases and only one pertussis case reported, respectively—historically the lowest numbers of reported cases. This decline in reported cases is likely related to the restrictive measures implemented during the COVID-19 pandemic.
- In 2024, 440 cases of pertussis were reported, marking the largest outbreak of the disease during the 2004–2025 period.

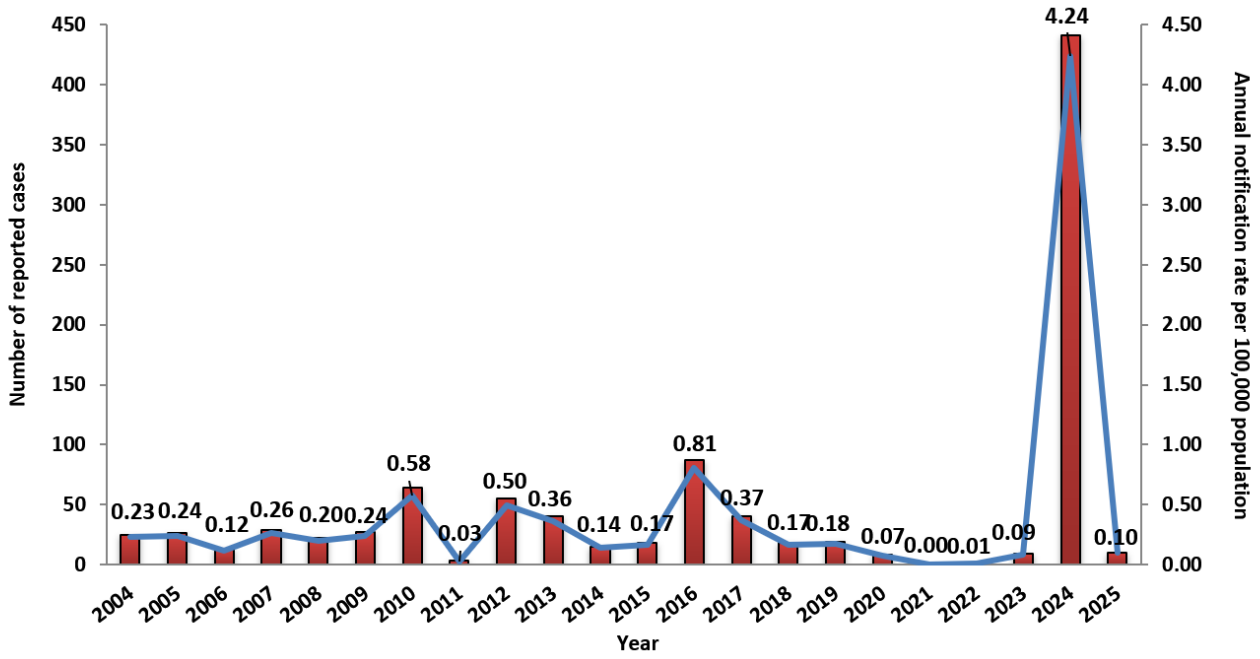
Pertussis is an acute bacterial infection of the respiratory tract, caused by *Bordetella pertussis*. The bacterium mode of transmission is airborne, via droplet spread or by direct contact with excretions from the respiratory tract of an infected person. Indirect contact, via air, or recently infected surfaces/objects, occurs rarely. Pertussis is rather easily transmitted (family members that have no immunoprotection, are affected up to 80%) [1].

Time trend

During the period 2004-2025, a total of 970 cases of pertussis were reported through the mandatory notification system to the National Public Health Organization (NPHO). In 2021 and 2022, there were no cases and only one case reported respectively (numbers that are historically the lowest reported). This decline in reported cases is likely related to the restrictive measures implemented during the COVID-19 pandemic. In 2024, the largest outbreak of the disease was recorded, with 440 cases reported.

The notification rate during the period 2004-2025, ranged from 0.00/100,000 population (in 2021) to 4.24/100,000 population (in 2024) (Figure 1). The mean annual notification rate for the period 2004-2024 was 0.41 cases per 100,000 population (mean number of reported cases per year: 44.1, total number of reported cases for 2004-2025: 970).

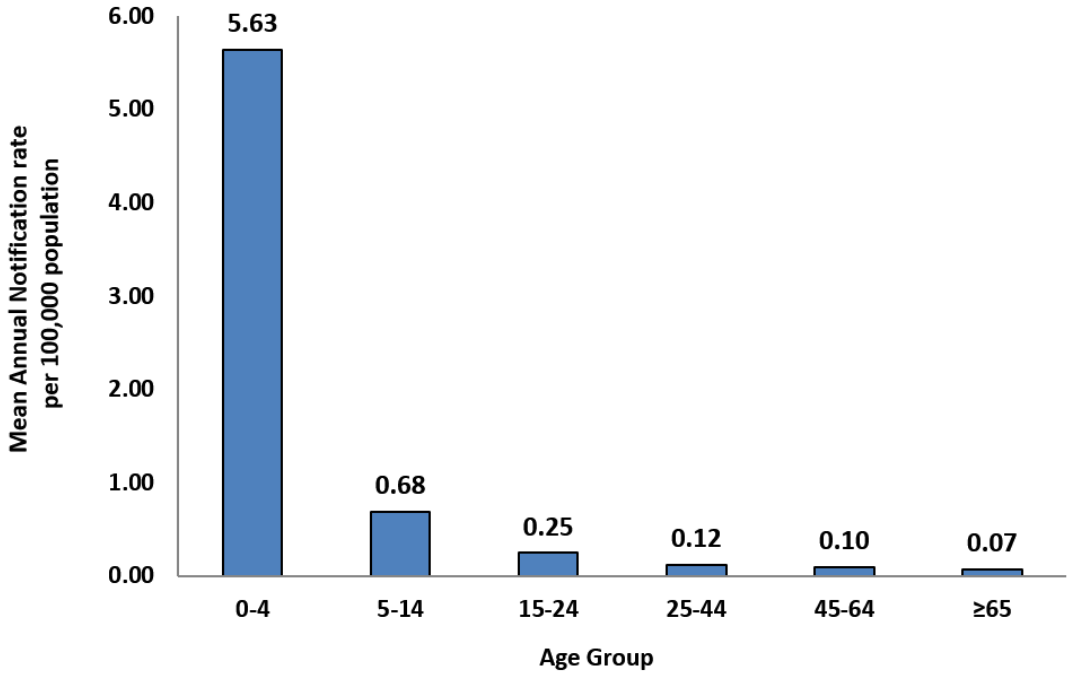
Figure 1. Time trend of pertussis reported cases and annual notification rate /100,000 population in Greece, 2004-2025



Age and gender distribution

During the period 2004-2025 the number of notified cases with known age and gender was 967. The highest incidence was recorded in the age group of 0-4 years old, with a mean annual notification rate of 5.63 cases /100,000 population (number of cases: 583, of which 485 were under one year of age). The age group 5-14 years had the second highest incidence, with 153 cases and a mean annual reported incidence of 0.68 per 100,000 population. Other age groups followed with significantly lower incidences (Figure 2). Regarding gender, a predominance of females was recorded, with a mean annual reported incidence of 0.46 per 100,000 population compared to 0.36 per 100,000 population for males.

Figure 2. Age distribution of the mean annual notification rate of pertussis (cases/100,000 population), Greece, 2004-2025.



Geographical distribution

During this period, the highest mean annual notification rate was recorded in the geographical area of Central Greece (0.50/100,000 population) whilst slightly lower was the notification rate in Attica (0.48/100,000 population. The notification rate for the geographical areas of Aegean Islands – Crete and Northern Greece was 0.32 and 0.28 cases per 100,000 population, respectively.

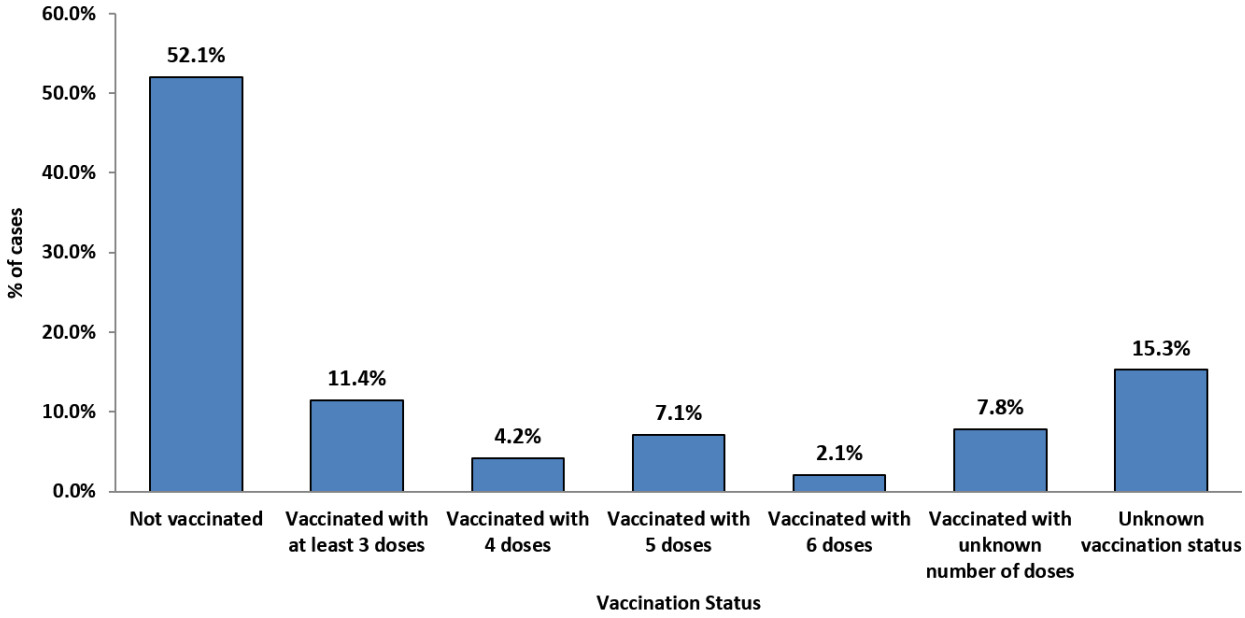
Laboratory data

Of the 970 reported cases during the period 2004-2025, 780 (80.4%) were laboratory-confirmed (either through serological testing or PCR), 49 (5.1%) had a clinical presentation of pertussis and an epidemiological link to another case, and 141 (14.5%) presented only clinical manifestations of the disease.

Vaccination coverage

Of the 970 reported cases of the disease during the period 2004–2025, vaccination status was known for 822 cases (84.7%). The majority of reported cases (505 cases – 52.1%) were not vaccinated at all. A total of 111 cases (11.4%) had received up to 3 vaccine doses, 41 (4.2%) had received 4 doses, 69 (7.1%) had received 5 doses, 20 (2.1%) had received 6 doses, while 76 (7.8%) were vaccinated but with an unknown number of doses (Figure 3). It is widely known that vaccination for pertussis provides immunity that wanes over time. In Greece, for cases that were vaccinated with at least 3 doses of the vaccine, the disease is possibly associated with waning immunity in approximately half of the cases (mainly in individuals aged 10–19 years) [2].

Figure 3. Frequency distribution of pertussis notified cases by number of vaccine doses, Greece, 2004-2025.



Risk factors – Burden of disease

A significant percentage of reported cases, during the period 2004–2025, involved Roma individuals (24.1%, n=234), primarily children aged 0–14 years. The cases that required hospitalization during the same period amounted to 664 (68.5%), while 152 cases (15.7%) experienced complications, mainly affecting the respiratory system. The outcome of pertussis was generally good. During the 2004–2025 period, 7 deaths were recorded, corresponding to a fatality rate of 0.72%.

Conclusion

Pertussis is a globally endemic disease, even in countries with high vaccination coverage programs, with outbreaks expected every three to five years [3,4]. The disease has typically exhibited a low reported incidence in our country, averaging approximately 0.25 cases per 100,000 population during the 2004–2015 period. In 2016, the annual reported incidence rose to 0.81 per 100,000 population, followed by a pre-pandemic decline to 0.17–0.18 per 100,000 population in 2018–2019. The reporting of pertussis cases was significantly affected by the COVID-19 pandemic, with the annual incidence plummeting to a record low of 0 cases per 100,000 population in 2021 and only 0.01 per 100,000 population in 2022. A modest increase was observed in 2023 (0.09 per 100,000), but 2024 marked an epidemic surge, with the reported incidence reaching an unprecedented 4.23 cases per 100,000 population.

In 2024, 209,674 pertussis cases were reported from 29 countries of the European Union (EU/EEA). Three countries (Czechia, Poland and Spain) accounted for over 46% of all reported cases. The annual notification rate in 2024 reached 54.9 cases per 100,000 population, representing more than an eight-fold increase compared with 2023 (6.7/100,000) and a 78-fold increase compared with 2022 (0.7/100,000) [5]. The sharp rise in pertussis incidence likely reflects the accumulation of susceptible

individuals following the prolonged COVID-19 control measures, including unvaccinated or incompletely vaccinated individuals, waning immunity, and reduced natural boosting of immunity during the pandemic. In addition, the COVID-19 pandemic accelerated improvements in diagnostic capacity in many countries and influenced testing practices, with broader use of PCR and multiplex PCR methods. [5]

According to available ECDC data, the age groups most affected are children, young adolescents, and infants who are either unvaccinated or have not completed their vaccination schedule. In Greece, as in other European Union (EU/EEA) countries, unvaccinated or partially vaccinated infants under one year of age constitute the age group with the highest incidence. In Greece, they are followed primarily by children aged 1–4 years, and to a lesser extent by children aged 5–14 years, as well as adolescents and young adults aged 15–24 years. The reported incidence among adults is considerably lower, likely due in part to underdiagnosis. In 2024, the second most frequently affected group after infants under one year of age, across EU/EEA countries, was adolescents aged 10–14 years, with reported incidences of 318.5 and 204.2 per 100,000, respectively [5]. It is noteworthy that 41% of hospitalizations occur in infants up to six months of age [5]. In a recent risk assessment [6], based on analysis of epidemiological data, the ECDC highlights that the overall risk for infants up to six months of age who are unvaccinated or partially vaccinated is high, with a high likelihood of exposure to pertussis and high incidence. Their source of infection may be a parent, sibling, or caregiver with the disease. Outbreaks have also been known to occur in neonatal units.

In previous years, the low occurrence of the disease among children in our country can be attributed to the high vaccination rates documented in coverage studies. These studies indicate that 89.5% of children aged 6, in the first grade of primary school, had completed 5 doses of DTwP or DTaP [7]. Similarly, 95.8% of children in nurseries/kindergartens aged 2–3 years had received 4 doses of DTaP [8]. Additionally, a recent vaccination coverage study analysing electronic prescription data revealed that 91.5% of children born in 2021 were vaccinated with 3 doses of DTP [9].

Pertussis is often underdiagnosed, particularly in very young infants, as well as in adolescents, adults, or partially immunized children, who generally have milder or atypical symptoms [10]. Historically, the absence of laboratory confirmation further contributed to underdiagnosis. Furthermore, it is well-established that immunity provided by pertussis vaccination wanes over time, and a significant proportion of cases involve unvaccinated children. In response to these concerns, the Ministry of Health issued a circular in June 2024 addressing the need for vaccination of susceptible individuals [11].

Vaccination of susceptible individuals is an important measure in disease prevention. The National Immunization Committee (NIC) and the National Public Health Organization (NPHO) recommend the prompt vaccination of all susceptible individuals, especially pregnant women, in accordance with the current National Immunization Programs for Children and Adolescents [12], and Adults [13], as well as the guidelines outlined in the circular titled "Vaccination against pertussis - Recommendations of the National Immunization Committee" [14].

Specifically, pregnant women should be vaccinated during each pregnancy with a single dose of the TdaP or TdaP-IPV vaccine, preferably between the 27th and 36th week of gestation, regardless of the time elapsed since their previous Td/TdaP vaccination [14]. The same vaccines may also be administered to postpartum women who missed vaccination during pregnancy as well as family members, ideally at least two weeks prior coming into contact with newborns and infants.

It is emphasized that vaccination of pregnant women and family members is the most effective preventive measure to safeguard infants under three months of age, who face the highest risk of severe illness, complications, or even death. The vaccination of pregnant women results in the production of maternal antibodies within two weeks, which are transferred to the fetus through the placenta, offering protection to the newborn from birth. Small quantities of maternal antibodies

against pertussis can also be passed to the infant through breast milk. Additionally, the vaccine protects the pregnant woman from illness and reduces the likelihood of transmitting pertussis from mother to infant after birth. Extensive research has validated the safety of pertussis vaccines, such as TdaP or TdaP-IPV, which have been incorporated into the vaccination schedules for pregnant women across many European countries, including Greece. [11]

Equally important is the vaccination of healthcare professionals with a booster dose of TdaP every decade. Pertussis, a highly contagious disease, has been reported to cause clusters of cases among healthcare staff within hospitals. Preventing the spread of pertussis in healthcare facilities through the timely vaccination of healthcare professionals is crucial for protecting individuals who are at increased risk of severe illness and complications. [11]

Furthermore, the National Public Health Organization (NPHO) emphasizes the importance of healthcare professionals maintaining a heightened clinical awareness for suspected pertussis cases. This vigilance allows for the prompt initiation of macrolide-based treatment, as delaying antibiotic administration is ineffective in addressing the disease and preventing its transmission. Additionally, the NPHO advises administering antimicrobial treatment to everyone who has come into contact with a confirmed pertussis case, irrespective of their prior vaccination status or history of illness.

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