

SURVEILLANCE REPORT

Tetanus

Annual Epidemiological Report for 2022

Key facts

- In 2022, 53 tetanus cases were reported in the European Union/European Economic Area (EU/EEA), of which 16 (30%) were confirmed cases.
- The number of cases reported in 2022 remained similar to the year before but was lower than in 2018 and 2019 (92 and 73, respectively).
- Adults aged 65 years and above were the most affected age group, with women accounting for most cases.
- The current epidemiology in the EU/EEA may be explained by lower vaccination coverage or waning immunity among older populations.
- The average estimated vaccination coverage of the diphtheria tetanus toxoid and pertussis (DTP3) vaccine among one-year-olds in the EU/EEA remained at a high level from 2018 to 2022 (2022: 94%; range 84–99%)
- Due to the severity of tetanus, there is a need to maintain high vaccination rates in all eligible age groups and to continue developing and implementing strategies to protect specific groups – particularly the elderly – in countries with higher rates of disease.

Introduction

Tetanus is a severe disease caused by the neurotoxin of the bacterium *Clostridium tetani*, which infects through wounds and thrives in low-oxygen conditions. Unlike other vaccine-preventable diseases, tetanus is not contagious and can only be contracted through direct contamination with spores found in soil, dust and faeces. The neurotoxin affects the nervous system, leading to muscle rigidity and spasms. The disease presents in three forms: generalised, localised, and cephalic, with generalised being the most common. Vaccination, which began in 1938, is the primary prevention method, significantly reducing incidence in regions with comprehensive immunisation programmes. Tetanus remains a concern in areas with inadequate vaccination, especially affecting newborns and mothers. Treatment involves immunoglobulin, antibiotics and wound care, but once the toxin binds to neurons it cannot be neutralised. Despite the decline in cases in Europe, maintaining high vaccination coverage, especially among the elderly and high-risk groups, is essential.

Methods

This report is based on data for 2022 retrieved from The European Surveillance System (TESSy) on 22 January 2024. TESSy is a system for the collection, analysis and dissemination of data on communicable diseases.

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For a detailed description of the methods used to produce this report, refer to the Methods chapter of the 'ECDC Annual Epidemiological Report' [1].

An overview of the national surveillance systems is available online [2].

A subset of the data used for this report is available through ECDC's online 'Surveillance Atlas of Infectious Diseases' [3].

For 2022, 26 EU/EEA countries reported data on tetanus cases to TESSy. All countries except Denmark, France, Italy and Liechtenstein reported data on cases of tetanus in accordance with the 2008, 2012 or 2018 EU case definitions [4].

The majority of countries reported case-based data from comprehensive and passive surveillance systems with national coverage; Bulgaria reported aggregated data. Tetanus is not under surveillance in Belgium and Finland. Germany has never reported tetanus data to ECDC and Austria last reported tetanus data to ECDC in 2011.

Vaccination coverage estimates presented in this report were obtained from the World Health Organization (WHO) Global Health Observatory and the WHO/United Nations Children's Fund (UNICEF) Estimates of National Immunization Coverage (WUENIC) [5]. Vaccination coverage is defined as the percentage of one-year-olds who have received three doses of the combined diphtheria, tetanus toxoid and pertussis vaccine in a given year. The method of calculating this indicator is outlined in the metadata, which is available online [5].

Epidemiology

For 2022, 26 EU/EEA countries reported 53 tetanus cases, of which 16 (30%) were classified as confirmed and 34 (64%) as probable. Italy accounted for 40% of all notified cases (Table 1, Figure 1). Spain, Poland and Romania accounted for 30% of all notified cases (Table 1, Figure 1). Fifteen countries reported zero cases. The number of cases reported in 2022 was slightly higher than in 2021 (50 cases), but lower than in 2018 and 2019.

The crude EU/EEA notification rate was 0.02 cases per 100 000 population, which is within the range reported since 2012. The highest rate was reported by Slovenia (0.19 cases per 100 000 population) and Italy (0.04 cases per 100 000 population).

Between 2018 and 2022, Italy reported 40% (n = 119) of all cases reported in the EU/EEA (n = 300). From 2019 to 2021, Italy reported mostly probable cases (88%) – as opposed to the years before 2018, where it reported mostly confirmed cases. However, the case definition used for reporting was not the EU definition. Of the 119 cases reported by Italy from 2018 to 2022, 93% occurred in the age group 65 years and above.

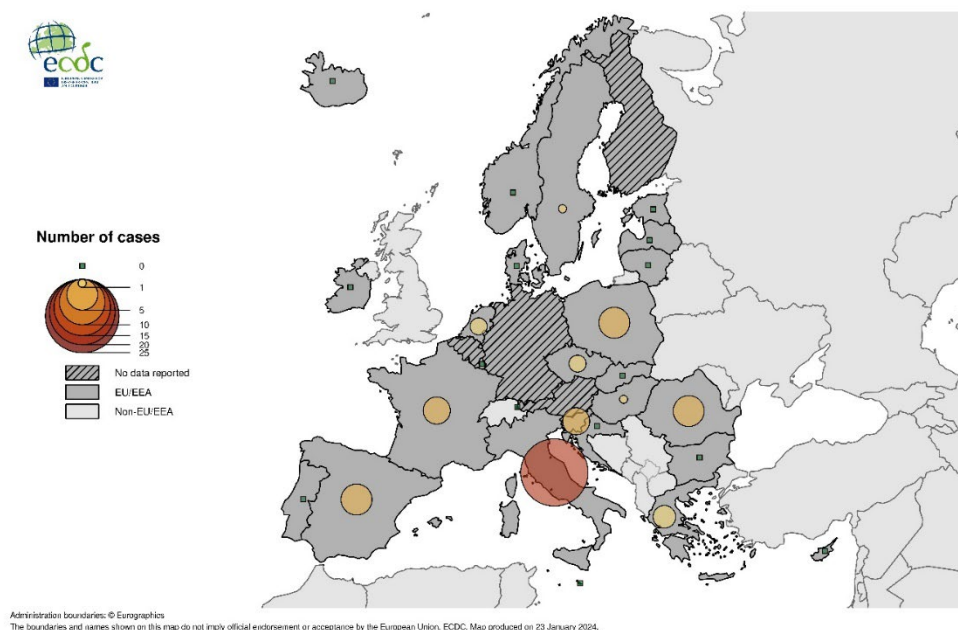
Table 1. Tetanus cases and rates per 100 000 population by country and year, EU/EEA, 2018–2022

Country	2018		2019		2020		2021		2022		
	Number	Rate	Number	Rate	Number	Rate	Number	Rate	Number	Rate	ASR
Austria	NDR	NRC	NDR	NRC	NDR	NRC	NDR	NRC	NDR	NRC	NRC
Belgium	NDR	NRC	NDR	NRC	NDR	NRC	NDR	NRC	NDR	NRC	NRC
Bulgaria	1	0.01	0	0.00	0	0.00	0	0.00	0	0.00	0.00
Croatia	3	0.07	2	0.05	0	0.00	0	0.00	0	0.00	0.00
Cyprus	1	0.12	0	0.00	0	0.00	0	0.00	0	0.00	0.00
Czechia	0	0.00	1	0.01	0	0.00	0	0.00	2	0.02	NRC
Denmark	2	0.03	NDR	NRC	NDR	NRC	1	0.02	0	0.00	0.00
Estonia	1	0.08	0	0.00	0	0.00	0	0.00	0	0.00	0.00
Finland	NDR	NRC	NDR	NRC	NDR	NRC	NDR	NRC	NDR	NRC	NRC
France	2	0.00	4	0.01	3	0.00	5	0.01	4	0.01	NRC
Germany	NDR	NRC	NDR	NRC	NDR	NRC	NDR	NRC	NDR	NRC	NRC
Greece	4	0.04	5	0.05	2	0.02	2	0.02	3	0.03	NRC
Hungary	1	0.01	5	0.05	3	0.03	2	0.02	1	0.01	NRC
Iceland	0	0.00	0	0.00	0	0.00	0	0.00	0	0.00	0.00
Ireland	0	0.00	0	0.00	0	0.00	0	0.00	0	0.00	0.00
Italy	36	0.06	25	0.04	10	0.02	27	0.05	21	0.04	NRC
Latvia	0	0.00	1	0.05	0	0.00	0	0.00	0	0.00	0.00
Liechtenstein	NDR	NRC	NDR	NRC	NDR	NRC	0	0.00	0	0.00	0.00
Lithuania	1	0.04	1	0.04	0	0.00	1	0.04	0	0.00	0.00
Luxembourg	0	0.00	0	0.00	0	0.00	0	0.00	0	0.00	0.00
Malta	0	0.00	0	0.00	0	0.00	0	0.00	0	0.00	0.00
Netherlands	1	0.01	0	0.00	2	0.01	0	0.00	2	0.01	NRC
Norway	3	0.06	0	0.00	0	0.00	0	0.00	0	0.00	0.00
Poland	8	0.02	17	0.04	2	0.01	5	0.01	5	0.01	NRC
Portugal	2	0.02	0	0.00	0	0.00	1	0.01	0	0.00	0.00
Romania	6	0.03	5	0.03	3	0.02	4	0.02	5	0.03	NRC
Slovakia	1	0.02	0	0.00	1	0.02	0	0.00	0	0.00	0.00
Slovenia	2	0.10	1	0.05	2	0.10	0	0.00	4	0.19	NRC
Spain	6	0.01	2	0.00	1	0.00	1	0.00	5	0.01	NRC
Sweden	4	0.04	0	0.00	3	0.03	1	0.01	1	0.01	NRC
EU/EEA (30 countries)	85	0.02	69	0.02	32	0.01	50	0.01	53	0.02	NRC
United Kingdom	7	0.01	4	0.01	NDR	NRC	NA	NA	NA	NA	NA
EU/EEA (31 countries)	92	0.02	73	0.02	32	0.01	NA	NA	NA	NA	NA

Source: Country reports.

ASR: age-standardised rate; NA: not applicable; NDR: no data reported; NRC: no rate calculated.

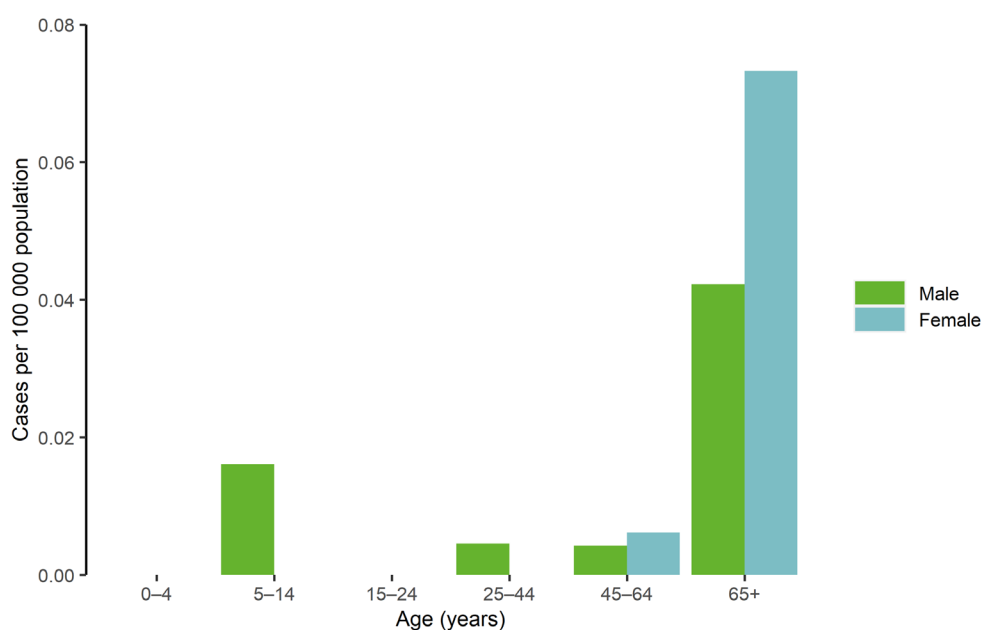
No data from 2020 onwards were reported by the United Kingdom, due to its withdrawal from the EU on 31 January 2020.

Figure 1. Distribution of tetanus cases by country, EU/EEA, 2022

Age and gender

In 2022, the age group 65 years and above was most affected and accounted for 81% of all reported tetanus cases (43 cases) (Figure 2). The age distribution of the remaining cases was three confirmed cases in the five to nine years age group and seven cases in the 30 to 64 years age group (three confirmed cases, three probable cases and one case reported as unknown).

More than two thirds of the reported cases were women (62%). However, men were more frequently reported in the younger age groups (6 to 49 years). Among those aged 65 years and above, 30 cases were reported as women and 13 as men. The overall female-to-male ratio was 1:0.6.

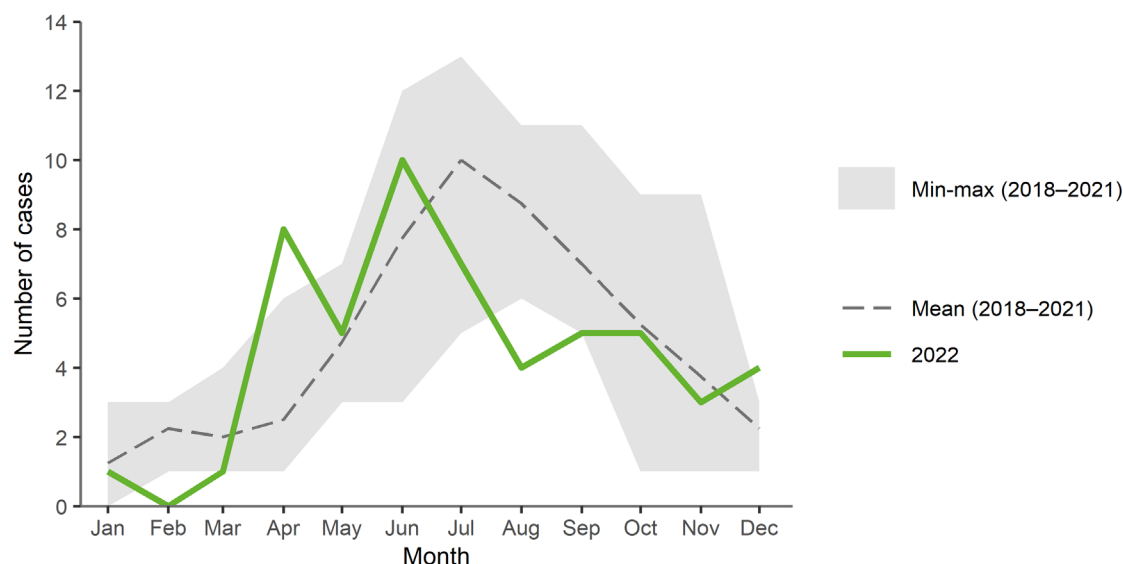
Figure 2. Tetanus cases per 100 000 population, by age and gender, EU/EEA, 2022

Source: Country reports from Bulgaria, Croatia, Cyprus, Czechia, Denmark, Estonia, France, Greece, Hungary, Iceland, Ireland, Italy, Latvia, Liechtenstein, Lithuania, Luxembourg, Malta, the Netherlands, Norway, Poland, Portugal, Romania, Slovakia, Slovenia, Spain and Sweden.

Seasonality

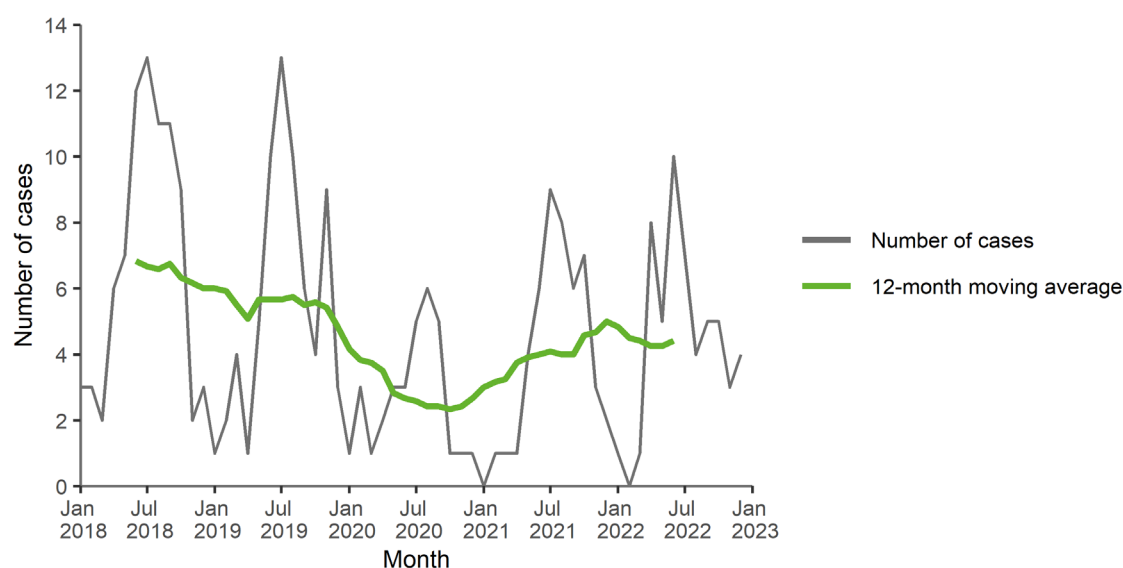
In 2022, most tetanus cases were reported between April and October. An initial peak occurred early in April, followed by a second peak in June and a smaller peak in October. Overall, the number of cases reported fell within the expected range based on the previous four years; however, the early peak in April was unique to 2022. (Figures 3–4).

Figure 3. Tetanus cases by month, EU/EEA, 2022 and 2018–2021



Source: Country reports from Bulgaria, Croatia, Cyprus, Czechia, Estonia, France, Greece, Hungary, Iceland, Ireland, Italy, Latvia, Luxembourg, Malta, the Netherlands, Norway, Poland, Portugal, Romania, Slovakia, Slovenia, Spain and Sweden.

Figure 4. Tetanus cases by month, EU/EEA, 2018–2022



Source: Country reports from Bulgaria, Croatia, Cyprus, Czechia, Estonia, France, Greece, Hungary, Iceland, Ireland, Italy, Latvia, Luxembourg, Malta, the Netherlands, Norway, Poland, Portugal, Romania, Slovakia, Slovenia, Spain and Sweden.

Outcome

Of the 40 cases with a reported known outcome, seven (13%) were fatal. Six of the cases with a fatal outcome were in those older than 79 years. One fatal outcome was reported in a 71-year-old case.

The number of cases with a reported fatal outcome remained similar to the previous four years (range: 7–11 cases).

Vaccination coverage

Vaccination coverage estimates for the third dose of DTP3 among one-year-olds were available from WHO (WUENIC estimates). In 2022, the average estimated vaccination coverage for the EU/EEA was 94% (range: 84–99%). Four countries (Greece, Hungary, Luxembourg and Portugal) reported an estimated 99% DTP3 coverage. Twelve countries reported a decrease in DTP3 coverage (range -1 to -13%) compared with 2018. Four countries (Iceland, Malta, Norway and Slovakia) reported an increase in DTP3 coverage of 1% each, compared with 2018 (Table 2). Overall, DTP3 coverage among one-year-olds remains very high in the EU/EEA.

Table 2 Diphtheria tetanus toxoid and pertussis-containing vaccine (DTP3) immunisation coverage among one-year-olds (%) (WUENIC), EU/EEA, 2018–2022

Country	2018	2019	2020	2021	2022	% change ^a (2018–2022)
Austria	95	95	95	95	84	-13
Belgium	98	97	97	98	98	0
Bulgaria	92	93	91	89	91	-1
Croatia	93	94	94	92	92	-1
Cyprus	99	96	96	96	96	-3
Czechia	97	97	97	94	94	-3
Denmark	97	97	97	97	97	0
Estonia	92	91	91	90	85	-8
Finland	91	91	90	89	91	0
France	96	96	96	96	96	0
Germany	91	91	91	91	91	0
Greece	99	99	99	99	99	0
Hungary	99	99	99	99	99	0
Iceland	91	92	93	92	92	1
Ireland	94	94	94	94	93	-1
Italy	95	96	94	94	95	0
Latvia	96	99	99	94	95	-1
Liechtenstein	NDR	NDR	NDR	NDR	NDR	NRC
Lithuania	92	92	91	90	90	-2
Luxembourg	99	99	99	99	99	0
Malta	97	98	98	99	98	1
Netherlands	93	94	94	95	93	0
Norway	96	97	97	97	97	1
Poland	95	95	90	90	90	-6
Portugal	99	99	99	99	99	0
Romania	86	88	87	86	85	-1
Slovakia	96	97	97	97	97	1
Slovenia	93	95	95	86	89	-4
Spain	96	95	94	92	93	-3
Sweden	97	98	97	98	94	-3
EU/EEA^b	95	95	95	94	94	NRC

Source: WHO Immunization Data Portal, WHO and UNICEF Estimates of National Immunization Coverage (WUENIC).

NDR: no data reported; NRC: no rate calculated.

^a The percentage of change was calculated for each dose as the percentage of increase or decrease between 2018 and 2022, i.e. $((\text{coverage in 2021} - \text{coverage in 2017}) / \text{coverage in 2017}) \times 100$

^b Population-weighted average vaccination coverage rate

Discussion

Since the onset of the COVID-19 pandemic in 2020, the reported number of tetanus cases in the EU/EEA decreased by approximately 50%. In 2022, the number of reported cases (53 cases) was consistent with recent years. However, under-reporting or under-ascertainment of tetanus cases is possible, particularly since partially immunised patients may present with very mild disease and as tetanus has become increasingly rare.

Italy accounted for more than one third ($n = 119$ cases) of the cases reported in the EU/EEA from 2018 to 2022 (total number of cases = 300). Italy uses national case definitions that are different from the EU case definition [6]; therefore, any interpretation in relation to the EU epidemiological picture should be undertaken with caution.

Most cases were reported in older adults (aged 65 years and above), likely due to lower vaccination coverage or waning immunity in this population, with higher notification rates observed in women. It is likely that women aged 65 years and above had fewer opportunities for vaccination compared with men of the same age, who may have received the vaccine during compulsory military service in many countries [6]. A recent study performed in Italy in 2019 and 2020, assessing seroprotection in those aged 6 to 90 years, revealed that 85% of the population had antibodies against tetanus. However, findings indicate that protection rates decreased with age (93.6% in those aged 6–12 years vs. 45.3% in those aged 65 years and above) and that there was a significant difference between men and women in the age group 65 years and above (60.8% in men vs. 30.4% in women) [7]. Collecting vaccination status of tetanus cases, which is not currently part of EU/EEA surveillance, would help to better describe this population's characteristics.

In recent decades, routine immunisation services for children have expanded greatly. However, some have been affected by the COVID-19 pandemic. A recent study in the United States estimated that there was an 8.2% (95% confidence interval: 4.3–12.1) increase in the risk of a missed opportunity for vaccination for the DTaP (diphtheria, tetanus, pertussis) vaccine among adolescents visiting healthcare services, compared with the pre-pandemic period [8]. WHO has estimated that DTP3 vaccination coverage among one-year-olds worldwide decreased from 86% in 2019 to 81% in 2021 [9]. In the EU/EEA region, the overall estimated vaccination coverage was 94% (range: 84–99%) for 2022. Although some fluctuations in coverage estimates was observed for some countries between 2018 and 2022, overall coverage remained quite high, with the majority of countries maintaining a resilient DTP vaccination programme throughout the pandemic.

In the EU/EEA, tetanus vaccination is part of the infant primary immunisation schedule (three to four doses in the first two years of life) [10]. Booster doses are recommended at different ages depending on the country. Most countries recommend a booster for adults aged 18 years and above.

According to the most recent WHO position paper on tetanus vaccines, a three-dose primary series is recommended to provide lifelong protection against tetanus (with the first dose administered from six weeks of age and subsequent doses given with a minimum interval of four weeks between doses), as well as three booster doses. Ideally, there should be at least four years between booster doses, given at 12 to 23 months old; four to seven years old; and 9 to 15 years old. WHO recommends that six doses of tetanus-containing vaccine be given to all people from childhood to adolescence and adulthood [11].

A recent WHO expert consultation reviewing the available evidence on immunogenicity and safety of tetanus-diphtheria (Td) vaccine use in children four to seven years old concluded that giving the second booster dose to children in this age group as part of a six-dose series would provide adequate protection against diphtheria and tetanus. It recommended adding this age specification to the information given in the vaccine product's package insert. The current WHO advice to use Td vaccine in children aged 4 years and above is, in effect, an off-label recommendation [12].

Public health implications

Due to its severity, tetanus poses a risk to unvaccinated or insufficiently vaccinated people. There is a need to maintain high vaccine-induced immunity in all age groups and awareness of the potential threat to non- and under-immunised people. High clinical suspicion and strategies to protect specific groups, particularly the elderly, should be considered in countries with higher rates of disease.

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