

# EPIDEMIOLOGY OF VACCINE-PREVENTABLE INFECTIOUS DISEASES

Annual summary 2023

Vaccines included in the vaccination schedule

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# WHO

# WE ARE

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**SCIENSANO unites science, health and society, and has more than 900 employees working every day to improve human and animal health. As our name suggests, science and health are at the heart of our mission. Sciensano draws its strength and uniqueness from a holistic and multidisciplinary approach to health. More specifically, our activities are guided by the inseparable interconnection between the health of humans, animals and their environment (the "One health" concept). With this in mind, Sciensano makes a unique contribution to the health of all by combining several research angles.**

**The result of the merger between the former Centre d'Étude et de Recherches Vétérinaires et Agrochimiques (CERVA) and the former Institut Scientifique de Santé Publique (ISP), Sciensano draws on over 100 years of scientific expertise.**

**Sciensano**  
Epidemiology and public health

**Epidemiology of infectious diseases**

December 2024 - Brussels - Belgium  
Legal registration number : D/2024.14.440/83



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DAMBRE C



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With the financial support of



The Infectious Diseases Epidemiology Department would like to thank all those who contributed to data collection and all the colleagues in Ruben Brondeel's team for their cooperation and contribution to the production of this report.

Please cite this publication as follows: Cornelissen L, Dambre C, Hansford K, Jacquinet S, Peeters I, , Epidemiology of vaccine-preventable infectious diseases, Annual summary report 2023. Brussels, Belgium: Sciensano ; 2024. Report number: D/2024.14.440/83 Available online : <https://www.sciensano.be/fr/sujets-sante/maladies-a-prevention-vaccinale>

# CONTEXT



In Belgium, thirteen infectious diseases are included in the vaccination schedule recommended for children and adolescents by the [Superior Health Council](#). With the exception of the rotavirus vaccine, all these vaccines are provided free of charge by the federated authorities. So, although vaccination policy in Belgium is organised by different authorities, the basic vaccination schedule is the same everywhere. You can find out more about [Belgium's vaccination policy](#) and [coverage](#) on our website.

Epidemiological surveillance of vaccine-preventable infectious diseases is based on data from networks of microbiology laboratories ([sentinel laboratories](#) and [national reference centres](#)), networks of doctors ([PediSurv](#) or the [GP Sentinel Network](#)) and data on [notifiable infectious diseases](#), [mortality data](#) and [minimum hospital summary \(MHS\)](#). The data from most of these surveillance systems are not exhaustive and therefore do not allow us to estimate the exact number of new cases in Belgium. For example, surveillance based on declarations from doctors and laboratories only gives a picture of cases for which patients consult a doctor and/or for which a laboratory diagnosis is made. For the most severe forms, which require hospitalisation or result in death, fairly complete data are often available via the MHS or mortality surveillance, but they are only available with a time lag of 2 to 3 years. Non-exhaustive monitoring enables trends to be tracked over time. Combining different sources of information also helps to paint as complete a picture as possible.

**This report summarises the main epidemiological trends in 2023 for 11 of the diseases on the vaccine schedule<sup>1</sup> : whooping cough, diphtheria, invasive *Haemophilus influenzae* type b, meningococcal and pneumococcal infections, mumps, poliomyelitis, rotavirus, measles, rubella and tetanus.** More detailed results by pathogen are available on the Sciensano website (via the [vaccine-preventable diseases](#) page or directly by pathogen via the links below).

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<sup>1</sup> The main aim of vaccinations against hepatitis B and human papillomavirus is to prevent late complications over several years. These include cirrhosis and liver cancer in the case of hepatitis B. The papillomavirus can cause genital warts and several types of cancer, the most common of which is cervical cancer. The epidemiology of these diseases is therefore monitored by colleagues in other departments. The following links provide more information on [hepatitis B](#) and [HPV](#).

# GENERAL TRENDS IN 2023



The vaccines introduced into Belgian vaccination programmes have considerably changed the epidemiology of the infectious diseases they target, sharply reducing their incidence. Some infections have become sporadic, such as tetanus, or have been eliminated in Belgium, such as congenital rubella and poliomyelitis. Vaccination and surveillance are still necessary, however, because of the risk of importation and the severity of these diseases.

After a general decline in the number of cases of vaccine-preventable infectious diseases in 2020-2022 as a result of the covid-19 pandemic, the year 2023 shows quite different trends:

- 1) A steady increase in the number of cases of pertussis (since August 2023) and measles (last quarter of 2023), which has continued into 2024.
- 2) For other pathogens, such as pneumococcus and *haemophilus influenzae*, the number of cases was the highest seen in the last 10 years.
- 3) For meningococcus, the number of cases rose in 2023, but has not yet reached the trends seen before covid-19. There was also a slight increase in mumps cases.

The increase in the number of **measles** cases was to be expected, as measles vaccination coverage is still too low. More than half the cases were unvaccinated, and one in four people had no information about their vaccination status. Belgium, like other European countries and the WHO, is committed to eliminating measles, but inadequate vaccination coverage (<95% for two doses) makes it difficult to achieve the WHO's objectives.

As far as **pertussis** is concerned, vaccination coverage among children is sufficiently high, but because of the weakening of immunity over time, less serious infections can occur later in life. A typical pattern can therefore be observed, with cyclical epidemics occurring every 4 to 5 years. Infants aged between 0 and 3 months are the most vulnerable to complications. These very young children can only be protected by vaccination during pregnancy. Unfortunately, [vaccination coverage of pregnant women is very low in Wallonia and Brussels](#).

For invasive meningococcal, pneumococcal and *Haemophilus influenzae* infections, the coverage rates achieved are satisfactory, but the vaccines available/present in the vaccination schedule do not protect against all serogroups/serotypes. In addition, changes or replacements of circulating serotypes/serogroups occur over time. In the case of **pneumococcus**, for example, there has been a clear increase in the number of serotypes not covered by the free 13-valent PCV13 vaccine. However, some of these serogroups are contained in 15- or 20-valent vaccines, which have not yet been introduced into the vaccination schedule. In the case of **meningococcus**, an increase in serotypes W and Y has been observed, and this will continue in 2024. The vaccine against ACWY serotypes is available free of charge for one-year-olds, but only since mid-2023. What's more, this vaccine, which has also been recommended for adolescents by the Superior Health Council since 2019, is not free for this age group, despite the fact that adolescents are the main carriers (and therefore contaminators), along with young adults. Most cases of *Haemophilus influenzae* are linked to non-encapsulated strains for which there is no vaccine.

These developments and this increase are not in themselves unexpected, and do not constitute a failure of the vaccination policy: the total number of cases remains well below what it was before vaccination was introduced.

# TRENDS BY PATHOGEN

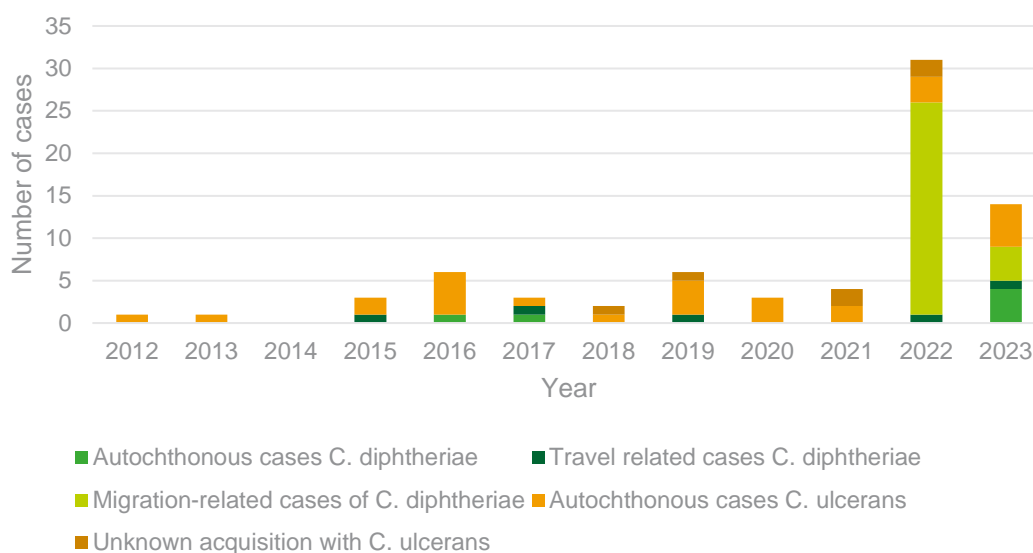
## DIPHTHERIA ([more information](#))

Thanks to high vaccination coverage in all regions of the country (>90%), diphtheria has become a rare disease in Belgium. However, since 2022, [an epidemic](#) of toxigenic *Corynebacterium diphtheriae* infections, also affecting other European countries, has occurred among asylum seekers. Also in 2023, four cases were diagnosed in asylum seekers, including a family group of three people. Unfortunately, these cases resulted in the [death of an unvaccinated child](#). The [previous death](#) from diphtheria was in 2016, also in an unvaccinated child.

In 2023, 14 cases were recorded: 9 with *Corynebacterium diphtheriae* and 5 with *Corynebacterium ulcerans*. Apart from the epidemic among asylum seekers, 5 other cases of *C. diphtheriae* infection were diagnosed, including 3 among homeless people.

All the cases of *C. ulcerans* were indigenous, and most of them had cutaneous diphtheria. The median age of the cases was 55 years.

Diphtheria antitoxin had to be administered on 3 occasions in 2023. [A treatment guide](#) was drawn up by the Belgian Society of Infectiology and Clinical Microbiology in June 2023.



*Figure 1 - Number of diphtheria cases per year, by type and origin, 2012-2023, Belgium (source: National Reference Centre)*

## HAEMOPHILUS INFLUENZAE [\(more information\)](#)

Before the introduction of vaccination against serotype b (1993), *H. Influenzae type b* (Hib) was the main cause of bacterial meningitis in children under the age of 5, with some 250-300 cases a year. In 2023, 13 cases of Hib were detected by the NRC, corresponding to 0.11 cases/100,000 inhabitants. With 2022 (14 cases of Hib), this is the highest number of invasive Hib infections diagnosed since the NRC began surveillance in 2011. Over the previous ten years, between 2 and 10 cases per year had been reported. However, this increase is also occurring against a backdrop of an increase in all other types of *Haemophilus influenzae* (see paragraph below). Future years will have to show whether this rise continues. In 2023, two cases between the ages of 1 and 4, correctly vaccinated with three or four doses of Hib vaccine, were observed. The 5 other cases under 5 were either unvaccinated (3 cases), too young to be vaccinated (1 case) or with unknown vaccination status (1 case).

All invasive *H. Influenzae* infections combined (i.e. including those caused by types not covered by the vaccine) reached their highest level in 2023 since the start of surveillance by the NRC: 205 cases recorded, or 7.3 cases/100,000 inhabitants. This upsurge in cases is most likely the result of the COVID-19 pandemic and the measures taken to limit the spread of the virus during this period. Infections mainly affect children under the age of five, in particular children under the age of one, and people aged 65 and over. The vast majority of infections (82%) are now caused by non-encapsulated strains (known as "non-typeable" strains). Among the encapsulated strains, there has been an increase in the number of cases caused by serotype a since 2018, although the absolute numbers remain low.

No deaths due to *H. influenzae* type b infection were reported in 2023. Overall, invasive *H. influenzae* infections (all serotypes) still cause a number of deaths each year in Belgium, but precise figures are not currently available. The NRC, which does not always have this information, has received reports of 5 deaths in 2023, all linked to non-encapsulated strains.

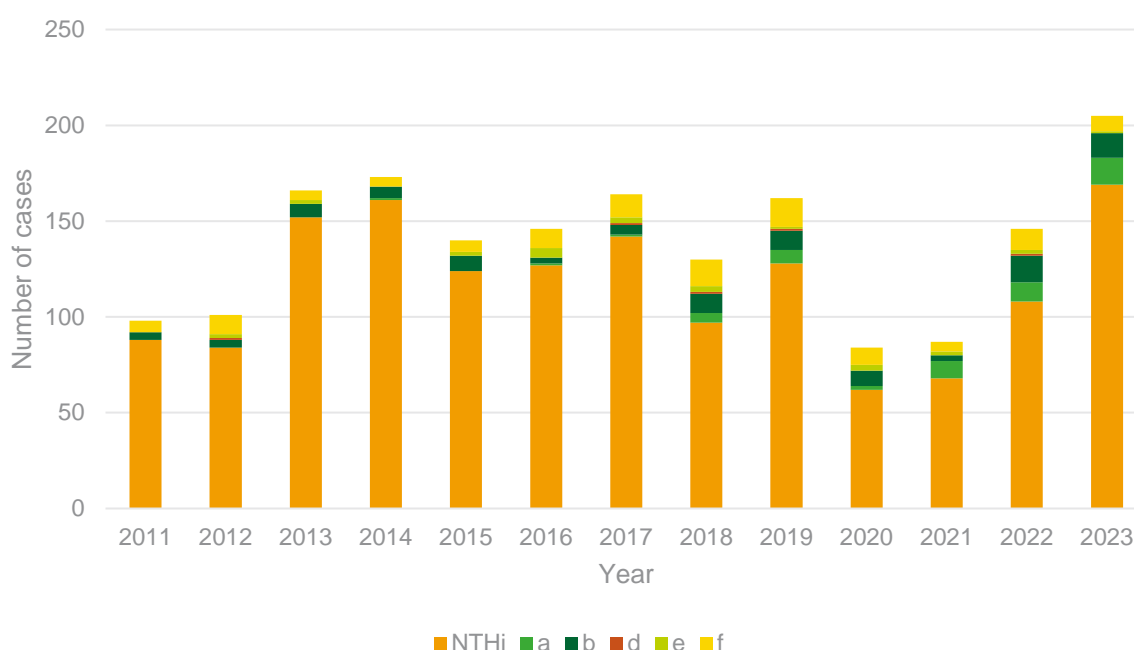


Figure 2 - Number of *H. influenzae* infections, by serotype and year, 2011-2023, Belgium.  
NTHi = non-typeable *H. Influenzae* (Source: NRC)

## NEISSERIA MENINGITIDIS (MENINGOCOCCUS) [\(more information\)](#)

Since the introduction of vaccination against meningococcal serogroup C in 2002, the number and incidence of invasive meningococcal infections has fallen sharply for all serogroups. Since 2008, the number of cases of meningococcal infection confirmed by the National Reference Centre (NRC) has fluctuated around 100 per year. However, in COVID-19 years 2020-2021 and 2022, this number was much lower. In 2023, the number of reported cases of meningococcal disease has not yet reached pre-COVID levels: 84 cases were recorded by the NRC (0.71 cases per 100,000 inhabitants) and 104 cases through compulsory notification. The age groups most affected are children under 5, particularly those under one year old, adolescents (15-19 years), and the over-80s. Three deaths have been reported to the NRC (2 linked to serogroup B and 1 linked to serogroup W).

In terms of serogroup distribution, since the introduction of vaccination, the number of serogroup C infections has fallen from 179 cases in 2001 to less than 10 cases a year since 2014 and just 1 case a year since 2021. These cases occur in people who have not been vaccinated. Other serogroups are therefore gaining in relative importance. Until 2019, a gradual increase in the number of infections caused by serogroups Y and W was observed. The Superior Health Council then decided to [recommend](#) the combined ACWY vaccine instead of the monovalent MenC vaccine. Since the 2nd half of 2023, this combined vaccine has been offered free of charge in the country's various vaccination programmes. Between 2018 and 2020, infections with serogroups W and Y together accounted for 40% of all infections; in 2023, for the first time, these serogroups were dominant, with 51.8% of cases (43/83 cases) followed by serogroup B with 43.4% of cases (36/83 cases). There is also a vaccine against serotype B, which [is not recommended as part of the basic vaccination schedule](#) by the Superior Health Council, but which can be considered on an individual basis (and must then be paid for by the parents themselves).



Figures 3 and 4 Absolute number (top) and relative importance (bottom) of invasive meningococcal infections by serogroup, Belgium, 2000-2022 (Source: NRC)

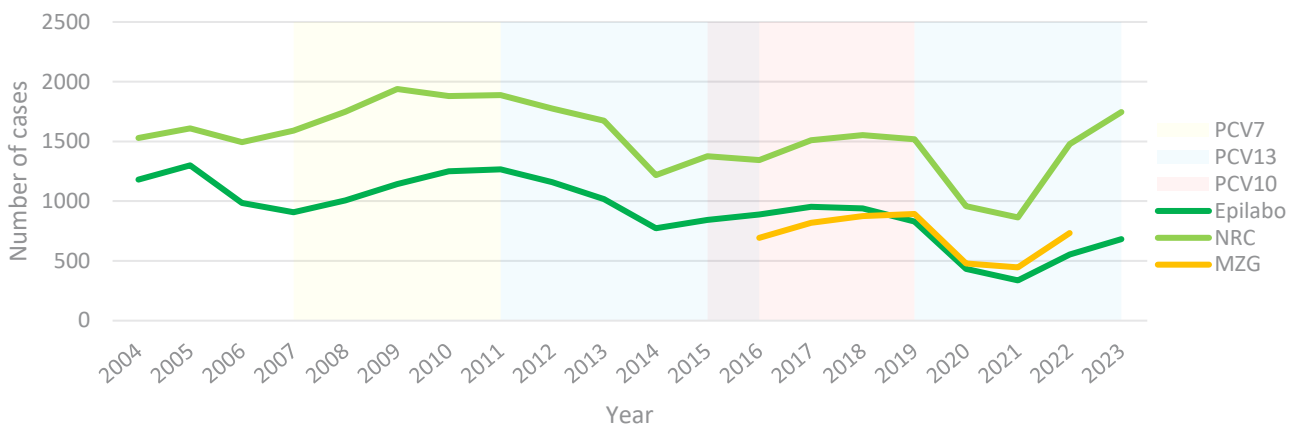


## STREPTOCOCCUS PNEUMONIAE (PNEUMOCOCCUS) [\(more information\)](#)

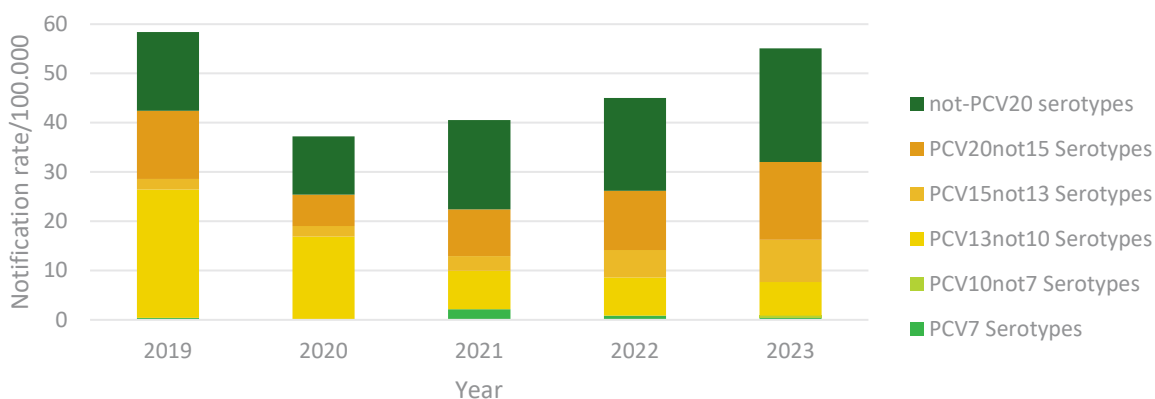
After the introduction of the 7-valent pneumococcal vaccine PCV7 in 2007, the incidence of invasive infections (IPD) decreased in children under 2 years of age, and since the introduction of PCV13 in 2011, a decrease has been observed in all age groups. After the switch to PCV10 in 2016, incidence increased again in young children, mainly due to serotype 19A (in PCV13, but not in PCV10). This led to the reintroduction of PCV13 in 2019, after which the trend reversed and the incidence of serotype 19A fell again. [The Superior Health Council recommends PCV13 or PCV15](#) for vaccination of children without preference, although PCV13 remains the vaccine offered free of charge by local authorities as part of the basic immunisation programme. For the [vaccination of people aged 65 and over](#), PCV20 has been recommended as the first choice since 2022.

Following the COVID-19 pandemic, which was accompanied by a drop in the number of IPD cases, the number of cases has risen sharply again. In 2023, the NRC reported 1,746 cases (14.9 per 100,000 population), the highest number for 10 years. Children under the age of 2 were most affected (53.4 per 100,000). The NRC reported at least 87 deaths in 2023, the majority of which (51/87) occurred in people aged over 65. Among children under the age of 2, 2 deaths were reported, both following infection with a non-vaccine serotype.

The number of infections by PCV13 serotypes has fallen in children under 2, accompanied by an increase in the proportion of serotypes contained in PCV15 and PCV20. In 2023, 16% (n=20) of IPDs in children under 2 years of age were caused by PCV15-non13 serotypes and a further 29% (n=37) by PCV20-non15 types (Figure 5). In the older population, mainly PCV20 serotypes circulated. Across all ages, serotypes 8 and 3, included in PCV20 and PCV13 respectively, were the most common.



**Figure 5** - Number of reported cases of invasive pneumococcal disease per year, all ages combined, Belgium, 1993-2023, by data source. The coloured blocks represent the free vaccine used. (Epilabo= sentinel laboratories, NRC = national reference centre, MZG = minimum hospital summary)



**Figure 6** - Proportion of invasive pneumococcal infections in children under 2 years of age, 2019-2023, according to vaccine serotypes, including PCV15 and PCV20, Belgium (Source: NRC for *S. pneumoniae*, UZ Leuven).

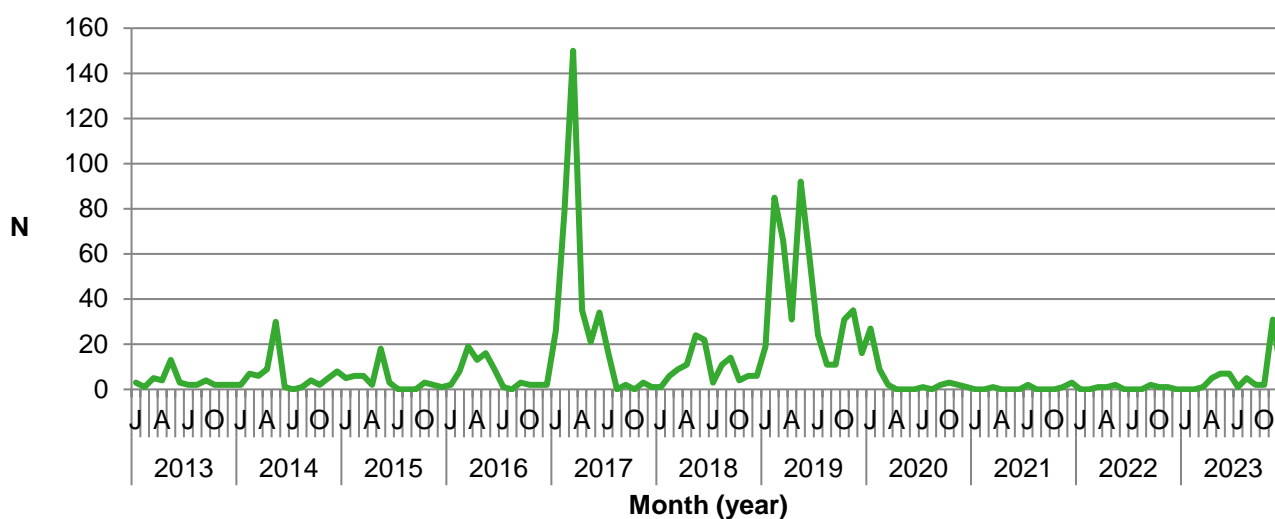
## MEASLES [\(more information\)](#)

Because of the risk of serious complications from measles, which can be perfectly prevented by a highly effective vaccine, all European countries have committed to eliminating the disease in collaboration with the World Health Organisation (WHO). The aim is to achieve an annual incidence of less than 1 case per million inhabitants. If infections are imported from abroad, the chain of infection must be stopped as quickly as possible. To achieve and maintain this objective, vaccination coverage must be at least 95% for a complete two-dose vaccination.

After very low figures in 2020-2022 due to the COVID pandemic, an increase in cases occurred in the last quarter of 2023. A total of 67 cases were reported, 15 of which were linked to contamination during a trip abroad. These 15 imported cases formed 7 clusters with a total of 29 cases. The incidence was 4.4 per million population, almost 10 times higher than in 2021-2022, and above the proposed elimination threshold of 1 per million. The majority of cases (35/67) occurred in children under the age of 10, and in particular in children under the age of one (n=8) who are still too young to be vaccinated. Hospitalisation was necessary for 24 cases. No deaths were observed.

The vaccination rate is currently [75% in Wallonia and Brussels and 89% in Flanders](#) for two doses. In 2023, more than half the cases were unvaccinated (35/67) and information on vaccination status was missing for 15 cases. Cases in fully vaccinated individuals are possible but remain rare (n=4, all >20 years old).

The WHO has granted Belgium 'eliminated measles' status for the years 2020-2022. This does not mean that there are no longer any cases of measles in Belgium, but rather that no chain of infection has lasted for more than 12 months and that the incidence of non-imported cases is low (<1/1 million population). No official WHO decision has yet been taken for 2023. The incidence of non-imported cases was too high (4.4/million population), but the chain of infection was always successfully interrupted: no chain continued to circulate throughout the year.

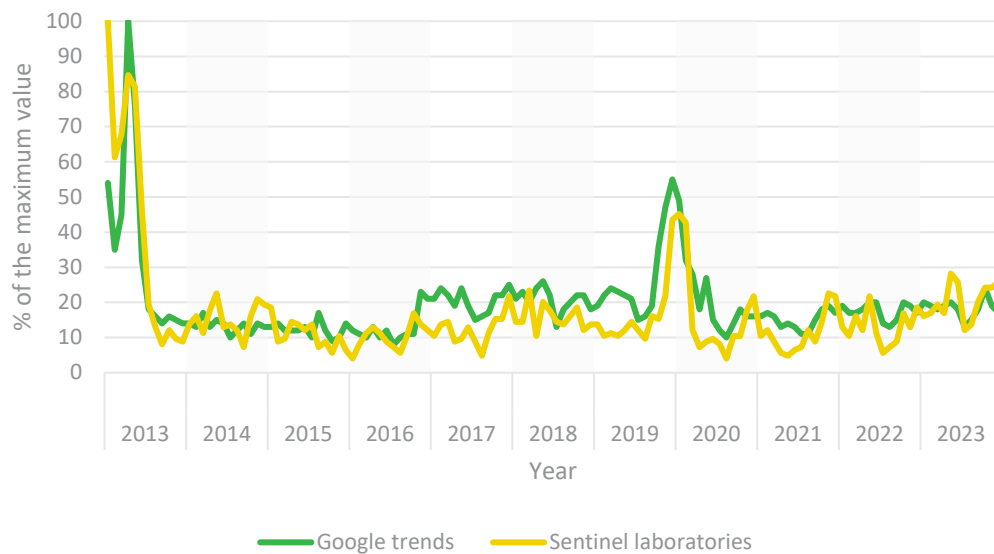


*Figure 7 - Number of measles cases per month, 2013-2023, Belgium  
(Sources: Compulsory declarations (AZG, AViQ, COCOM), NRC RRO and Pedisurv (Sciensano))*

## MUMPS [\(more information\)](#)

Since the widespread vaccination against measles, mumps and rubella in 1985, the incidence of mumps has fallen considerably. From 2011 to mid-2013, a mumps epidemic mainly affected young adults in university towns. Several smaller outbreaks of mumps were also reported in late 2019/early 2020, mainly in universities and colleges in Brussels and Wallonia. This is probably due to the fact that vaccine protection wanes over time ("waning immunity"). However, the outbreaks remain limited in scale.

In 2023, the number of mumps cases reported by surveillance laboratories increased slightly compared with 2022 (244 cases in 2023; 155 cases in 2022). By contrast, surveillance via google trends remained stable in 2023 compared with 2022. The level of virus circulation since mid-2020 is similar to the low years from 2014 to mid-2019.



*Figure 8 - Monthly reported cases (SL) or search intensity (Google Trends) for mumps, compared with the maximum value for January 2013, Belgium, 2013-2023*

## PERTUSSIS [\(more information\)](#)

Widespread vaccination against pertussis has considerably reduced the incidence of this disease. However, immunity after vaccination declines over time. The main aim of the vaccination programme is therefore to prevent severe cases of pertussis in young children. To this end, infants themselves and pregnant women are vaccinated. This is because children under one year of age are the highest risk group in terms of the severity of the disease in the event of infection.

Despite high vaccination coverage among children and adolescents, the number of cases of pertussis, caused by the bacterium *Bordetella pertussis*, rose sharply between 2011 and 2014. From 2014 to 2017, the number of cases remained relatively stable, with a slight decrease in 2018 and 2019. During the pandemic years 2020-2021, as well as in 2022, only very low numbers of pertussis cases were observed.

Since August 2023, as in other European countries, there has been an increase in the number of cases of pertussis in Belgium. The increase has been so significant that [a risk assessment](#) was carried out in early September 2023 to recommend specific measures to the health authorities.

The National Reference Centre has recorded 1,048 confirmed cases. The figures for 2023 are similar to the previous peaks in 2014 and 2016 (2014: n=1394; 2016: n=1486). Although this increase occurred in all age groups, mainly in those up to 14 years old. A large proportion of hospitalisations happened in infants under 1 year of age. Vaccination during each pregnancy protects the main risk group of young infants. Unfortunately, there are striking differences in maternal vaccination coverage between regions ([85% Flanders](#); [39% Wallonia](#); [31% Brussels](#)). Two deaths have been reported: a person aged over 65 and an infant under a year old whose mother was not offered vaccination during pregnancy.

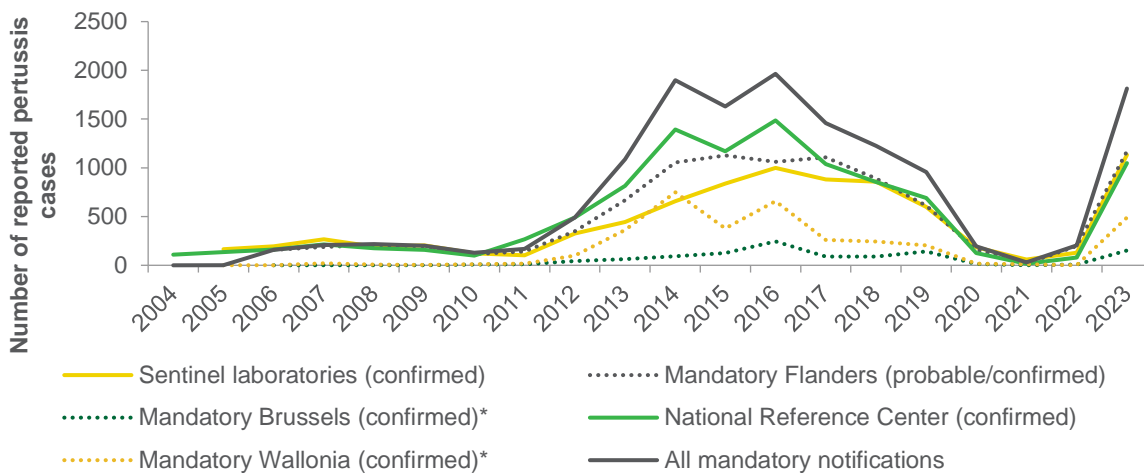


Figure 9 - Number of pertussis cases by data source, Belgium, 2004-2023

## POLIOMYELITIS ([more information](#))

The last indigenous case of poliomyelitis occurred in 1979 and the last imported case in 1989.

The risk of an epidemic in Belgium remains negligible thanks to high vaccination coverage (> 95%; compulsory vaccination of children since 1967). However, as long as the virus is circulating elsewhere, a case of polio could be imported and the virus transmitted to one or more unvaccinated or incompletely vaccinated people.

As part of the global polio eradication initiative, polio-free countries such as Belgium must have a sensitive surveillance system capable of demonstrating the absence of poliovirus circulation on their territory. Surveillance involves recording and conducting microbiological investigations of cases of acute flaccid paralysis (AFP), from all causes, in people aged < 15 years. According to WHO indicators, 1 case of AFP per 100,000 individuals aged <15 must be detected and investigated for the surveillance system to be considered sufficiently sensitive. For Belgium, this means that 19 cases of AFP per year should be reported. However, only four cases were recorded in 2023 (3 in Flanders and 1 in Wallonia), mainly Guillain-Barré syndromes. The number of AFP notifications has averaged 5 per year (min 1, max 9) over the last 20 years. The current system therefore does not meet WHO requirements. Fortunately, additional monitoring for enteroviruses is in place, and polioviruses have been monitored in wastewater since 2024.

## ROTAVIRUS ([more information](#))

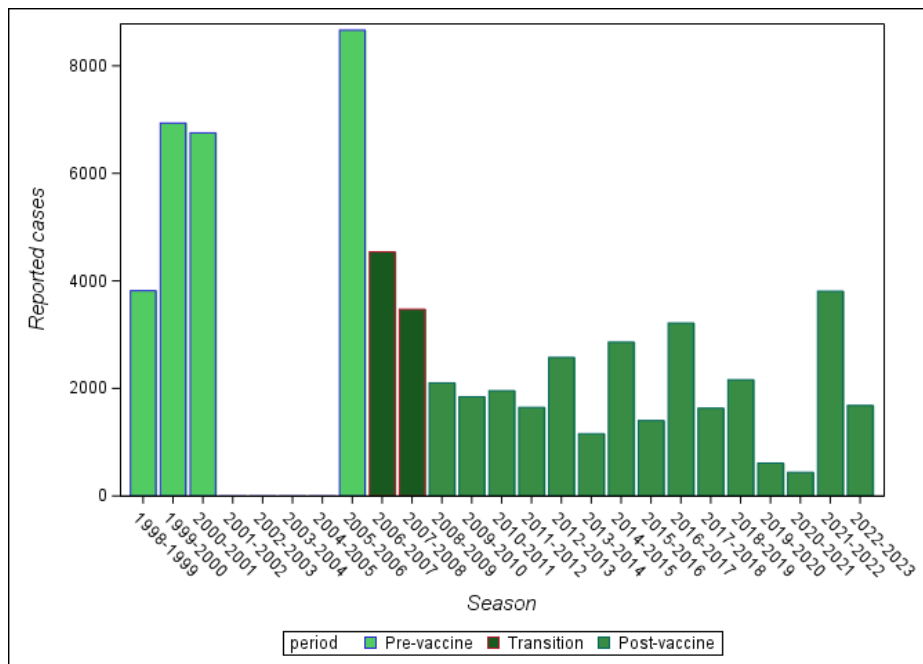
*Same version as the 2022 annual summary*

The epidemiology of rotavirus has changed significantly since the Superior Health Council recommended infant vaccination and the introduction of partial reimbursement in 2006. A sharp reduction in the number of cases has been observed, particularly in children under one year of age (reduction of +/- 70%).

Since 2012, rotavirus epidemiology appears to have evolved according to biennial cycles, with alternating seasons of high and low activity. This typical pattern was not observed in the COVID-19 years, with very low activity in the 2019-2020 and 2020-2021 seasons. In contrast, the 2021-2022 season was more intense than usual, with the highest number of cases recorded in the entire post-vaccination period. While sentinel laboratories usually record around 2,500 cases during a busy season, the number of cases for the 2021-2022 season was 3,809. The 2022-2023 season was a more typical low-activity season, with 1,683 cases.

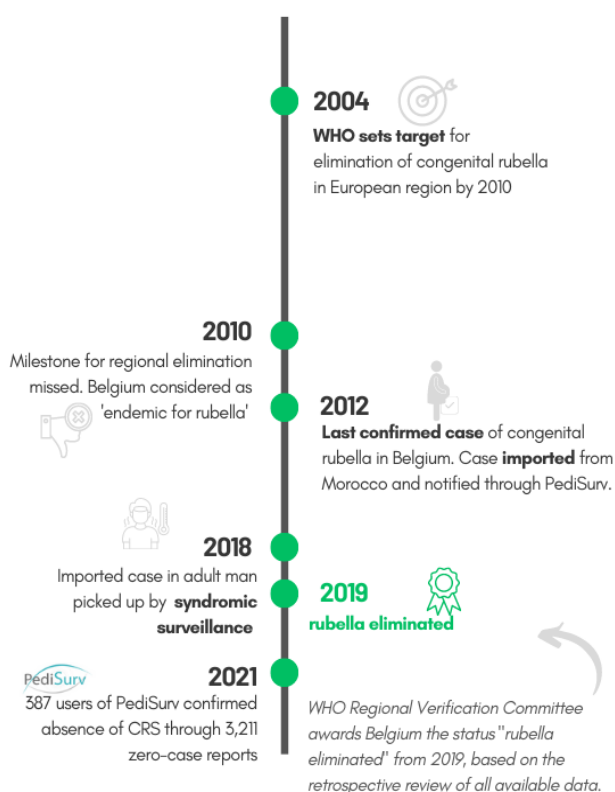
The age group most frequently affected is children under 2 years of age (49% of all reported cases in 2021-2022 and 66% in 2022-2023). During the 2021-2022 peak season, there was also a remarkably high number of cases among people aged over 80, accounting for up to 12% of cases. This is important because severe cases of rotavirus in the elderly require, on average, much longer hospitalisation than in young children: in recent years, the median length of hospitalisation for people aged over 85 was 9.5 days, compared with 2 days for children under one year old (hospitalisation data for 2022 are not yet available).

In the 2021-2022 (85.6%) and 2022-2023 (80.9%) seasons, G3P[8] was by far the most frequent genotype. The distribution of genotypes changed depending on the season: from 2019 to 2021, virtually no G3P[8] was observed, but mainly G2P[4].



*Figure 10 - Number of rotavirus cases reported by season and vaccination period, 1998-2023, Belgium (Source: sentinel laboratories)*

## RUBELLA ([more information](#))



Rubella is an important virus in terms of public health, as infection during pregnancy can lead to congenital rubella syndrome (CRS), which causes stillbirths or birth defects. This is why rubella, like measles, is the subject of a sustained elimination campaign in Belgium.

The last known indigenous case of CRS dates back to 2007 and the last imported case to 2012. In 2023, 2 suspected cases of CRS in newborns were ruled out after investigations including PCR on the amniotic fluid and urine of the newborn. Numerous data also confirmed the *absence* of rubella and CRS: 349 doctors confirmed, via 2,658 monthly referral reports, that they had not diagnosed congenital rubella in their practice. Similarly, the surveillance of congenital anomalies, as carried out by the EuroCat network in Antwerp (16% of all births, data up to 2020) and in Hainaut (11% of all births, data up to 2023), has not revealed any CRS either. Furthermore, no deaths due to rubella have been reported in the RHM data or in the mortality data for recent years (data up to 2021).

Figure 11 - Main stages in rubella surveillance and progress towards elimination targets, Belgium

## TETANUS ([more information](#))

The bacterium responsible for tetanus (*Clostridium tetani*) is present everywhere in the environment. Infection therefore occurs through contaminated wounds and not from person to person. Preventing the disease therefore mainly involves individual vaccination (there is no herd immunity). In Belgium, the incidence of tetanus has fallen sharply since systematic vaccination began in 1959 and the disease has become rare.

The latest mortality data available is for 2021. During the 10-year period 2011-2020, a total of 5 tetanus deaths were recorded, all in people aged over 70. Hospital admissions due to tetanus have also become rare, with fewer than 5 to 10 admissions per year over the last 10 years. The presence of tetanus toxin in the blood can be detected by the [National Reference Centre](#). The NRC carried out five such tests in 2023 on clinical suspicion of tetanus, all of which were negative. In 2022 (3 negative samples), 2021 (4 negative samples) and 2020 (5 negative samples), no cases of tetanus were confirmed by the NRC. Consequently, the last cases detected in the NRC date from 2019 and 2018. Each case involved a patient aged between 70 and 80 years.

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## MORE INFORMATION

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