NATIONAL PUBLIC
HEALTH ORGANIZATION

# Directorate of Epidemiological Surveillance and Interventions for Infectious Diseases

## Department of Vaccine Preventable and Congenital Diseases

## EPIDEMIOLOGICAL DATA FOR PERTUSSIS IN GREECE, 2004-2024

## (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 2004–2024 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 2004–2024 period.

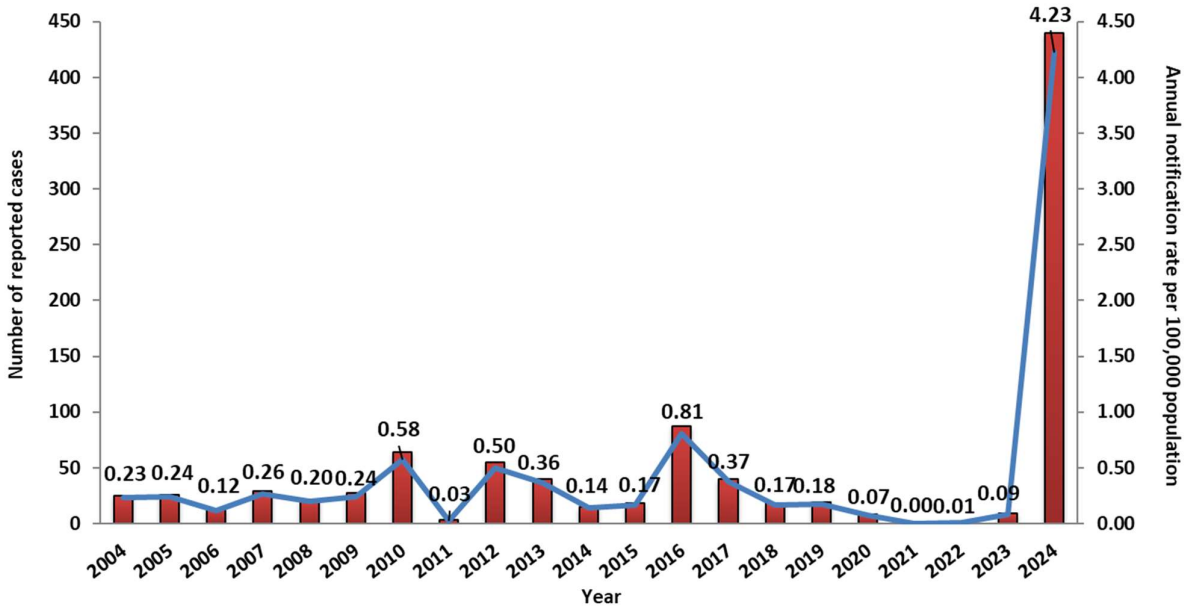
Pertussis is an acute bacterial infection of the respiratory tract, caused by *Bordetella pertussis*. The bacterium mode of transmission is airborne, via droplet spread or by direct contact with excretions from the respiratory tract of an infected person. Indirect contact, via air, or recently infected 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 2004-2024, a total of 959 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 2004-2024, ranged from 0.00/100,000 population (in 2021) to 4.23/100,000 population (in 2024) (Figure 1). The mean annual notification rate for the period 2004-2024 was 0.43 cases per 100,000 population (mean number of reported cases per year: 45.7, total number of reported cases for 2004-2024: 959).

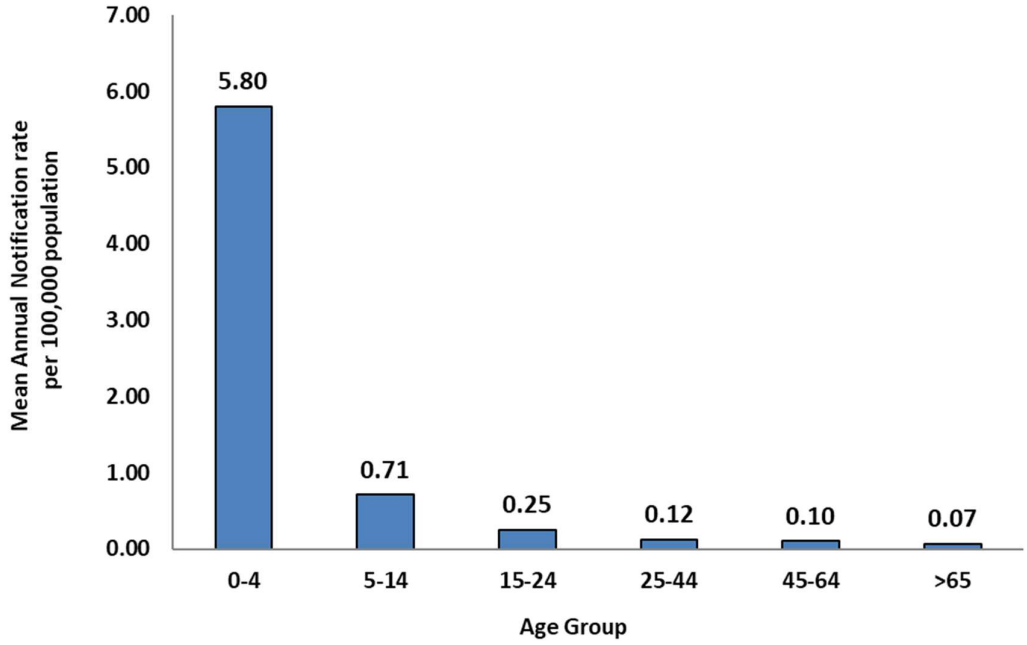
**Figure 1.** Time trend of pertussis reported cases and annual notification rate /100,000 population in Greece, 2004-2024




## Age and gender distribution

During the period 2004-2024 the number of notified cases with known age and gender was 956. The highest incidence was recorded in the age group of 0-4 years old, with a mean annual notification rate of 5.82 cases /100,000 population (number of cases: 576, of which 477 were under one year of age). The age group 5-14 years had the second highest incidence, with 152 cases and a mean annual reported incidence of 0.711 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 0.48 per 100,000 population compared to 0.37 per 100,000 population for males.

**Figure 2.** Age distribution of the mean annual notification rate of pertussis (cases/100,000 population), Greece, 2004-2024.




## Geographical distribution

During this period, the highest mean annual notification rate was recorded in the geographical area of Central Greece (0.51/100,000 population) whilst slightly lower was the notification rate in Attica (0.50/100,000 population. The notification rate for the geographical areas of Aegean Islands – Crete and Northern Greece was 0.33 and 0.28 cases per 100,000 population, respectively.

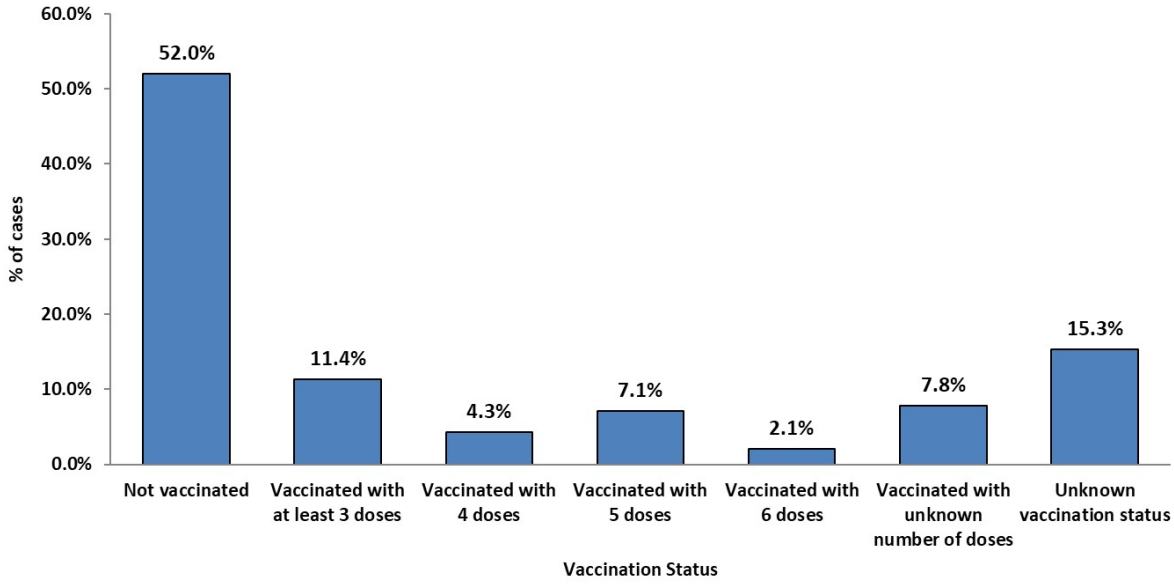
## Laboratory data

Of the 959 reported cases during the period 2004-2024, 429 (80.5%) 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 138 (14.4%) presented only clinical manifestations of the disease.

## Vaccination coverage

Of the 959 reported cases of the disease during the period 2004–2024, vaccination status was known for 809 cases (84.4%). The majority of reported cases (497 cases – 51.8%) were not vaccinated at all. A total of 86 cases (9.0%) had received up to 3 vaccine doses, 33 (3.4%) had received 4 doses, 53 (5.5%) had received 5 doses, 15 (1.6%) had received 6 doses, while 55 (5.7%) 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, 2004-2024.




## Risk factors – Burden of disease

A significant percentage of reported cases, during the period 2004–2024, involved Roma individuals (23.8%, n=228), primarily children aged 0–14 years. The cases that required hospitalization during the same period amounted to 655 (68.3%), while 143 cases (14.9%) experienced complications, mainly affecting the respiratory system. The outcome of pertussis was generally good. During the 2004–2024 period, 7 deaths were recorded, corresponding to a fatality rate of 0.73%.

## 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.

Recently, several European countries (Denmark, Belgium, Croatia, Czechia, Norway, Spain, Sweden, Montenegro, the United Kingdom, Switzerland, Serbia), including Greece, have recorded an increase in the number of pertussis cases compared to previous years. This rise is believed to stem from delayed immunizations among certain age groups and reduced pathogen circulation during the COVID-19 pandemic. Data from the ECDC indicates that the most affected groups include children,

young adolescents, and infants who are either unvaccinated or have not completed their vaccination schedule. Notably, nearly 80% of hospitalizations are among infants under six months of age. In a recent risk assessment [5], based on the analysis of epidemiological data, the ECDC highlights that the overall risk for infants up to six months old who are unvaccinated or partially vaccinated is high, with a high likelihood of exposure to pertussis and a high incidence. Infants are often infected by a parent, sibling, or a caregiver. Outbreaks have also been known to occur in neonatal units.

In Greece, as in other EU/EEA countries, infants under one year of age who are either unvaccinated or partially vaccinated constitute the age group with the highest incidence rate. They are followed mainly by children aged 1–4 years, with lower incidence observed among children aged 5–14 years, adolescents, and young adults aged 15–24 years. The incidence reported among older adults is significantly lower.

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 [6]. Similarly, 95.8% of children in nurseries/kindergartens aged 2–3 years had received 4 doses of DTaP [7]. 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 [8].

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 [9]. 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 [10].

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 [11], and Adults [12], as well as the guidelines outlined in the circular titled "Vaccination against pertussis - Recommendations of the National Immunization Committee" [13].

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 [13]. 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. [10]

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. [10]

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.

## References


1. Clark T. Pertussis. In: Control of communicable diseases manual, 20th edition. Heymann DL ed. American Public Health Association 2015; p. 449-454.
2. Pervanidou D, Polonifi Z, Palioura Z, Giannaki – Psinaki M, Mentis A, Kikis G, Patrinos S, Menegas D, Bonovas S, Panagiotopoulos T. Pertussis in Greece through the Mandatory Notification System. 8th Greek Conference of Public Health and Health Care Services "Social Epidemics". Athens, March 2010.
3. Bouchez V, Guiso N. Bordetella pertussis, B. parapertussis, vaccines and cycles of whooping cough. Pathog Dis. 2015 Oct;73(7):ftv055.
4. European Centre for Disease Prevention and Control. Pertussis. In: ECDC. Annual epidemiological report for 2022. Stockholm: ECDC; 2024. Διαθέσιμο από: https://www.ecdc.europa.eu/sites/default/files/documents/PERT_AER_2022_Report.pdf
5. European Centre for Disease Prevention and Control. Increase of pertussis cases in the EU/EEA, 8 May 2024 (Rapid Risk Assessment). Διαθέσιμο από: https://www.ecdc.europa.eu/sites/default/files/documents/Increase%20in%20pertussis%20cases%20in%20the%20EU-EEA%20-%20May%202024%20FINAL.pdf
6. Panagiotopoulos T, Papamichail D, Stavrou D, Laggas D, Gavana M, Salonikioti A, Gogoglou V, Theocharopoulos G, Koutentakis K, Benos A, Giannakopoulos S, Georgakopoulou T, Gkolfinopoulou K, Detsis M, Keramarou D, Livaditi V, Mellou K, Danis K, Panteli I, Pervanidou D, Sideroglou T, Tsana M. National study of vaccination coverage in children in Greece, 2012. National School of Public Health,
7. Georgakopoulou T, Menegas D, Katsioulis A, Theodoridou M, Kremastinou J, Hadjichristodoulou C. A cross-sectional vaccination coverage study in preschool children attending nurseries-kindergartens. Implications on economic crisis effect. Hum Vaccin Immunother. 2017 Jan 2;13(1):190-197. Available from: https://www.tandfonline.com/doi/full/10.1080/21645515.2016.1230577
8. Zografaki E, Panagiotopoulos T, Papamichael D, Georgakopoulou T, Theodoridou M, Papaevangelou V, Pavlopoulou I, Stavrou D, Tsolakidis A, Fotiadou E. Study of vaccination coverage in Greece based on electronic prescription data. October 2024. Available from: https://php.uniwa.gr/wp-content/uploads/sites/222/2024/11/EKTHESI-ektimisi-emvoliastikis-kalypsis-apo-syntagografisi_2024-10.pdf
9. European Centre for Disease Prevention and Control. Factsheet about pertussis. Διαθέσιμο από: https://www.ecdc.europa.eu/en/pertussis/facts

10. Ministry of Health. Circular titled: “Outbreak of pertussis cases in Greece and Europe. Need for vaccination of susceptible pregnant women and adults with the TdaP vaccine», Protocol number. Δ1α/Γ.Π.οικ. 34683, 27/6/2024. ΑΔΑ: Ψ6ΤΟ465ΦΥΟ-Γ0Ο. Available from: https://diavgeia.gov.gr/decision/view/Ψ6ΤΟ465ΦΥΟ-Γ0Ο

11. Ministry of Health. Circular titled: “Vaccination against pertussis - Recommendations of the National Immunization Committee”, Protocol number. Δ1α/Γ.Π.οικ. 19039, 2/4/2024. ΑΔΑ: 6ΦΚΗ465ΦΥΟ-ΞΡΑ. Available from: https://diavgeia.gov.gr/decision/view/6ΦΚΗ465ΦΥΟ-ΞΡΑ

12. Ministry of Health. Circular titled: “National Immunization Programme for Children and Adolescents 2024 - Schedule and Recommendations”. Protocol number. Δ1α/ Γ.Π.οικ.39544, 25/7/2024. ΑΔΑ: 92ΞΕ465ΦΥΟ-9Ƹ3. Available from: https://diavgeia.gov.gr/decision/view/92ΞΕ465ΦΥΟ-9Ƹ3

13. Ministry of Health. Circular titled: “National Immunization Programme for Adults – Schedule and Recommendations”. Protocol number. Δ1α/Γ.Π.οικ.14223, 7/3/2024. ΑΔΑ: ΨΜ16465ΦΥΟ-ΟΦΚ. Available from: https://diavgeia.gov.gr/decision/view/ΨΜ16465ΦΥΟ-ΟΦΚ

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