ASSESSMENT

Deferral criteria and testing strategies for dengue virus in blood donors returning from affected areas

Survey results

Key findings

To support discussions with the ECDC network on substances of human origin (SoHO-Net), ECDC conducted a survey among members of the SoHO-Net blood group on the donor assessment and deferral strategies for blood donors in the European Union/European Economic Area (EU/EEA) countries with regard to dengue virus. This report presents the results of the survey.

- While 91% of the responding EU/EEA countries have deferral criteria for blood donors returning from dengue-endemic areas, only 55% have specific criteria for those returning from affected non-endemic areas within the EU/EEA.
- For countries that defer donors returning from endemic countries or affected areas in non-endemic countries, the deferral period is consistently 28 days. For donors with a confirmed dengue diagnosis, the deferral period is reported as 120 days.
- Different trigger criteria are used to implement safety measures for prospective donors returning from affected areas with local dengue outbreaks in EU countries. Five countries implement safety measures when there is at least one locally-acquired case in an area with an active cluster of dengue, while six countries implement measures on a case-by-case basis.
- Deferral of prospective donors who have travelled to a dengue affected area is the most commonly used blood safety measure for prevention of transfusion-transmitted dengue. Nucleic Acid Testing (NAT) for dengue is rarely reported as a screening tool.
- There is no standardised definition for the geographical scope of an 'affected area' for local dengue outbreaks in EU countries, with risk levels being applied at the country, regional, or municipal level by different Member States.

Conclusions: The increasing frequency and size of autochthonous dengue outbreaks in EU/EEA countries presents an emerging challenge for blood safety. Safety measures reported by EU/EEA countries generally address travellers returning from endemic countries outside the EU and only a few countries report measures for travellers returning from affected areas in non-endemic countries.

Suggested citation: European Centre for Disease Prevention and Control. Deferral criteria and testing strategies for dengue virus in blood donors returning from affected areas – survey results. Stockholm: ECDC; 2025.

Stockholm, August 2025

ISBN: 978-92-9498-815-7. TQ: 01-25-045-EN-N. DOI: 10.2900/4266554

Introduction

Dengue virus (DENV) is an enveloped, single-stranded, positive RNA virus belonging to the *Flaviviridae* family, within the *Flavivirus* genus. There are four distinct serotypes of DENV (DENV-1, DENV-2, DENV-3, and DENV-4), each capable of causing the full spectrum of dengue. The virus is primarily transmitted to humans through the bite of infected female *Aedes* mosquitoes, particularly *Aedes aegypti* and *Aedes albopictus* [1]. In addition to the vectorial route, DENV can also be transmitted through perinatal transmission [2], blood transfusion [3], stem cell transplantation [4], organ transplantation [5], and needlestick injuries [6]. Probable sexual transmission of DENV has also been documented [7].

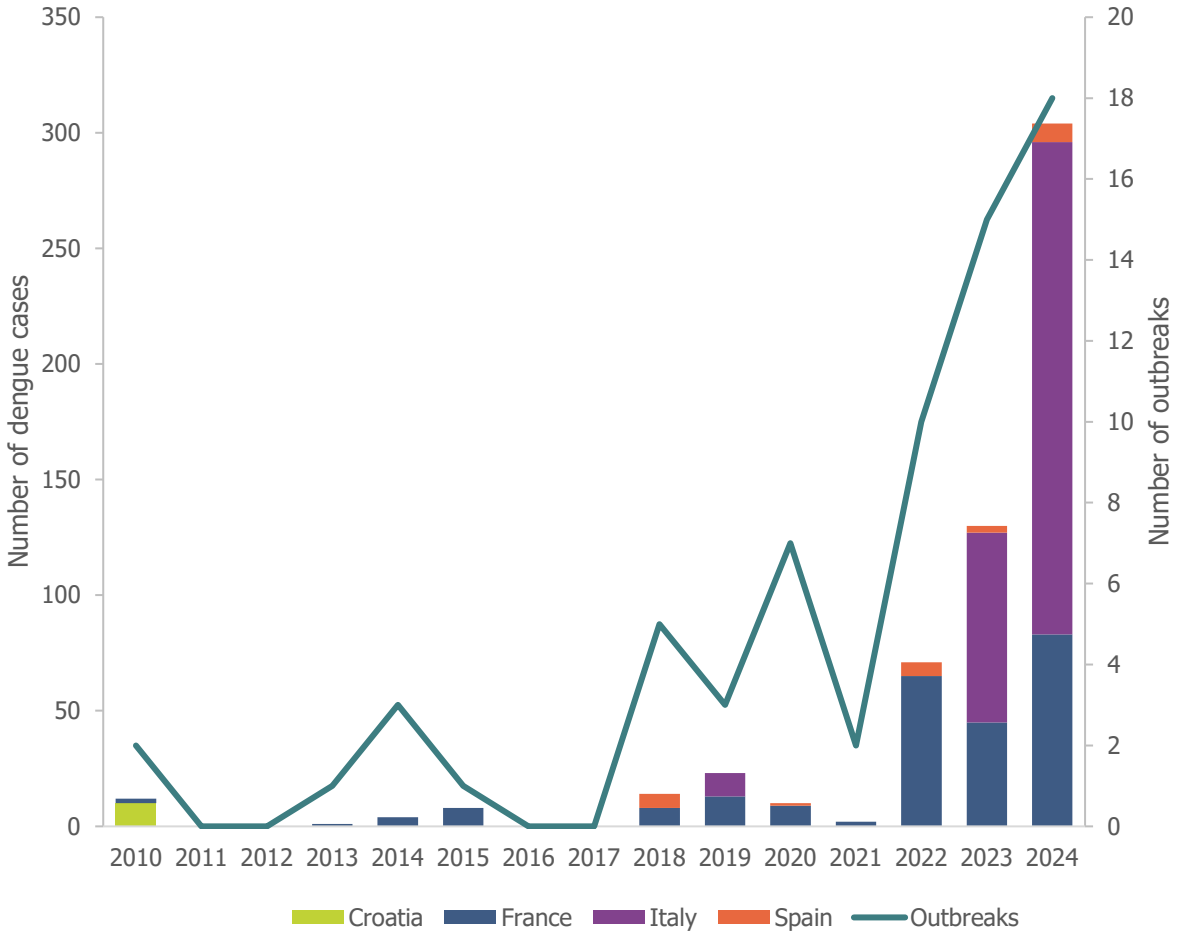
The clinical manifestations of dengue range from mild, asymptomatic infections to severe and potentially life-threatening conditions. It is reported that 60–80% of individuals infected with DENV will remain asymptomatic [8]. However, this proportion can vary widely across studies due to the impact of prior infections on the likelihood of severe dengue, as well as differences in methodological aspects [9]. The definition of 'asymptomatic' seems to be one key aspect for this variation. In a systematic review of the asymptomatic dengue infection rate, authors reclassified asymptomatic infection into three groups, aiming for a more precise description of the cases included: no symptoms, subclinical (i.e. mild or aspecific symptoms), and unapparent (infections not captured by the healthcare system regardless of symptomatology). Rates of asymptomatic infection ranged from 0 to 42% of cases (median 7.5%, six studies) for the 'no symptoms' category; 0 to 100% of cases (median 64%, 30 studies) for the 'subclinical' category, and 50 to 100% of cases (median 72%, 14 studies) for the 'unapparent' category [9].

In symptomatic cases, the incubation period typically lasts four to seven days (range: 3−10 days [10]), after which patients may experience a sudden onset of high fever, severe headache, retro-orbital pain, myalgia, arthralgia, and rash. In milder cases, these symptoms last from two to seven days. A subset of patients, approximately 2−5% [8], can progress to a more severe presentation after four to six days of illness. Severe dengue includes dengue haemorrhagic fever (DHF) and dengue shock syndrome (DSS), which are marked by plasma leakage, haemorrhage, circulatory collapse, and multi-organ failure. The exact mechanisms underlying the progression to severe dengue are not fully understood, but they appear to involve a combination of viral and host factors, including the host's immune response and genetic predisposition [1]. A median case fatality rate of 5% (range: 0−39%) was identified in a systematic review of observational studies analysing risk factors associated with mortality [11]. However, with good clinical management, the case fatality rate is below 0.5% [12].

The different dengue serotypes induce serotype-specific as well as serogroup-specific antigens. After infection, the adaptive immune response provides long-term immunity to the specific type and a shorter immunity to the other serotypes: between three months to two years, depending on reports [1]. Prior infection with a given serotype is thought to increase the likelihood of severe dengue after a new infection with a different serotype [13]. This increased severity is explained by antibody-dependent enhancement (ADE). The ADE model states that cross-reactive antibodies or sub-neutralising concentrations of serotype-specific antibodies bind and facilitate the entry of DENV through receptors on target cells, which include dendritic cells, macrophages, and monocytes [14]. Through facilitated entry, ADE is thought to increase viral replication in the early infection stage and increase the risk of progression to severe dengue, DHF or DSS. The management of the infection is based on symptomatic treatment and supportive therapies. To date, two vaccines against DENV have been authorised for use in the EU, both of which are recommended for use in dengue-endemic areas [12].

The burden of dengue has been increasing worldwide in the past decade [15]. In 2024, over 14 million dengue cases and over 10 000 dengue-related deaths were reported globally [16]. Dengue is not endemic in mainland EU/EEA, and the vast majority of the cases reported in the EU/EEA are among travellers coming from dengue-endemic areas. However, as competent vectors of DENV are established in mainland EU/EEA, local, sporadic outbreaks of autochthonous cases (locally-acquired cases) can occur, starting from an imported case. The frequency and size of these local outbreaks has increased over the last decade to events with outbreaks of over 50 cases reported in 2022, 2023, and 2024 in France and Italy (Figure 1; [17]). This trend in increasing size and frequency of local outbreaks in mainland EU/EEA is expected to continue in coming years. Furthermore, with the geographical spread of competent vectors and longer periods of favourable environmental conditions for vector-borne DENV transmissions across EU/EEA countries, such outbreaks could occur in an increasing number of countries in the future [18].

Figure 1. Number of locally acquired dengue cases and outbreaks in the EU/EEA*, 2010–2024 (n=579)



*EU outermost regions excluded

Source: European Centre for Disease prevention and Control, 2025 [17]

The risk of transfusion-transmitted dengue

Transfusion-transmission of dengue is well established [3], though the rate of transmission through transfusion of blood products from infected donors is uncertain, given the low number of reported transfusion cases, even in high-incidence areas [19]. A study reported a transmission rate from viraemic donors of around 30% [20]. Hypotheses for the low number of reported transfusion-transmission cases in endemic areas include undetected and unreported transmission events, which could be associated with misdiagnosis due to non-specific symptoms in recipients, mild disease manifestations in individuals infected through non-vectorial routes, presence of protective immunity in recipients in endemic areas, and co-transfusion of antibody-positive units neutralising the infectivity of viraemic donations [21-23]. In addition, in endemic areas recipients are simultaneously exposed to vectorial transmission (i.e. through mosquito bites) making it difficult to identify transfusion-transmission.

Several studies among blood donors in endemic countries have documented viraemia in asymptomatic donors. A systematic review summarising the published DENV RNA prevalence among blood donors reported rates ranging from 0.0% to 5.5% in this population and a pooled viraemic rate of 0.2% [24]. In the three studies conducted in non-endemic countries (Australia 2008–2013, USA 2015, Portugal - date not specified), the viraemic rate was 0.0%, with 0 positive NAT from 15 471 samples tested. A study conducted during an outbreak in Rio de Janeiro estimated the incidence of DENV infection in the donor population to be 6.2% (95% confidence interval [CI]: 3.2%–9.1%) over the duration of the outbreak. Based on the increase in IgM-reactivity and the temporal yield of NAT, the authors estimated the viraemia remained detectable in individual donation nucleic acid tests (NAT) for a period of 9.1 days (95% CI: 4.4–13.9 days) after infection [25]. In this study, authors estimate that there was one RNA-positive donation per 800 clinical dengue cases in the general population of donor-age.

A study conducted in Brazil (Rio de Janeiro and Recife) linked donor and recipient pairs and considered groups according to the presence of DENV RNA in the donation and the presence of DENV RNA in the recipients. The study describes six probable or possible[1] cases of transfusion-transmitted DENV, and 10 susceptible recipients who did not become infected by DENV despite receiving a DENV RNA-reactive blood component. The comparison of the viral load in the donations from both groups did not identify an association between transmission and viral load. A median viral load of approximately 200 copies/mL in the transfused blood unit was reported for both groups. No association with blood component type was found. Using blinded chart review to compare the probable and possible transfusion-transmitted cases to controls (transfusion recipients who had not received known RNA-positive components), the authors also reported similar rates of symptomatic infection among these two groups. No recipient developed severe dengue symptoms [20].

Assessment of blood donors for the risk of dengue virus in the EU/EEA

Deferral of prospective blood donors (individuals presenting for blood donation) returning from dengue-endemic countries is a well-established safety measure by EU/EEA countries. The recent large outbreaks of dengue in certain EU Member States have led to concerns about the risk of transfusion-transmitted dengue from travellers returning from affected areas in the EU/EEA and raised questions on the appropriate safety measures for these travellers.

In December 2024, ECDC hosted the second meeting of the Blood Group from ECDC's Network for the Microbial Safety of Substances of Human Origin (SoHO-Net)[2]. This meeting included a session dedicated to the risk of DENV infection in the EU/EEA. To support discussions during this session, prior to the meeting ECDC disseminated a survey to the Blood Group of SoHO-Net on the blood donor assessment and deferral strategies in EU/EEA countries related to DENV. This report aims to present the results of this survey.

Methods

Between 28 October 2024 and 22 November 2024, ECDC shared an online survey on deferral criteria and testing strategies for dengue in blood donors in EU/EEA countries to the national focal points (NFP) of the ECDC SoHO-Network Blood Group.The survey questions are detailed in the annexes. The survey data were collected and managed using REDCap electronic data capture tools hosted at ECDC [26]. Collected data were analysed in Excel.

For the context of this document, dengue-endemic countries are defined as countries with transmission of dengue over several seasonal cycles [27]; non-endemic countries are defined as countries with sporadic (including seasonal clusters in EU/EEA) or no cases of transmission. Affected areas are defined as areas with autochthonous transmission of dengue in the current transmission season [28].

Results

The NFPs from 22 of 30 EU/EEA countries replied to the survey: Austria, Cyprus, Czechia, Denmark, Estonia, Finland, France, Germany, Greece, Hungary, Iceland, Italy, Latvia, Malta, The Netherlands, Norway, Portugal, Romania, Slovakia, Slovenia, Spain, and Sweden.

Safety measures

Among the responding countries, 16 (73%) declared that they had specific deferral criteria for individuals with a dengue diagnosis, 20 (91%) had specific deferral criteria for travellers returning from endemic areas (e.g. South America), and 12 (55%) had specific deferral criteria for travellers returning from an affected non-endemic area, such as EU/EEA countries with autochthonous outbreaks (Table 1).

[1] Recipients DENV RNA negative and IgM negative, or data not available, before transfusion and DENV RNA positive after transfusion were classified as probable transmission cases; recipients DENV RNA negative and IgM negative before transfusion and DENV RNA negative and IgM positive after transfusion were classified as possible transmission cases.

[2] https://www.ecdc.europa.eu/en/about-ecdc/what-we-do/partners-and-networks/disease-and-laboratory-networks/network-microbial

Table 1. Presence of deferral criteria related to dengue virus infections for prospective donors with a dengue diagnosis, prospective donors returning from endemic areas, and prospective donors returning from affected non-endemic areas

Country	Prospective donors with a dengue diagnosis	Prospective donors returning from endemic areas	Prospective donors returning from affected non-endemic areas
Austria	Yes	Yes	No
Belgium	NR	NR	NR
Bulgaria	NR	NR	NR
Croatia	NR	NR	NR
Cyprus	Yes	Yes	Yes
Czechia	Yes	Yes	Yes
Denmark	Yes	Yes	No
Estonia	No	Yes	No
Finland	Yes	Yes	Yes
France	Yes	Yes	Yes
Germany	No	No	No
Greece	Yes	No	No
Hungary	No	Yes	No
Iceland	Yes	Yes	No
Ireland	NR	NR	NR
Italy	Yes	Yes	Yes
Latvia	No	Yes	No
Liechenstein	NR	NR	NR
Lithuania	NR	NR	NR
Luxembourg	NR	NR	NR
Malta	Yes	Yes	Yes
Netherlands	Yes	Yes	Yes
Norway	Yes	Yes	No
Poland	NR	NR	NR
Portugal	Yes	Yes	Yes
Romania	No	Yes	No
Slovakia	Yes	Yes	Yes
Slovenia	Yes	Yes	Yes
Spain	Yes	Yes	Yes
Sweden	Yes	Yes	Yes

NR: not reported.

Deferral periods for prospective donors presenting for blood donation with a dengue diagnosis were reported by 16 countries. This period ranged from 14 days (a non-specific deferral period following an infection) to 180 days after clinical resolution, with a median and mode of 120 days. Deferral periods for prospective donors returning from endemic areas were provided by 18 countries and were generally 28 days. Similarly, 10 of the 12 countries that have specific deferral criteria for travellers returning from an affected non-endemic area indicated deferral periods of 28 days (Table 2).

Deferral criteria and periods are described in national recommendations or guidelines for 19 countries (86%) and in regional recommendations for two countries (9%). These criteria may be recommendations or advice, and not necessarily formal requirements in some countries.

The survey included a question asking for estimates of the number of prospective blood donors that had been deferred due to a risk of DENV infection in the previous two years. Only one country could provide such information: Portugal with a total of 450 donors who deferred during the period 2023–2024.

Table 2. Duration of deferrals in EU/EEA countries for prospective donors with a dengue diagnosis, individuals returning from endemic areas, and individuals returning from affected non-endemic areas

	Prospective donors with a dengue diagnosis	Prospective donors returning from endemic areas	Prospective donors returning from affected non-endemic areas
Min – Max	14–180 days*	28–30 days*	28 days
Median and mode	120 days	28 days	28 days
Responding countries	16	18	10

** Deferral periods in months were converted to days, calculated as 30 days for one month, 120 days for four months, and 180 days for six months.*

Trigger for safety measures

Twelve countries (55%) use thresholds based on the size of an outbreak to decide on the implementation of deferral criteria for donors returning from an affected area. For affected areas in non-endemic countries with local outbreaks, this threshold is defined as at least one autochthonous case by five countries and on a case-by-case basis by six countries. One country considers safety measures for outbreaks of 20 autochthonous cases or more, and where ongoing transmission is expected (Table 3).

Table 3. Criteria to trigger the implementation of deferrals for prospective donors returning from affected areas in non-endemic countries

Country	Criteria
Austria	None defined
Belgium	NR
Bulgaria	NR
Croatia	NR
Cyprus	None defined
Czechia	None defined
Denmark	More than one human autochthonous case
Estonia	None defined
Finland	Case-by-case assessment
France	One human autochthonous case
Germany	NR
Greece	None defined
Hungary	Case-by-case assessment
Iceland	Case-by-case assessment
Ireland	NR
Italy	One human autochthonous case
Latvia	NR
Liechtenstein	NR
Lithuania	NR
Luxembourg	NR
Malta	None defined
Netherlands	20 human autochthonous cases with ongoing transmission expected
Norway	Case-by-case assessment
Poland	NR
Portugal	One human autochthonous case
Romania	None defined
Slovakia	None defined
Slovenia	One human autochthonous case
Spain	Case-by-case assessment
Sweden	Case-by-case assessment

NR: not reported.

Scope of affected areas

The level of the geographical area considered for the evaluation of dengue risk in the donor assessment varies for endemic and non-endemic countries and depending on whether the prospective donor is returning from an affected area in an EU/EEA country. For endemic countries outside of the EU/EEA, 16 EU/EEA countries consider the geographical level to be the country. For non-endemic countries outside of the EU/EEA, the level of the 'affected area' was most frequently the country (seven countries, 32%), but was also defined at the regional or municipal by three countries (14%). For non-endemic countries in the EU/EEA, the level is the country in four countries (18%), the administrative region (either NUTS2 or NUTS3[3]) in four countries, the municipality in two countries (9%), and based on other definitions in two countries. (Table 4).

Table 4. Geographical extent of 'affected areas' considered for the evaluation of dengue risk in the donor assessment in EU/EEA countries by endemicity status

Country	Endemic countries	Non-endemic countries in EU/EEA	Non-endemic and non-EU/EEA countries
Austria	Country	NR	NR
Belgium	NR	NR	NR
Bulgaria	NR	NR	NR
Croatia	NR	NR	NR
Cyprus	Country	Country	Country
Czechia	Country	Country	Country
Denmark	Administrative region	NR	NR
Estonia	Country	NR	NR
Finland	Country	NUTS3	Country
France	Country	Affected area	Affected area
Germany	NR	NR	NR
Greece	Country	NR	NR
Hungary	Administrative region	NR	NR
Iceland	Country	NR	NR
Ireland	NR	NR	NR
Italy	Administrative region	Based on information published by ECDC	Based on information published by ECDC
Latvia	NR	NR	NR
Liechtenstein	NR	NR	NR
Lithuania	NR	NR	NR
Luxembourg	NR	NR	NR
Malta	Country	Municipality	Municipality
Netherlands	Country	NUTS3	Country
Norway	Country	NR	NR
Poland	NR	NR	NR
Portugal	Country	NUTS2 Country if more than two regions are affected	Country
Romania	Country	NR	NR
Slovakia	Country	Country	Country
Slovenia	Country	Country	Country
Spain	Country	Municipality	Municipality
Sweden	Country	NUTS3	Administrative region

NR: not reported. NUTS: Nomenclature of territorial units for statistics.

[3] https://ec.europa.eu/eurostat/web/nuts

Testing strategies

Three countries (14%) indicated testing prospective donors at risk of DENV infection as an alternative to deferral: Cyprus, France, and Italy. All three countries reported individual donation DENV RNA NAT screening. Cyprus and Italy reported testing 2 732 and 4 000 prospective donors respectively in 2024, with no positive findings for DENV.

Pathogen reduction technologies

Eleven countries (50%) reported the use of pathogen reduction technologies for platelets or plasma, either at the national or regional level, regardless of the risk of DENV infection. Of the eleven countries, ten reported the use of these technologies for platelets and seven for plasma (Table 5).

Table 5. Use of pathogen reduction technologies in EU/EEA countries

Country	Platelets	Plasma
Austria	Yes	Yes
Belgium	NR	NR
Bulgaria	NR	NR
Croatia	NR	NR
Cyprus	No	No
Czechia	Yes	NR
Denmark	No	No
Estonia	No	No
Finland	No	No
France	Yes	Yes
Germany	Yes	NR
Greece	Yes	NR
Hungary	No	No
Iceland	Yes	Yes
Ireland	NR	NR
Italy	No	No
Latvia	No	No
Liechtenstein	NR	NR
Lithuania	NR	NR
Luxembourg	NR	NR
Malta	No	No
Netherlands	No	Yes
Norway	Yes	Yes
Poland	NR	NR
Portugal	NR	Yes
Romania	No	No
Slovakia	No	No
Slovenia	Yes	No
Spain	Yes	No
Sweden	Yes	Yes

NR: not reported.

Assessment and conclusions

Summary of donor assessment and deferral strategies in EU/EEA countries

Nearly all responding countries reported having existing criteria to assess and defer prospective donors returning from dengue-endemic areas. However, only 55% reported criteria to assess and defer prospective donors returning from non-endemic countries with affected areas.

The definition of the geographical size of an affected area varied across reporting countries, and depending on whether it concerned an endemic or a non-endemic country. Affected areas in endemic countries were more frequently defined at the country level, while in non-endemic countries they were often set at the municipality level. Clusters of dengue in non-endemic areas are highly focal due to the limited flight capacity of the mosquitoes carrying DENV. As a result, it is considered very unlikely for someone to be infected by a mosquito bite outside of a short radius (e.g. 200–250 meters [29]) around infected individuals.

The most heterogeneous finding across countries was the trigger for safety measures in the event of outbreaks in the EU/EEA. Some countries implement measures with the first reported autochthonous case, whereas others perform case-by-case assessments and may only consider outbreaks with an elevated number of cases or a rapidly increasing number of cases. Safety measures aim to mitigate the risk that a traveller returning from an affected area and infected by DENV presents for blood donation while being both viraemic and asymptomatic. The association between the size of an outbreak and the likelihood of a viraemic prospective donor presenting for donation without symptoms is unknown in the EU/EEA. This association has was touched upon during an outbreak in Rio de Janeiro [25]. The authors estimated that there was one RNA-positive donation per 800 clinical dengue cases in the general population of donor-age. However, this number has been estimated in the context of a large outbreak in an endemic area where the relative proportion of asymptomatic and clinical cases of dengue is probably different to non-endemic areas, due to higher prevalence of antibodies against one or more DENV serotypes in the population. This number may not be applicable to the EU/EEA context where the prevalence of DENV-naïve individuals is expected to be higher, likely resulting in a lower proportion of asymptomatic cases. In this study, the proportion of reported symptomatic disease was estimated at 37%.

A related element that may be associated with heterogeneity in the criteria triggering safety measures are limitations related to surveillance: possible delays and lack of completeness of reported dengue cases in the EU. In the EU, surveillance of DENV infections is now established in affected countries but may not be as effective as for endemic diseases, such as West Nile virus infections for which there are consolidated systems and greater awareness.

Countries that recommend safety measures for prospective donors returning from affected or endemic areas do so for prospective donors having had an overnight stay in the affected area. It is worth noting that, while considered a diurnal species, the peak activity for *Ae. albopictus* and *Ae. aegypti* is in the early hours of the morning and late hours of the afternoon [30,31], periods which should be covered by overnight stays.

Once implemented, the most frequent preventive measure reported by countries is the temporary deferral for travellers returning from an affected area. The reported deferral periods were very homogeneous, with 28 days reported by all ten countries providing data. This deferral period covers more than twice the expected incubation period for dengue infection (range: 3–10 days [10]) and is identical to the deferral period considered for West Nile virus which may simplify the implementation of deferral periods for areas that are affected by both viruses. Only three countries reported the use of NAT for the prospective donors returning from affected areas, all other countries only reported the use of a 28-day deferral period.

The survey questionnaire did not include in-depth questions on the safety measures or supporting evidence. More detailed safety measures implemented in some EU/EEA countries are described in publicly-available documents [32].

Starting from the 2025 season, ECDC will publish weekly surveillance updates on its website. A report including maps will describe the ongoing clusters in the EU/EEA, including localisation at municipality level (local administrative unit), when reported by affected countries, and the number of reported cases in the cluster. Grouping of cases in clusters will be the responsibility of the reporting countries. A cluster will be reported if at least one confirmed case of autochtonous dengue has been identified, but clusters can include probable cases as well (see annexes for the case definitions). Clusters will be reported as 'closed' 45 days after the last reported date of symptom onset [28].

In the coming years, as part of its designation as an expert institution for the communicable diseases field in the SoHO regulation [33], ECDC intends to publish formal guidelines on preventing the transmission of arboviruses through SoHO, including DENV. The scope of ECDC's work on technical guidelines for the prevention of communicable disease transmission through SoHO and expected timelines is published on ECDC's website[4].

[4] https://www.ecdc.europa.eu/en/dengue-fever/surveillance-and-disease-data

Gaps and limitations

This report has several limitations that should be considered. Only 22 out of 30 EU/EEA countries replied to the survey, providing an incomplete overview of the safety measures considered by EU/EEA countries for prospective blood donors returning from dengue-affected areas. However, it is noteworthy that countries affected by local outbreaks dengue virus replied to the survey. The survey was designed to support expert discussions rather than provide comphresenive overview of safety measures, and its brevity did not capture the full extent of safety measures implemented by countries. Finally, the ssurvey did not include questions on the rationale or evidence supporting the safety measures reported by the countries. As a result, the relative benefit of the different measures (e.g., temporary deferral or NAT screening) could not be explored.

Uncertainty and research gaps on the disease

- The proportion of asymptomatic or undetected DENV infection cases in outbreaks occurring in EU/EEA countries is unknown.
- The likelihood of severe DENV infection in recipients of blood transfusion in the EU/EEA is unknown.

Uncertainty and research gaps on the risk for blood transfusion

- The association between the size of an outbreak and the identification of DENV RNA-positive blood donations, in the affected area or among returning travellers, is unknown for outbreaks occurring in EU/EEA countries. Consequently, a proportionate trigger based on cluster size – including cost-effectiveness considerations – for implementing safety measures for affected areas in EU/EEA countries is unknown.
- The value of DENV RNA NAT screening compared to temporary deferral of donors for returning travellers as a preventive measure for outbreaks in the EU/EEA is unknown.
- The reasons that can explain the low number of transfusion-transmitted dengue relative to the very high number of DENV infections in endemic countries are uncertain.

References

1. Wilder-Smith A, Ooi EE, Horstick O, Wills B. Dengue. Lancet. 2019 Jan 26;393(10169):350-63. Available at: https://www.ncbi.nlm.nih.gov/pubmed/30696575
2. Basurko C, Matheus S, Hilderal H, Everhard S, Restrepo M, Cuadro-Alvarez E, et al. Estimating the Risk of Vertical Transmission of Dengue: A Prospective Study. Am J Trop Med Hyg. 2018 Jun;98(6):1826-32. Available at: https://www.ncbi.nlm.nih.gov/pubmed/29692297
3. Gimenez-Richarte A, Ortiz de Salazar MI, Gimenez-Richarte MP, Collado M, Fernandez PL, Clavijo C, et al. Transfusion-transmitted arboviruses: Update and systematic review. PLoS Negl Trop Dis. 2022 Oct;16(10):e0010843. Available at: https://www.ncbi.nlm.nih.gov/pubmed/36201547
4. Punzel M, Korukluoglu G, Caglayik DY, Menemenlioglu D, Bozdag SC, Tekgunduz E, et al. Dengue virus transmission by blood stem cell donor after travel to Sri Lanka; Germany, 2013. Emerg Infect Dis. 2014 Aug;20(8):1366-9. Available at: https://www.ncbi.nlm.nih.gov/pubmed/25062084
5. Gajurel K, Dhakal R, Deresinski S. Arbovirus in Solid Organ Transplants: A Narrative Review of the Literature. Viruses. 2024 Nov 15;16(11) Available at: https://www.ncbi.nlm.nih.gov/pubmed/39599892
6. Lee C, Jang EJ, Kwon D, Choi H, Park JW, Bae GR. Laboratory-acquired dengue virus infection by needlestick injury: a case report, South Korea, 2014. Ann Occup Environ Med. 2016;28:16. Available at: https://www.ncbi.nlm.nih.gov/pubmed/27057314
7. Lee C, Lee H. Probable female to male sexual transmission of dengue virus infection. Infect Dis (Lond). 2019 Feb;51(2):150-2. Available at: https://www.ncbi.nlm.nih.gov/pubmed/30318968
8. Paz-Bailey G, Adams LE, Deen J, Anderson KB, Katzelnick LC. Dengue. Lancet. 2024 Feb 17;403(10427):667-82. Available at: https://www.ncbi.nlm.nih.gov/pubmed/38280388
9. De Santis O, Bouscaren N, Flahault A. Asymptomatic dengue infection rate: A systematic literature review. Heliyon. 2023 Sep;9(9):e20069. Available at: https://www.ncbi.nlm.nih.gov/pubmed/37809992
10. Chan M, Johansson MA. The incubation periods of Dengue viruses. PLoS One. 2012;7(11):e50972. Available at: https://www.ncbi.nlm.nih.gov/pubmed/23226436
11. Chagas GCL, Rangel AR, Noronha LM, Veloso FCS, Kassar SB, Oliveira MJC, et al. Risk factors for mortality in patients with dengue: A systematic review and meta-analysis. Trop Med Int Health. 2022 Aug;27(8):656-68. Available at: https://www.ncbi.nlm.nih.gov/pubmed/35761748
12. World Health Organization (WHO). WHO Position Paper on Dengue Vaccines, May 2024. Weekly epidemiological record. WHO: Geneva, 2024. Available at: https://iris.who.int/bitstream/handle/10665/376641/WER9918-eng-fre.pdf
13. Guzman MG, Halstead SB, Artsob H, Buchy P, Farrar J, Gubler DJ, et al. Dengue: a continuing global threat. Nat Rev Microbiol. 2010 Dec;8(12 Suppl):S7-16. Available at: https://www.ncbi.nlm.nih.gov/pubmed/21079655
14. Katzelnick LC, Gresh L, Halloran ME, Mercado JC, Kuan G, Gordon A, et al. Antibody-dependent enhancement of severe dengue disease in humans. Science. 2017 Nov 17;358(6365):929-32. Available at: https://www.ncbi.nlm.nih.gov/pubmed/29097492
15. Zeng Z, Zhan J, Chen L, Chen H, Cheng S. Global, regional, and national dengue burden from 1990 to 2017: A systematic analysis based on the global burden of disease study 2017. EClinicalMedicine. 2021 Feb;32:100712. Available at: https://www.ncbi.nlm.nih.gov/pubmed/33681736
16. European Centre for Disease Prevention and Control (ECDC). Communicable Disease Threats Report - Week 5, 24-31 January 2025. ECDC: Stockholm; 2025. Accessible at: https://www.ecdc.europa.eu/en/publications-data/communicable-disease-threats-report-24-31-january-2025-week-5
17. European Centre for Disease Prevention and Control (ECDC). Local transmission of dengue virus in mainland EU/EEA, 2010-present. ECDC: Stockholm; 2025. Accessible at: https://www.ecdc.europa.eu/en/all-topics-z/dengue/surveillance-and-disease-data/autochthonous-transmission-dengue-virus-eueea
18. Kraemer MUG, Reiner RC Jr Brady OJ, Messina JP, Gilbert M, Pigott DM, et al. Past and future spread of the arbovirus vectors *Aedes aegypti* and *Aedes albopictus*. Nat Microbiol. 2019 May;4(5):854-63.
19. Petersen LR, Busch MP. Transfusion-transmitted arboviruses. Vox Sang. 2010 May;98(4):495-503. Available at: https://www.ncbi.nlm.nih.gov/pubmed/19951309
20. Sabino EC, Loureiro P, Lopes ME, Capuani L, McClure C, Chowdhury D, et al. Transfusion-Transmitted Dengue and Associated Clinical Symptoms During the 2012 Epidemic in Brazil. J Infect Dis. 2016 Mar 1;213(5):694-702. Available at: https://www.ncbi.nlm.nih.gov/pubmed/26908780
21. Almeida FJ, Pacheco JT, Farias CGA, de Matos SF, de Morais CO, Guerra GG, et al. Dengue: a hidden threat in blood transfusions amidst Brazil's largest outbreak? Lancet Infect Dis. 2025 Jan;25(1):e10. Available at: https://www.ncbi.nlm.nih.gov/pubmed/39622264

22. Limothai U, Tachaboon S, Dinhuzen J, Singh J, Leewongworasingh A, Watanaboonyongcharoen P, et al. Dengue virus transmission risk in blood donation: Evidence from Thailand. J Med Virol. 2024 Jun;96(6):e29689. Available at: https://www.ncbi.nlm.nih.gov/pubmed/38818789
23. Levi JE. Dengue Virus and Blood Transfusion. J Infect Dis. 2016 Mar 1;213(5):689-90. Available at: https://www.ncbi.nlm.nih.gov/pubmed/26908779
24. Gimenez-Richarte A, de Salazar MO, Arbona C, Gimenez-Richarte MP, Collado M, Fernandez PL, et al. Prevalence of Chikungunya, Dengue and Zika viruses in blood donors: a systematic literature review and meta-analysis. Blood Transfus. 2022 Jul;20(4):267-80. Available at: https://www.ncbi.nlm.nih.gov/pubmed/34694219
25. Busch MP, Sabino EC, Brambilla D, Lopes ME, Capuani L, Chowdhury D, et al. Duration of Dengue Viremia in Blood Donors and Relationships Between Donor Viremia, Infection Incidence and Clinical Case Reports During a Large Epidemic. J Infect Dis. 2016 Jul 1;214(1):49-54. Available at: https://www.ncbi.nlm.nih.gov/pubmed/27302934
26. Harris PA, Taylor R, Minor BL, Elliott V, Fernandez M, O'Neal L, et al. The REDCap : Building an international community of software platform partners. J Biomed Inform. 2019 Jul;95:103208. Available at: https://www.ncbi.nlm.nih.gov/pubmed/31078660
27. Domanovic D, Giesecke J. How to define an area where transmission of arthropod-borne disease is occurring Eurosurveillance. 2012;17(20)
28. European Centre for Disease Prevention and Control (ECDC). Public health guidance for assessing and mitigating the risk of locally-acquired Aedes-borne viral diseases in the EU/EEA. Stockholm: ECDC; 2025. Available at: https://www.ecdc.europa.eu/en/publications-data/public-health-guidance-assessing-and-mitigating-risk-locally-acquired-aedes-borne
29. Haut Conseil de la santé publique (HSCP). Dengue et chikungunya: mesures pour la sécurité transfusionnelle et des greffes. HSCP: Paris; 2019. https://www.hcsp.fr/explore.cgi/avisrapportsdomaine?clefr=722
30. Lima-Camara TN. Activity Patterns of *Aedes Aegypti* and *Aedes Albopictus* (Diptera: Culicidae) under Natural and Artificial Conditions. Oecologia Australis. 2010;14(03):737-6
31. Muhammad NAF, Abu Kassim NF, Ab Majid AH, Abd Rahman A, Dieng H, Avicor SW. Biting rhythm and demographic attributes of Aedes albopictus (Skuse) females from different urbanized settings in Penang Island, Malaysia under uncontrolled laboratory conditions. PLoS One. 2020;15(11):e0241688. Available at: https://www.ncbi.nlm.nih.gov/pubmed/33175896
32. European Centre for Disease Prevention and Control (ECDC). Repository of Policy and Practice Resources. ECDC: Stockholm; 2025. Available at: https://qap.ecdc.europa.eu/public/extensions/repository-ppr/repository-ppr.html.
33. European Commission (EC). Regulation (EU) 2024/1938 of the European Parliament and of the Council of 13 June 2024 on standards of quality and safety for substances of human origin intended for human application and repealing Directives 2002/98/EC and 2004/23/EC. Available at: https://eur-lex.europa.eu/legal-content/EN/TXT/?uri=OJ:L_202401938
34. European Commission (EC). Commission Implementing Decision (EU) 2018/945 of 22 June 2018 on the communicable diseases and related special health issues to be covered by epidemiological surveillance as well as relevant case definitions. EC: Brussels, 2018. at: https://eur-lex.europa.eu/legal-content/EN/TXT/PDF/?uri=CELEX:32018D0945&from=EN.

Annex 1. Survey

A. DONOR DEFERRAL	
1) Are there specific deferral criteria for donors with dengue fever diagnosis implemented in your country?	◯ Yes ◯ No
1.1. If yes, could you describe the deferral criteria?	_____
2) Are there deferral criteria for donors at risk for dengue infection currently implemented in your country? Please select all the options that apply.	☐ Yes, for travellers returning from endemic areas. ☐ Yes, for travellers returning from an affected non-endemic area (EU/EEA or non-EU/EEA). ☐ Yes, for donors within an affected area in my country (if applicable). ☐ No.
If yes, could you describe the deferral criteria?	_____
2.1. At which level are deferral criteria provided in your country?	☐ National recommendations/guidance/regulations regarding dengue deferral ☐ Regional or local recommendations/guidance/regulations regarding dengue deferral ☐ Other _____
2.2. Are there any epidemiological thresholds for deciding on the implementation of deferral criteria for endemic and/or non-endemic affected areas? (for example, does one human case in an affected area trigger deferral criteria or is there the need for a defined number of cases in an affected area for the decision on deferral?)	◯ Yes ◯ No
2.2.1. For endemic areas? (please specify)	_____
2.2.2. For outbreaks within EU/EEA or other non-endemic areas? (please specify)	
For outbreaks in non-endemic areas outside of EU/EEA:	☐ Country-level ☐ Administrative region (e.g., federative unit in Brazil) ☐ Municipality ☐ Other _____
For outbreaks within the EU/EEA: For additional information, please see https://ec.europa.eu/eurostat/web/nuts	☐ Country-level ☐ NUTS-2 ☐ NUTS-3 ☐ Municipality/LAU ☐ Other _____
Please provide additional comments, if any.	_____
2.4. For how long are the deferral criteria considered valid?	◯ During the current mosquito season, only ◯ During the current mosquito season and for the following season ◯ During the whole year ◯ During the whole current year and for the following year
Please provide additional comments, if any.	_____
2.5. Can you provide estimates of the number of prospective blood donors that have been deferred for a risk of dengue infection only (i.e., not deferred due to other risks)?	◯ Yes ◯ No
In 2024:	_____
In 2023:	_____

B. TESTING STRATEGIES

3) Are testing strategies in place for potential donors at risk?	◯ Yes ◯ No
3.1. If yes, what testing strategies are in place? Please specify the technique used (serology, NAT, individual donation or pooled NAT...).	_____
3.2. What are the consequences of positive findings?	_____
3.3. If testing strategies are in place for potential donors at risk, can you provide estimates of: - The number of prospective blood donors tested for dengue virus (DENV)?	◯ Yes ◯ No
In 2024:	_____
In 2023:	_____
3.4. If testing strategies are in place for potential donors at risk, can you provide estimates of: - The number of prospective donors tested who had a positive result for DENV?	◯ Yes ◯ No
In 2024:	_____
In 2023:	_____
Please provide additional comments, if any.	_____

C. PATHOGEN REDUCTION/INACTIVATION TECHNIQUES

4) Are pathogen reduction/inactivation techniques in place in your country?	◯ Yes ◯ No
4.1. If yes, for which blood components? Platelets _____ Plasma _____ Other _____	
Please provide additional comments, if any.	_____

Annex 2. Dengue virus infection EU case definition[34]

Clinical criteria

- Fever.

Laboratory criteria

A. Probable case

- Detection of dengue specific IgM antibodies in a single serum sample.

B. Confirmed case

At least one of the following five:

- Isolation of a dengue virus from a clinical specimen;
- Detection of dengue viral nucleic acid from a clinical specimen;
- Detection of dengue viral antigen from a clinical specimen;
- Detection of dengue specific IgM antibodies in a single serum sample AND confirmation by neutralization;
- Seroconversion or four-fold antibody titre increase of dengue specific antibodies in paired serum samples.

Epidemiological criteria

History of travel to, or residence in an area with documented on-going transmission of dengue, within the two-week period prior to the onset of symptoms.

Case classification

A. Possible case: not applicable.

B. Probable case

Any person meeting the clinical and the epidemiological criteria, and the laboratory criteria for a probable case.

C. Confirmed case

Any person meeting the laboratory criteria for a confirmed case.