TECHNICAL DOCUMENT

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Zika virus disease epidemic: Preparedness planning guide for diseases transmitted by *Aedes aegypti* and *Aedes albopictus*

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Abbreviations

EEA	European Economic Area
ENIVD	European Network for Diagnostics of 'Imported' Viral Diseases
EWRS	Early Warning and Response System
GIS	Geographic information system
IHR	International Health Regulations
NGOs	Non-governmental organisations
SoHO	Substances of human origin
TESSy	The European Surveillance System
VectorNet	European network for sharing data on the geographic distribution of arthropod vectors, transmitting human and animal disease agents
WHO	World Health Organization

Entomological terminology

Arbovirus. Refers to viruses that are transmitted by arthropod vectors such as mosquitoes, sandflies, or ticks.

Invasive mosquito species. An invasive species is an exotic species that establishes and proliferates within an ecosystem and whose introduction causes, or is likely to cause, economic or environmental impact or harm to human health.

Native or indigenous mosquito species. A native or indigenous species is a species that occurs within its natural geographical range (past or present) and dispersal potential (i.e. within the range it occupies naturally, or could occupy, without direct or indirect introduction or other human intervention).

Introduction of mosquito species. Introduction is the process of bringing a species from its endemic range into a biogeographic area to which it is completely foreign.

Establishment of mosquito species. Establishment is the perpetuation, for the foreseeable future, of an invasive species within an area following the species' introduction.

Susceptible host. In the context of vector-borne diseases, 'susceptible host' is defined as an organism non-immune to the pathogen that can be infected by a pathogen through a vector-borne transmission mode. The host can be symptomatic or not. Depending on the characteristics of the disease, the susceptible host can become infectious to the vector and act as the source of further transmission.

Receptive area. A receptive area is an area where an abundant vector population is present and where the ecological and climatic factors favour the transmission of an arbovirus. To appraise receptivity one needs to assess vector capacity and the environmental and climatic suitability for transmission in that area.

Vector competence. Vector competence is the ability of an arthropod to transmit an infectious agent following exposure to that agent. In other words, it refers to the ability of a vector to acquire an arbovirus from a reservoir host and later transmit this arbovirus to a susceptible host during the act of taking another blood meal.
Vector competence can be assessed under laboratory conditions using artificial feeding of the vector species under study with blood meal infected with the pathogen (e.g. Zika virus). A sequential analysis of blood-fed mosquito pools at successive times is performed in order to identify the presence and quantity of the virus in the salivary glands. If the virus is identified in the salivary glands, it is assumed that the mosquitoes can transmit the disease to the susceptible host.
Competence depends on the characteristics of the pathogen (strain-specific vector competence) and the origin of the mosquito species. Mosquito populations originating from different areas but belonging to the same species can have different level of vector competence.

Aedes aegypti, current knowledge of vector competence:

- The first observation of vector competence for *Aedes aegypti* (population form Ikeja form Lagos state, Nigeria) was provided by Boorman et al. in 1956[1]. Cornet et al. showed that *Aedes aegypti* populations from Senegal are competent vectors of Zika virus[2]. In 2015, Diagne et al. could not confirm these observations in *Aedes aegypti* from Senegal[3].
- Li et al. showed under experimental conditions that *Aedes aegypti* from Singapore is a competent vector of Zika virus[4].

Aedes albopictus, current knowledge of vector competence:

- Wong et al. showed by experimental infection that local *Aedes albopictus* from Singapore is competent to transmit Zika virus[5].

Wild-caught *Aedes spp.* have been found infected with Zika virus in various settings. The detection of wild-caught infected mosquitoes does not imply directly that the vector is competent (e.g. wild-caught *Aedes albopictus* have

[1] Boorman JP, Porterfield JS. A simple technique for infection of mosquitoes with viruses; transmission of Zika virus. Trans R Soc Trop Med Hyg. 1956 May;50(3):238-42.

[2] Cornet M, Robin Y, Adam C, Valade M, Calvo MA. Transmission expérimentale comparée du virus amaril et du virus Zika chez *Aedes aegypti L.* Cah ORSTOM, Entomol Med Parasitol. 1979;17(1):47-53.

[3] Diagne CT, Diallo D, Faye O, Ba Y, Faye O, Gaye A, et al. Potential of selected Senegalese *Aedes spp.* mosquitoes (Diptera: *Culicidae*) to transmit Zika virus. BMC Infect Dis. 2015;15:492.

[4] Li MI, Wong PS, Ng LC, Tan CH. Oral susceptibility of Singapore *Aedes (Stegomyia) aegypti* (Linnaeus) to Zika virus. PLoS Negl Trop Dis. 2012;6(8):e1792.

[5] Wong PS, Li MZ, Chong CS, Ng LC, Tan CH. *Aedes (Stegomyia) albopictus* (Skuse): a potential vector of Zika virus in Singapore. PLoS Negl Trop Dis. 2013 Aug;7(8):e2348.

been found infected with Zika virus in Gabon; Zika virus was detected in Senegal in 31 mosquito pools with various mosquito species, mainly *Ae. furcifer, Ae. luteocephalus, Ae. africanus* and *Ae. vittatus*[6,7].

Vectorial capacity. The concept of vectorial capacity (or vector capacity) was developed for transmission models of vector-borne parasitic diseases, but can also be applied to arboviral diseases such as Zika virus. It is frequently used as a framework for disease transmission modelling.
Vector capacity is determined by a number of factors such as vector competence, the mosquito population density, feeding host preferences, biting rates and survival of the mosquito population.
In practice, the occurrence of an arbovirus outbreak is not only dependant on the presence of a competent vector in a location. This is a necessary, but not sufficient, condition. Mosquitoes may be competent, but if they have low vector capacity, they are not effective vectors. For instance a competent vector with a zoophilic feeding behaviour will not have with a high vector capacity with regard to pathogen transmission to humans.

[6] Grard G, Caron M, Mombo I, Nkoghe D, Mboui Ondo S, Jiolle D, et al. Zika virus in Gabon (Central Africa) – 2007: A new threat from *Aedes albopictus*? PLoS Negl Trop Dis. 2014.

[7] Diallo D, Sall AA, Diagne CT, Faye O, Faye O, Ba Y, et al. Zika virus emergence in mosquitoes in southeastern Senegal, 2011. PLoS One. 2014;9(10):e109442.

1 Introduction

On 1 February 2016, WHO declared that the observed increase of congenital microcephaly and other neurological disorders associated with the Zika outbreak constituted a public health emergency of international concern [1].

The threat posed by Zika virus infection highlights the need to reinforce preparedness for mosquito-borne diseases in EU/EEA countries, especially for pathogens transmitted by *Aedes aegypti* and *Aedes albopictus*, which are vectors of Zika virus and other arboviruses, for example dengue, chikungunya and yellow fever.

The aim of this document is to highlight preparedness activities that can effectively contribute to reduce the risk of importation and local transmission of pathogens transmitted by *Ae. aegypti* and *Ae. Albopictus*. The main diseases of concern in this context are Zika, dengue, chikungunya and yellow fever.

This document focuses mainly on the transmission of these four diseases by mosquito bite as this is the main mode of transmission. However, other modes of transmission, such as sexual transmission, perinatal transmission and potential transmission through blood transfusion, are also considered.

This document draws on internal consultations among ECDC experts, on previous ECDC publications, and on documents by national and international organisations that deal with preparedness planning for diseases transmitted by *Ae. aegypti* and *Ae. albopictus*.

Experts for preparedness activities in Member States can use this document to determine which capacities and capabilities their organisations need to strengthen in order to detect cases of importation and/or local transmission of Zika virus, how to respond to the threat of Zika virus, and how to deliver risk communication messages.

This preparedness planning guide focuses on the following main components that should be considered when developing preparedness plans:

- Identification of risk areas
- Organisation and coordination
- Early detection
- Response
- Risk and crisis communication

2 Identification of risk areas

Areas with abundant vector populations, and where the ecological and climatic factors favour the transmission of an arbovirus, are classified as receptive areas. To evaluate receptivity, it is necessary to assess vector capacity and the environmental and climatic suitability of transmission in that area.

2.1 Vector capacity and environmental suitability

The capacity of a competent vector to transmit Zika virus and other viruses as dengue, chikungunya and yellow fever is determined by a number of factors, such as mosquito population density, feeding host preferences, biting rates, environmental conditions. (See ECDC Rapid Risk Assessment on Zika, dated 9 March 2016 [2]).

Aedes aegypti is considered the main competent vector of Zika and dengue viruses. It is also a competent vector of chikungunya virus [3] and yellow fever. *Ae. aegypti* is established in most of the EU Overseas Countries and Territories, EU Outermost Regions, and on the eastern coast of the Black Sea in continental Europe.

Aedes albopictus is an important vector of dengue and chikungunya and has proven to be a competent vector of Zika virus [4-6]. It is established in several regions around the Mediterranean basin.

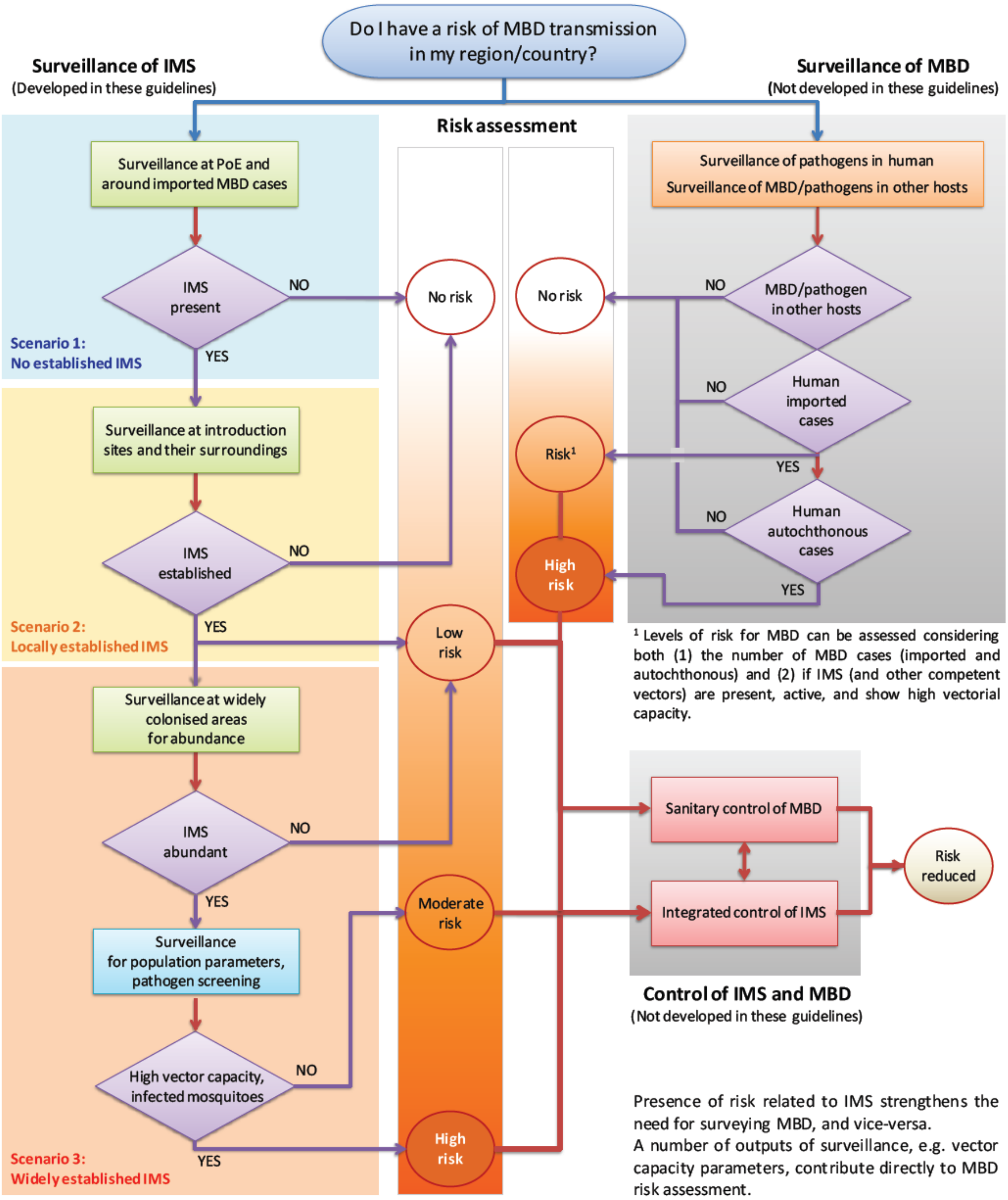
ECDC has been monitoring the spatial distribution of these two *Aedes* species since 2008 (see Annexes 1 and 2) [7]. Several studies have analysed the potential climatic suitability of various regions for these vectors [8].

The receptivity of a specific area might evolve over time as the two mosquito species are steadily spreading in some parts of Europe [9-11].

2.2 Data gathering

Entomological surveillance in EU/EEA countries is required to determine whether a competent vector is present and abundant as well as whether the environmental and climatic conditions are suitable for transmission at the local level. ECDC's *Guidelines for the surveillance of invasive mosquitos in Europe* have been developed for this purpose [12].

Figure 1. Decision diagram for the implementation of surveillance of invasive mosquito species



IMS: invasive mosquito species; MBD: mosquito-borne diseases

Source: European Centre for Disease Prevention and Control. Guidelines for the surveillance of invasive mosquitoes in Europe. Stockholm: ECDC; 2012 [12].

A precise identification of receptive areas is required to allow accurate risk assessments. An ECDC decision algorithm is available (Annex 3) to guide the risk assessment process [12].

2.3. Scenarios and overall actions

Preparedness planning should consider the following scenarios:

Scenario A. Areas receptive for arbovirus transmission:

- During the period of mosquito activity[8]
- Outside the period of mosquito activity.

Scenario B. Areas not receptive for arbovirus transmission[9].

Both scenarios require the following measures:

- Early detection and reporting of human cases
- Response after detection of cases:
  - case management (including safety measures related to substances of human origin)
  - determining the risk of further transmission.

For Scenario A, the following additional actions should be taken:

- Early detection and reporting of mosquito-borne infections in humans
- Monitoring and reporting of mosquito activity
- Additional response actions after detection of cases:
  - epidemiological investigation
  - vector control
  - measures to ensure the safety of substances of human origin.

[8] Period when mosquito activity can be detected through standard entomological surveillance.

[9] In these areas, autochthonous cases of Zika virus can occur through sexual and perinatal transmission.

3 Organisation and coordination

Planning preparedness activities will require a strategic and operational approach to ensure the availability of plans and/or other preparedness documents at the national, regional and local levels.

The main planning will require the following:

- Assessing and strengthening existing capacities (structures/services, staff equipment, written plans, standard operating procedures) and capabilities (vocational education and training, professional experience) for all response measures
- Ensuring cross-sectoral collaboration and clearly defined roles and responsibilities
- Identifying triggers for response in accordance with the various risk levels
- Establishing a multidisciplinary team to coordinate response measures following an alert
- Assessing the level of preparedness through simulation exercises and incidence reviews
- Ensuring the monitoring and evaluation of response and recovery measures.

A multidisciplinary team is required for the identification of stakeholders and partners in the health and other sectors, e.g. environment, territorial administration, transport, and tourism.

Capacity alone does not ensure readiness. Capabilities are required and imply a continuous effort to strengthen systems and competencies. Healthcare professionals in the primary and secondary healthcare settings, from both the public and private sectors, may need to reinforce their knowledge and practices in clinical awareness, assessment of mosquito-borne viral diseases and case reporting. This can be ensured by holding dedicated training sessions on clinical aspects and severe forms of mosquito-borne diseases as well as through simulation exercises which test procedures and explore capacities and capabilities. In addition, existing documents should be updated to reflect the changed situation [13].

In areas/regions with a competent vector, it is crucial that standard operating procedures are in place ahead of the potential transmission period and ready to be activated. Field investigations and vector control measures should be implemented as soon as human cases, either imported or autochthonous, are detected [14,15].

In addition to simulation exercises, incident reviews or post-incident evaluations should also be part of an organisation's preparedness planning activities.

4 Early detection and warning

Capacity for early warning and detection at national and cross-sectoral levels (as well as at the international level) should be in place for:

- imported human cases
- autochthonous human cases
- human cases infected through other modes of transmission, such as sexual, perinatal and blood transmission
- detection of invasive mosquito vectors.

4.1 Event-based surveillance

Event-based disease surveillance can process information from a large number of sources (e.g. media, social networks, hotlines, blogs, academia/research) in order to ensure the early detection of cases and warning of potential public health threats. ECDC's Round Table Reports and the ECDC Communicable Disease Threats Report are published regularly to support the Member States in their epidemic intelligence activities. Systematically collected data that are made available on a regular basis facilitate the timely assessment of public health risks and ensure the early activation of response mechanisms [16].

4.2 Indicator-based surveillance

The early detection and reporting of human cases remains a key element of epidemiological surveillance in receptive areas. Case definitions are based on Commission Decision 2008/351/EC[10] and on the EU legal framework for the mandatory reporting of viral haemorrhagic fevers [17,18]. In addition, specific case definitions for dengue, chikungunya and Zika are under discussion at the Commission level [19-21]. Specific case definitions connected to algorithms for case finding and laboratory testing are already implemented in a few EU/EEA countries, while other Member States have no such system in place.

ECDC proposed a case definition for Zika virus infection which would support both surveillance and the notification process at the Member-State level [22].

Reporting at the EU level is performed through TESSy for all diseases that are notifiable in the EU, e.g. dengue, chikungunya and yellow fever. The notification of imported and autochthonous cases of Zika virus infection is also required and will soon be implemented. This will also enable data sharing through maps and epidemiological updates [23-25].

4.3 Syndromic surveillance

The implementation of syndromic surveillance for signs and symptoms of mosquito-borne diseases (fever, rash and other symptoms and signs) can be considered of use for clinical suspicion and early detection of human cases.

4.4 Clinical awareness

Healthcare workers from the public and private health sectors should be aware of the importance of early detection. It would be helpful if procedures for clinicians on how to handle patients under suspicion and how to report mosquito-borne diseases could be made available at the healthcare level.

An ECDC algorithm for the public health management of cases under investigation for Zika virus infection is available and can be used for symptomatic patients [26].

Regular training of health staff should be based on existing procedures and focus on clinical suspicion, laboratory procedures and reporting. In case of a public health alert, information should be immediately disseminated to all health professionals, public health services and authorities to not slow down local investigations.

[10] Commission Decision of 28 April 2008 amending Decision 2000/57/EC as regards events to be reported within the early warning and response system for the prevention and control of communicable diseases.

4.5 Laboratory diagnosis

National authorities should ensure sufficient and validated laboratory capacity for virus detection, virus identification and serological testing. For each testing request, laboratories may require complementary information in order to conduct relevant investigations and to analyse and interpret their results correctly. Collaboration and communication between local laboratories and reference laboratories, for additional testing, should be strengthened, for example by sending out notices of shipped samples.

An ECDC *Interim guidance for healthcare providers and Zika virus laboratory diagnosis* is available online and can be used to guide the laboratory diagnosis of samples [27].

For more information on laboratory diagnosis, please refer to the homepage of the ENIVID network for diagnostics of ‘imported’ viral diseases [28].

4.6 Surveillance of severe forms of infection

Public health authorities should consider the possibility of reporting cases – through their disease surveillance systems – among targeted risk groups and offer the option of follow-ups in these groups. As Zika virus infection has been associated with congenital central nervous system malformations and foetal losses among women infected during pregnancy, dedicated disease surveillance of pregnant women should be considered. Children born to mothers who had Zika virus infection should also be monitored [29-33]. For example, epidemiological surveillance could be integrated into the national malformation notification system. Information should be shared between gynaecologists/obstetricians, mother–child care services and public health/epidemiological services.

The surveillance of neurological disorders could also be considered, for example patients with Guillain–Barré syndrome who were infected with Zika virus or other mosquito-borne viruses.

4.7 Entomological surveillance

Entomological surveillance needs to be in place to ensure the early detection of virus circulation or to detect the introduction of competent vectors. The following aspects should be considered:

- Conduct enhanced entomological surveillance in accordance with the IHR, i.e. at entry points such as harbours, ports and airports which have direct flights from disease-endemic areas or areas reporting ongoing transmission. Locations where containers are closed or opened should also be monitored [34]
- Ensure sustainable entomological surveillance. ECDC’s *Guidelines for the surveillance of invasive mosquitoes in Europe* [12] provides a useful overview of entomological surveillance at national and subnational levels
- Ensure that the detection of possible invasive species is reported at the EU level through the VectorNet network [35]
- Use a geographic information system (GIS)
- Establish monitoring of insecticide resistance in the local *Aedes spp.* populations.

4.8 Environmental and meteorological surveillance

The monitoring of relevant environmental data (e.g. breeding sites with suitable environmental conditions) and meteorological data (temperatures and precipitation) is important in receptive areas [9,12]. Monitoring could help predict periods of high mosquito activity and contribute to risk estimates of local transmission.

4.9 Integrated surveillance

In order to ensure a systematic and integrated exchange of information from all surveillance systems, coordination is essential [12]. In receptive areas it is important to integrate epidemiological, entomological, environmental and meteorological data, ideally with the help of a GIS tool. The coordination of integrated surveillance systems requires the involvement of a multidisciplinary team which should be responsible for the surveillance and control of diseases and mosquito vectors.

4.10 Warning and reporting

Surveillance and monitoring data should be systematically and regularly shared between all sectors and at all levels (local, regional and national levels). Alerts and warnings should be based on a joint analysis of surveillance data [12].

The detection of imported or autochthonous cases should be notified at the international level through the Early Warning and Response System (EWRS), The European Surveillance System (TESSy), and the various dedicated disease and/or public health networks. All notifications should comply with WHO International Health Regulations (IHR).

5 Response

The following capacities and capabilities should be strengthened to ensure a rapid and coordinated response.

5.1 Case management

Sufficient health service capacities and capabilities in the primary healthcare and hospital services – both public and private – are essential, and this should be reflected in all strategic and operational plans. A decision tree for case management for hospitals and healthcare centres should be in place, in accordance with the internal procedures for managing clinical cases. Healthcare professionals should be able to detect the early stages of mosquito-borne diseases, as well as their more severe forms, while maintaining a particular focus on high-risk groups (children, pregnant women, immunosuppressed patients, and the elderly).

Information and guidelines on patient and case management of dengue, chikungunya, yellow fever and Zika are available [19-21,27,36-40].

Depending on the actual disease, the case management team should be able to draw on specialist health services: In the case of Zika virus infection, services such as neurology (due to disease manifestations such as encephalitis and/or meningitis, Guillain–Barré syndrome), intensive care units, obstetrics and gynaecology, neonatology, and reproductive health services could be involved.

Although specific treatment is not yet available for dengue, chikungunya and Zika, research may eventually provide drug treatments to be considered.

5.2 Outbreak investigation capacity

In receptive areas, a multidisciplinary outbreak investigation team could be required. In the case of an alert, providing the investigation team with logistic support (including GIS) should be considered at the local level – in accordance with national strategies. The team should collect epidemiological, entomological and environmental information and produce an investigation report to support vector control.

In preparation for an actual alert, public health authorities should provide templates for epidemiological inquiries, especially in areas where a virus-competent vector is present.

5.3 Vector control

It is important to ensure that all sectors collaborate effectively in order to achieve good vector control. Public health authorities should facilitate the cooperation and collaboration of the health sector with other sectors such as environment, transport and tourism, civil defence, urban development, territorial administration and education.

A legal framework for licensing and authorisation for use of biocides at institutional, community and household level could be implemented for vector control.

In areas receptive for arbovirus transmission, it is particularly important to integrate vector management in order to reduce vector density in a sustainable manner. Rapid vector control measures should be planned and prepared so that they can be immediately activated as soon as imported cases are detected. Intersectoral collaboration of all relevant authorities/institutions and efficient public communication strategies to ensure community participation are required for a sustainable vector control programme [41-44].

Information on activities supporting vector control and the reduction of mosquito breeding sites is available from ECDC and other sources [14,15,19-21,30,31,34,45-47].

5.4 Safety measures related to substances of human origin

Timely safety measures for substances of human origin (SoHO) are essential. ECDC information on recommended measures for SoHO is available for dengue, chikungunya and Zika [2,48,49].

Preparedness plans on SoHO safety in areas/regions that report cases should be ready to be activated. Preparedness plans should include actions to be implemented by national competent authorities, SoHO establishments and other actors responsible for the safety and quality of SoHO products. The preparedness plan should consider preventive measures to be applied at every critical step of the SoHO supply chain.

Depending on the actual epidemiological situation, the preparedness plan should also establish methods to continuously assess the risk.

In order to achieve a coordinated and common approach, the Directorate-General for Health and Food Safety (Unit for Medical Products, team for substances of human origin), with the support of ECDC, has established a multi-country working group for developing an EU SoHO safety preparedness plan related to the risk of Zika virus transmission.

5.5 Vaccines

Although there is no vaccine available for most of the viruses transmitted by mosquito vectors, research developments may eventually offer vaccination options, which should be included in the preparedness plan.

Under the IHR for points of entry, a mandatory yellow fever vaccination may be necessary for people arriving from certain endemic countries in areas/regions where *Aedes spp*. are present.

6 Risk and crisis communication

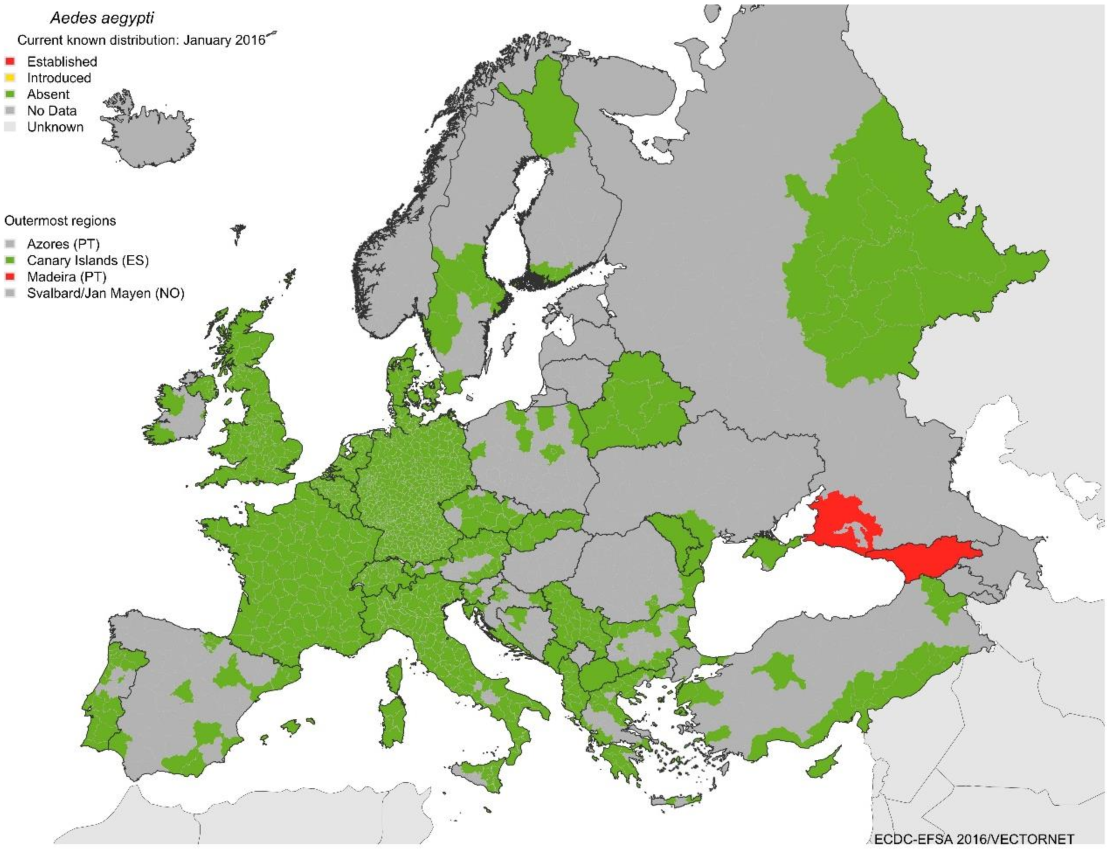
Communication planning requires a strategic and operational approach. For example, communication in a crisis situation should always ensure that the public receives meaningful, relevant and timely information for disease prevention. A communication plan should cover the possibility that certain events – e.g. the discovery of autochthonous cases – receive increased media attention and lead to a higher demand for information from the public.

Communication plans should contain mechanisms to ensure effective communication and cover the following aspects:

- Resource allocation: a sufficient number of staff to ensure adequate capacities to rapidly respond to increased media attention and requests for information (for example working in shifts or ensuring 24/7 availability)
- Effective clearance processes to ensure swift internal approval of information materials such as key messages and 'lines to take'
- Media monitoring and mechanisms to respond to public concerns, misinformation and rumours (e.g. social media monitoring, surveys, focus groups)
- Assessment of the most appropriate communication channels for target audiences. If needed, dedicated channels to convey information to the public or specific audiences (e.g. healthcare workers, travellers, journalists) should be set up, e.g. dedicated websites, hotlines, regular press briefings
- Information for travellers [2]
- A communication plan aimed at health professionals in order to raise awareness of the risk during periods of mosquito vector activity
- Key messages/lines to take: mechanisms to harmonise messages with other national and international organisations, e.g. sharing lines to take, coordination of messaging, linking to useful resources developed by other organisations (e.g. dedicated webpages and other online materials on dengue, chikungunya and Zika from the European Commission and ECDC) [50,51]
- Collaboration with other organisations (associations, private health sector firms, community organisations, NGOs) to disseminate public health messages
- Community engagement: mechanisms to involve communities in disease prevention and health promotion initiatives
- Evaluation: how to monitor the implementation of communication activities and generate lessons learned
- Training: exercises to test communication capacities and capabilities; media training to improve communication skills.

Annex 1. Distribution map for *Aedes aegypti*

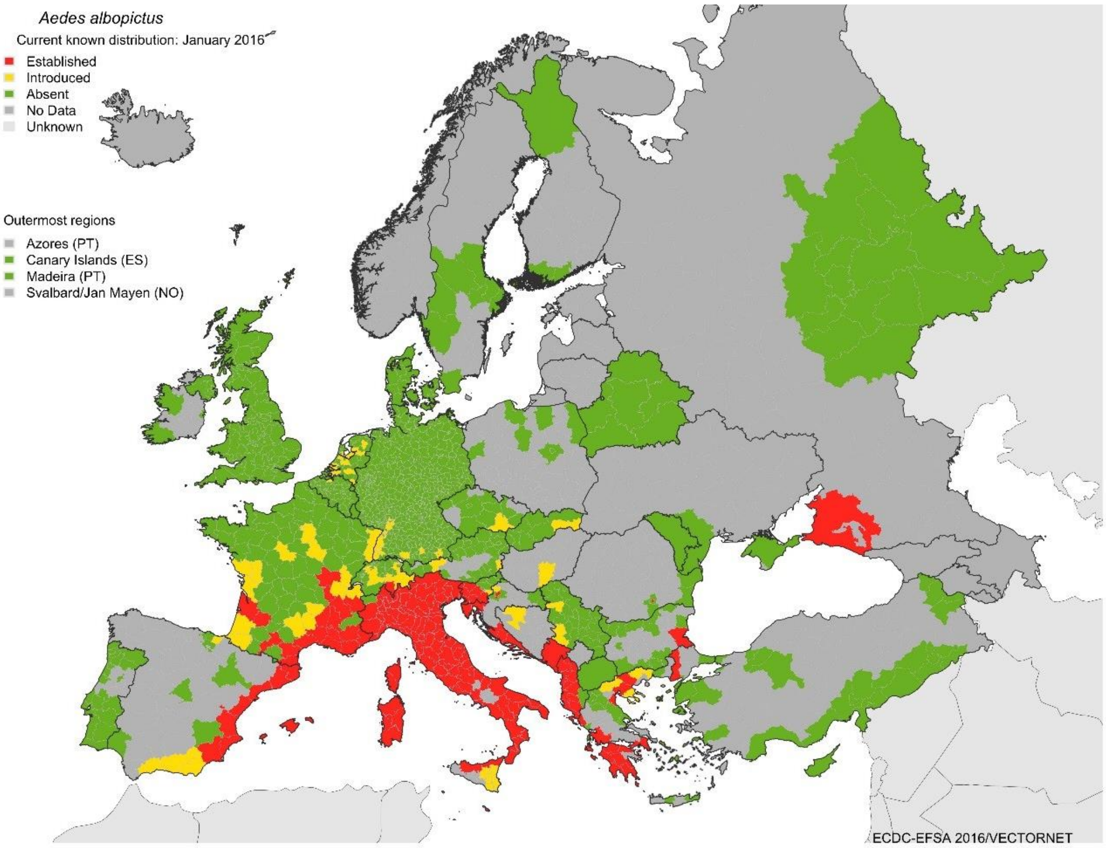
Figure A1. *Aedes aegypti*, current known distribution, January 2016



Source: European Centre for Disease Prevention and Control, VectorNet: Current known distribution of Aedes aegypti *as of January 2016 [Internet]. Stockholm: ECDC; 2016. Available from: http://ecdc.europa.eu/en/healthtopics/vectors/vector-maps/Pages/VBORNET_maps.aspx*

Annex 2. Distribution map for *Aedes albopictus*

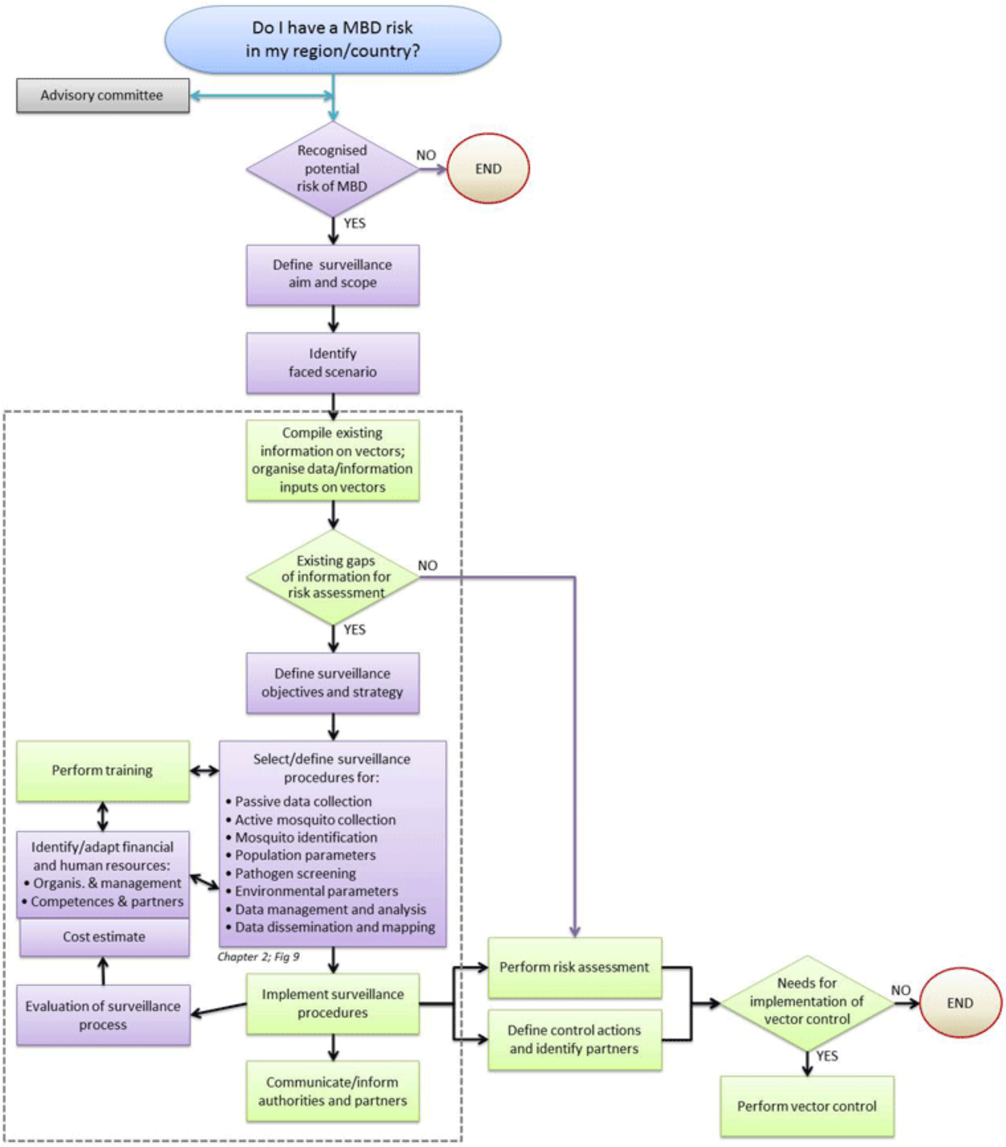
Figure A2. *Aedes albopictus*, current known distribution, January 2016



Source: European Centre for Disease Prevention and Control, VectorNet: Current known distribution of Aedes albopictus *as of January 2016 [Internet]. Stockholm: ECDC; 2016. Available from:* http://ecdc.europa.eu/en/healthtopics/vectors/vector-maps/Pages/VBORNET_maps.aspx

Annex 3. Flowchart and algorithm

Figure A3. Implementation of invasive-mosquito surveillance in response to the risk of mosquito-borne disease in a country/region



Source: European Centre for Disease Prevention and Control. Guidelines for surveillance of invasive mosquitoes in Europe [webpage on the Internet]. Stockholm: ECDC; 2016. Available from: http://ecdc.europa.eu/en/healthtopics/vectors/surveillance-invasive-mosquitoes/Pages/guidelines.aspx.

See also: European Centre for Disease Prevention and Control. Guidelines for the surveillance of invasive mosquitos in Europe [Internet]. Stockholm: ECDC; 2012. Available from: http://ecdc.europa.eu/en/publications/Publications/TER-Mosquito-surveillance-guidelines.pdf.

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