PZH NARODOWY INSTYTUT ZDROWIA PUBLICZNEGO od 1918 r.

PZH NATIONAL INSTITUTE OF PUBLIC HEALTH Est. 1918

Rozprzestrzenianie się chorób przenoszonych przez wektory – obawa, czy realne zagrożenie?

Dissemination of vector-borne diseases - doubt or threat?

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National Institute of Public Health - National Institute of Hygiene, Warsaw, Poland

Zmiana klimatu i zdrowie: Wyzwania dla sektora zdrowia w Polsce. HEAL, SUM, Katowice 8.12.2018

Table 2: Vector- and rodent-borne diseases and pathogens that may be affected by climate change in Europe. Source: ECDC 2008 a,b [22,28].

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	Dengue ^		Cowpox virus
			Lassa fever*

**This disease is currently not prevalent in the European Union*

^ author's „update" 2018

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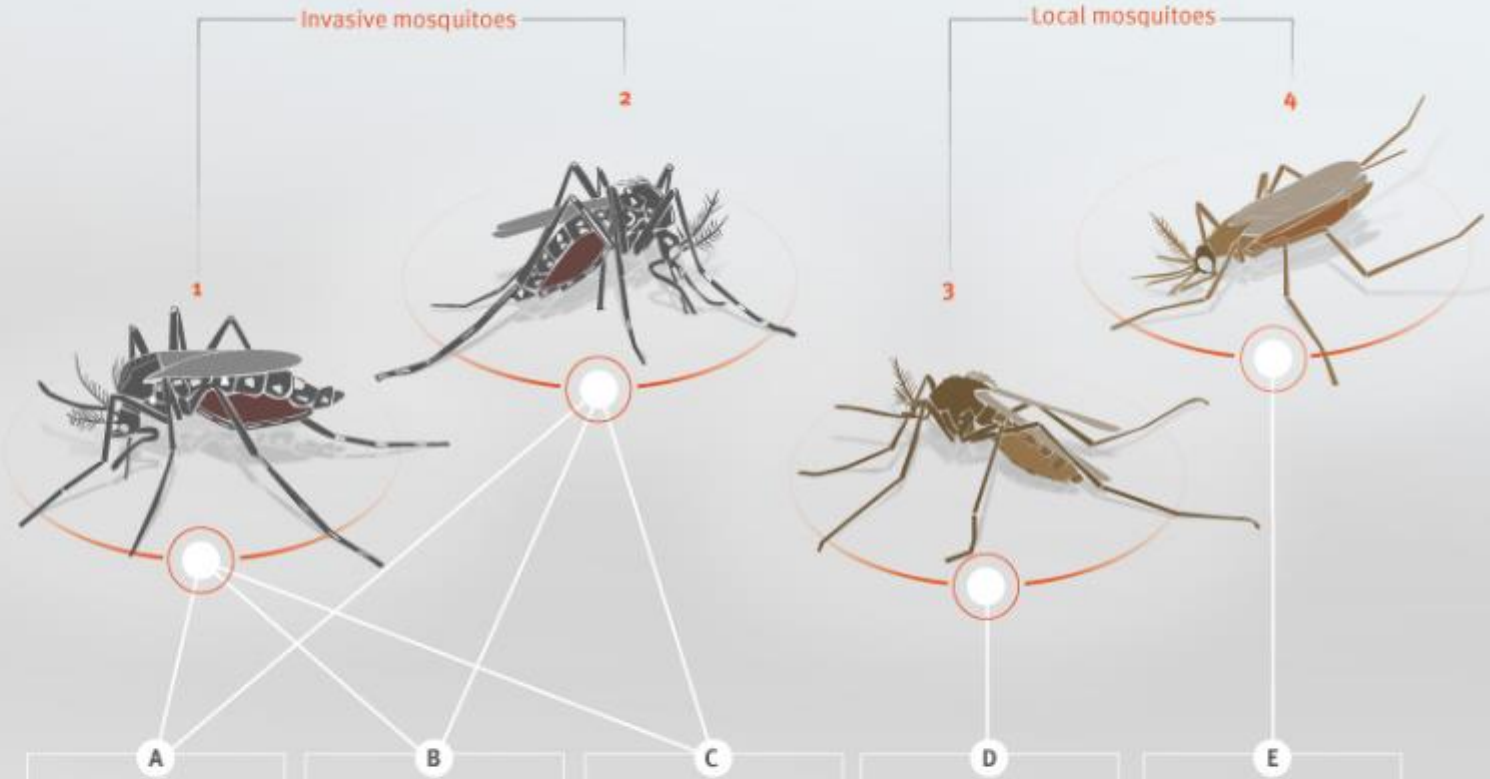
Just one bite away from infection

Different species of mosquitoes can carry different diseases

Invasive mosquitoes are characterised by their ability to colonise new territories. A considerable increase in the spread of invasive mosquitoes has been observed in Europe since the late 1990s.



1. After its disappearance in the 20th century in Europe, ***Aedes aegypti*** has recently become established in Madeira. It is also present in some areas around the Black Sea coast.

2. ***Aedes albopictus*** is considered to be the most invasive mosquito species in the world. It is present in much of southern Europe.

3. ***Culex pipiens*** is the most widespread mosquito in Europe.

4. The ***Anopheles*** mosquito can be found from south-eastern Sweden to Portugal.

A — Chikungunya
Infected people suffer from fever and severe joint pain, which can last for months.

B — Zika
Mild disease with low fever and rash- but most cases are asymptomatic. The risk of serious complications have been identified for some.

C — Dengue
Most infected people have fever lasting seven days. More than 390 million cases are estimated worldwide per year. The most important mosquito-borne disease affecting humans.

D — West Nile fever
Cases can be severe, most often among the elderly. An estimated 1 out of 140 to 320 persons infected can get severely sick.

E — Malaria
Worldwide, approx. 450 000 deaths every year. Early diagnosis and prompt treatment can prevent illness and death. Prophylaxis is available.

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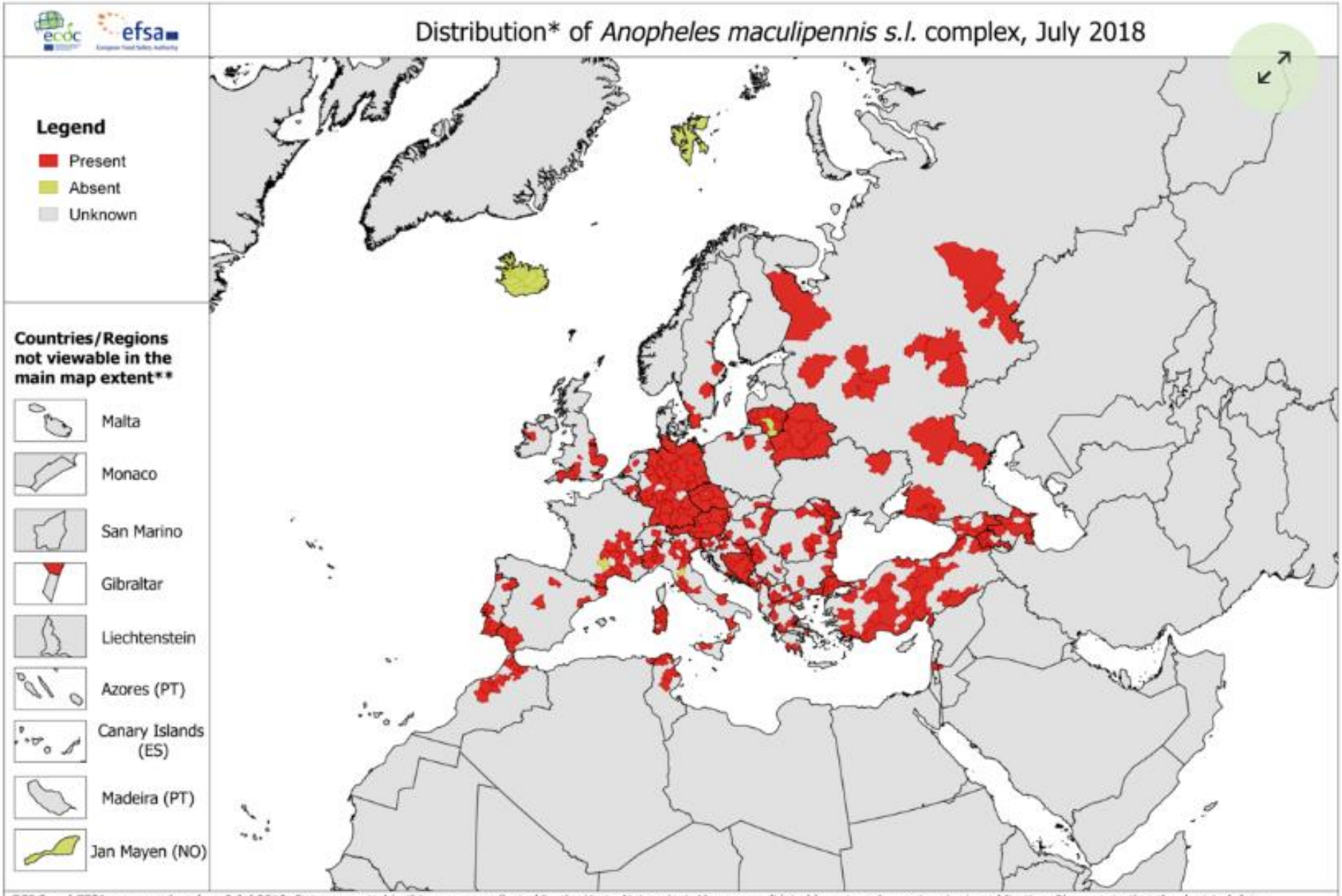
Malaria is caused by *Plasmodium* parasites. Four *Plasmodium* species (*Plasmodium falciparum, Plasmodium vivax, Plasmodium ovale and Plasmodium malariae*) give disease in humans, and **humans are their only relevant reservoir**.

Malaria is characterised by **fever and influenza-like symptoms**, including chills, headache, these symptoms can occur at intervals. ***P. falciparum* infections can cause seizures, mental confusion, kidney failure, coma, and death**, particularly in young children.

No vaccine available .
In 2017, there were an estimated **219 million** cases of malaria in **90 countries** with **435000 fatal cases** (*WHO 2018*).

***An. maculipennis* s.l.** is a complex of mosquito species native to Europe, which are found in different geographical areas.

Source: www.ecdc.europa.eu

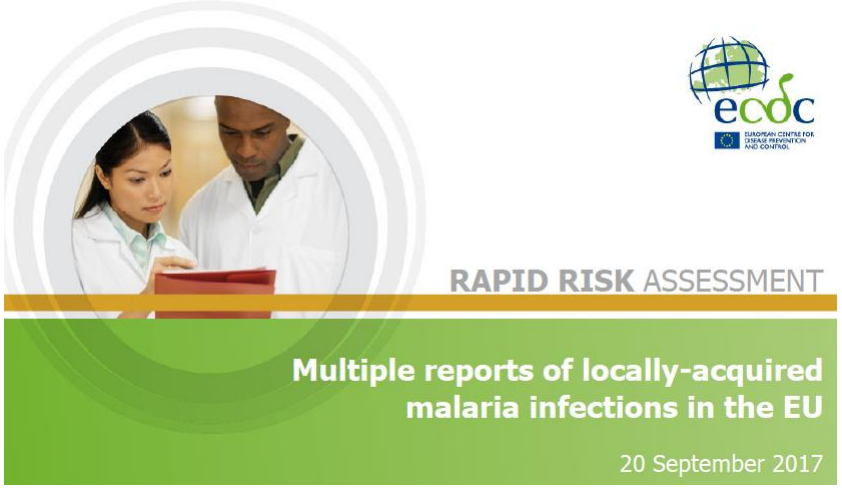


ECDC and EFSA, map produced on 9 Jul 2018. Data presented in this map are collected by the VectorNet project. Maps are validated by external experts prior to publication. Please note that the depicted data do not reflect the official views of the countries. * Map takes into account distribution data from 1980. ** Countries/Regions are displayed at different scales to facilitate their visualisation. Administrative boundaries © EuroGeographics, UNFAO, TurkStat.

Surveillance of malaria in the EU

In the EU/EEA countries a yearly average of around **6 400** cases (2012 to 2016)

Infection occurred in malaria endemic countries for 99.8% of the cases. The notification rate 1.0 per 100 000 population in 2014-2016.



Introduced malaria: the transmission results from the bite of a local mosquito infected by an imported case. In the EU/EEA countries, several areas experienced introduced malaria foci: in Greece since 2009; in France (Corsica) in 2006 and in Spain in 2010.

Table 1: Number of cases of locally acquired malaria in the EU, by country of report, May-September 2017.

Country of report	N	*Plasmodium* species	Date of onset	Suspected mode of transmission, place of infection	Date of report
France	2	*P. falciparum*	26 August	Mosquito-borne, Allier, France	7 September
Greece	5	*P. vivax*	2 May-22 July	Mosquito-borne, regions of Dytiki Ellada and Sterea Ellada, Greece	18 May, 21 July, 17 August
	1	*P. falciparum*	17-23 July	Mosquito-borne or nosocomial, region of Ipeiros, Greece	17 August
Italy	1	*P. falciparum*	29 August	Mosquito-borne or nosocomial, Trento I, Italy	5 September
The United Kingdom	3	*P. vivax*	29 August	Mosquito-borne, northern part of Cyprus	8 September

Malaria summary in EU:	Count
• *Historically present:* **YES**	**1**
• *Competent vector*: **PRESENT** (*P. vivax*) or possible (*P. falciparum*)	**1**
• *Infected host population density*: **LOW**	**0**
• *Animal reservoir*: **NO**	**0**
• *Asymptomatic infections:* **NO**	**0**
• *Non-vector transmission:* **YES** (blood transfusion)	**1**
Total risk:	3

Climate change risk factors:

- Large numbers of infected migrants
- *P. falciparum* vector increase

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**This disease is currently not prevalent in the European Union*

^ author's „update" 2018

Gorączka Zachodniego Nilu (West Nile Fever)

Most WNV infections in humans are asymptomatic. About 20% of WNV infections in humans may cause WNF and less than one percent may cause WNND.
WNF is characterised by a sudden onset of: headache, malaise, fever, myalgia, vomiting, rash, fatigue and eye pain.
WNND involves symptoms that **affect the central nervous system** (meningitis, encephalitis and acute flaccid paralysis) or a combination of the three. The case **fatality ratio** can be up to 17%.

Risk factors include advanced age, malignancies disrupting the blood–brain barrier, **hypertension**, hematologic disorders, **diabetes mellitus**, renal disease, **alcohol abuse**.

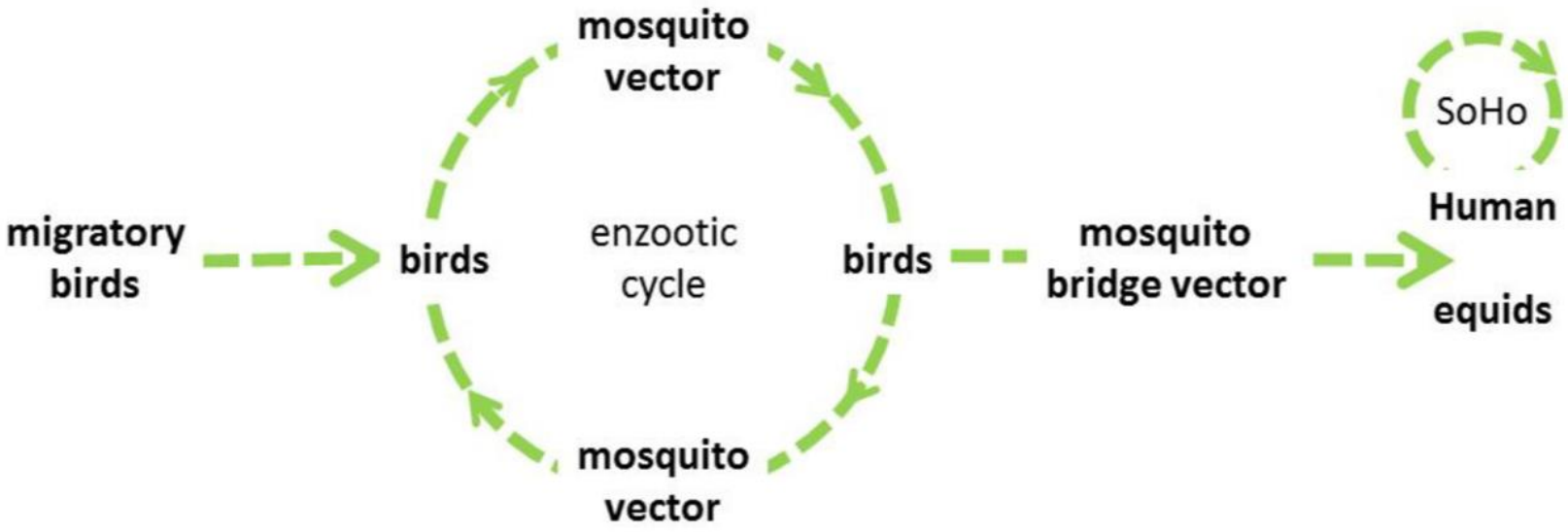
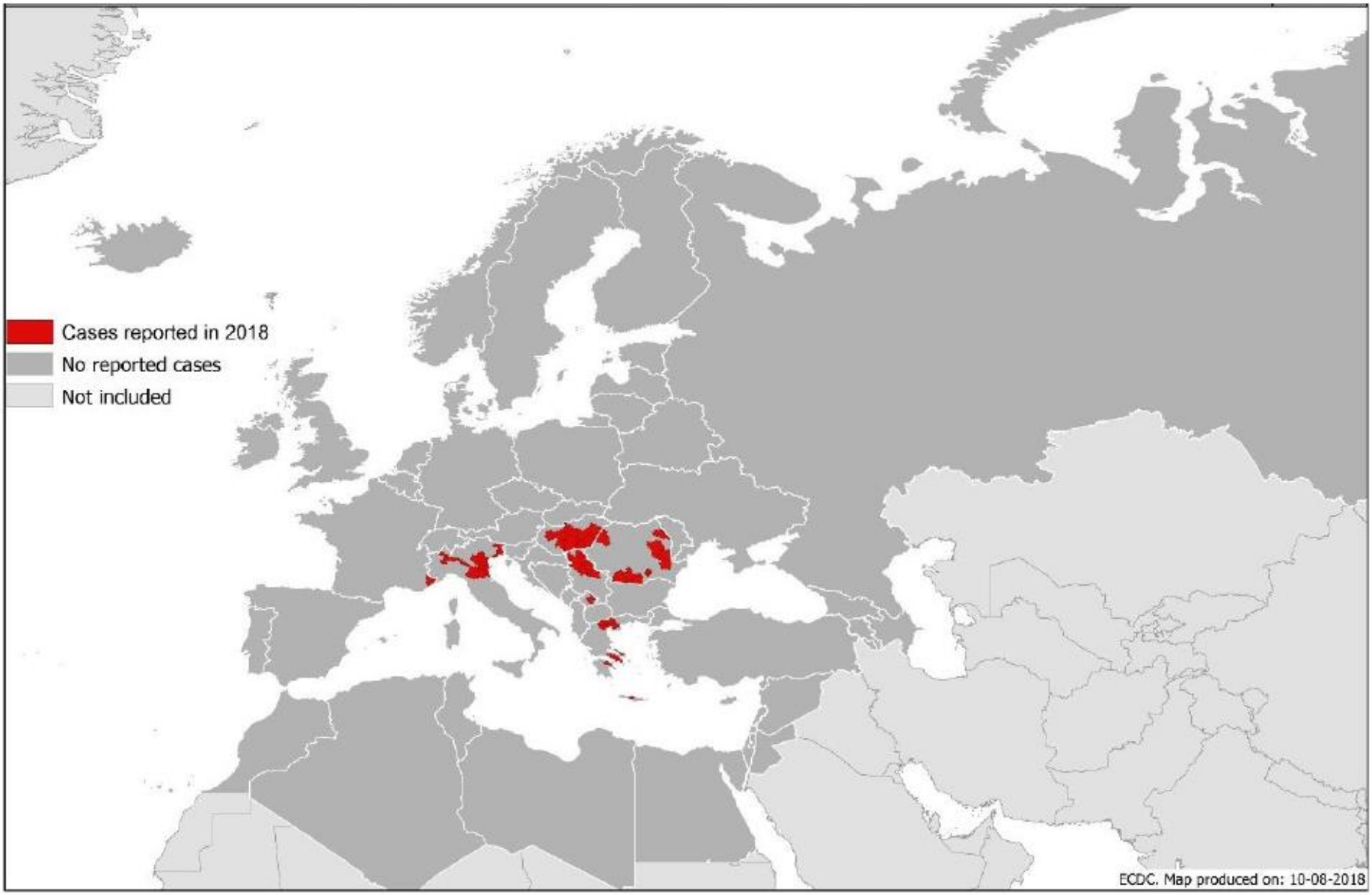
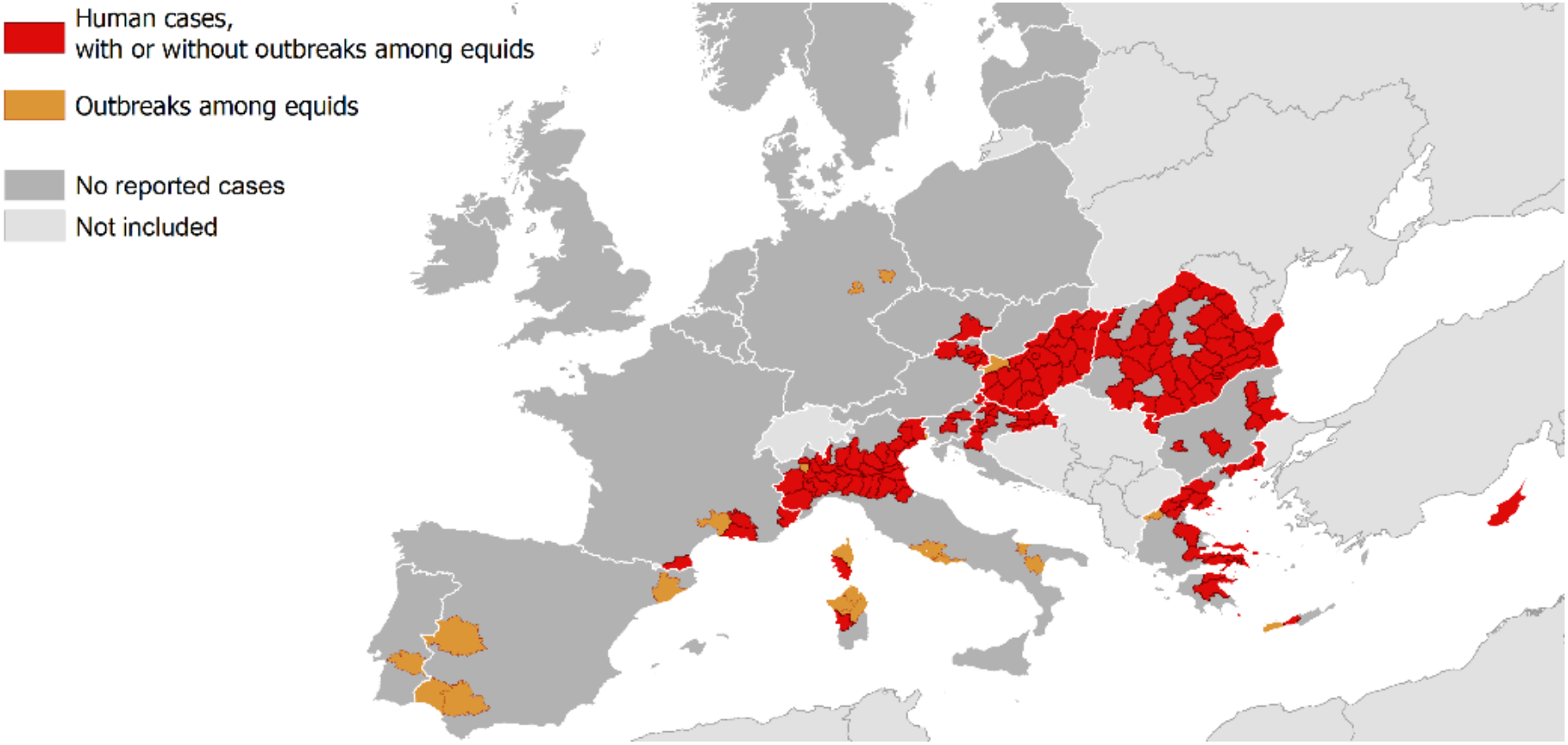


Figure 1. Distribution of West Nile fever cases in humans by affected areas in EU/EEA Member States and EU neighbouring countries in 2018 as of 9 August 2018



Distribution of West Nile virus infections among humans and outbreaks among equids in the EU

Transmission season 2018; latest data update 29 Nov 2018



West Nile

2018 transm

The number of WN
of infections in the
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this is more than th
cases) or 2016 (22
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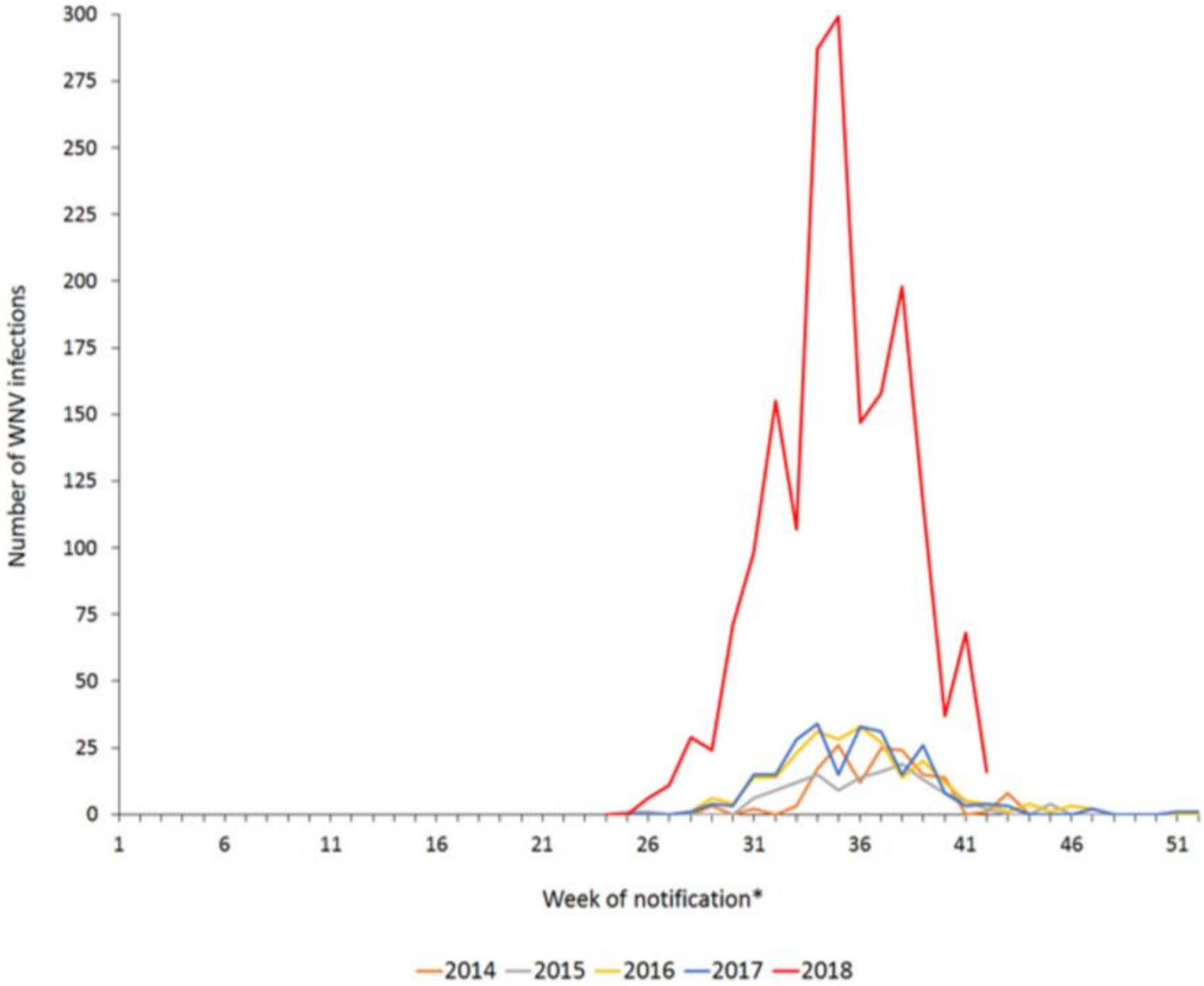
As expected at this
decreasing.

During the transmi
issues weekly upd

Last updated: 30

1 503 cases



Semenza *et al. Environmental Health* 2016, **15**(Suppl 1):28
DOI 10.1186/s12940-016-0105-4

Environmental Health

RESEARCH Open Access

Climate change projections of West Nile virus infections in Europe: implications for blood safety practices

Jan C. Semenza[1*], Annelise Tran[2], Laura Espinosa[1], Bertrand Sudre[1], Dragoslav Domanovic[1] and Shlomit Paz[3]

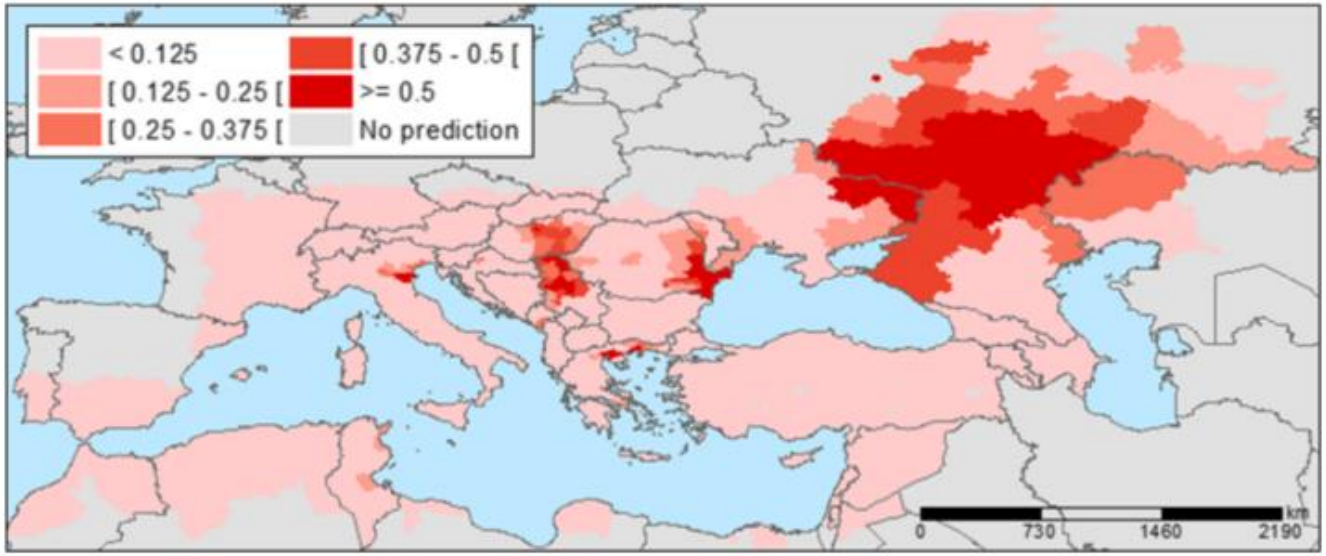


Fig. 3 Predicted probability of districts with West Nile Virus infections for 2014

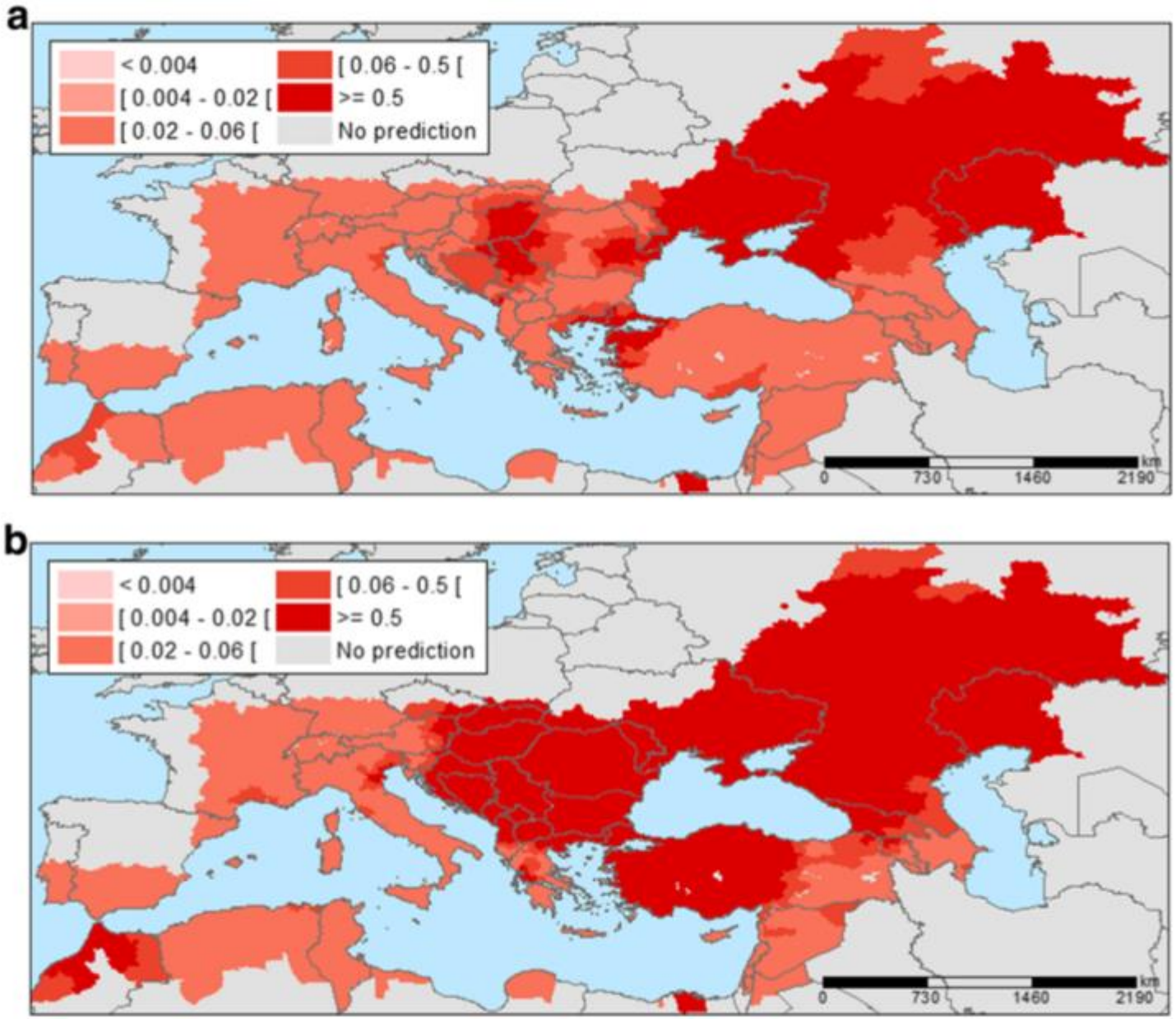


Fig. 5 Predicted probability of districts with West Nile Virus infections based on July temperatures for A1B scenario projections for 2025 (**a**) a
2050 (**b**). Note: Among IPCC scenarios, the A1 scenario groups are distinguished by their technological emphasis. A1B represent a balance ac
all energy sources (intensive fossil and non-fossil energy)

WNV summary in EU:	Count
• *Historically present:* **NO**	**0**
• *Competent vector*: **PRESENT**	**1**
• *Infected host population density*: **periodically-HIGH**	**1**
• *Animal reservoir*: **YES**	**1**
• *Asymptomatic infections:* **YES**	**1**
• *Non-vector transmission:* **YES** (blood transfusion)	**1**
	Total risk: 5

Climate change risk factors:

- *Increasing incidence among local hosts (equines*)
- *Longer occupation by primary host (migratory birds)*

Tick-borne diseases

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Lyme Borreliosis (Lyme disease)

Infection agent
The spirochaete ***Borrelia burgdorferi***

Transmission
Infection occurs through the bite of infected ticks, both adults and nymphs, of the genus Ixodes. Many species of mammals can be infected, and deer act as an important reservoir.

Nature of the disease
- Early skin lesions have an expanding ring form, often with a central clear zone. Fever, chills, myalgia and headache are common.
- Central nervous system and other complications may occur weeks or months after the onset of illness. (Neuro-borreliosis)
- Arthritis may develop up to 2 years after onset.

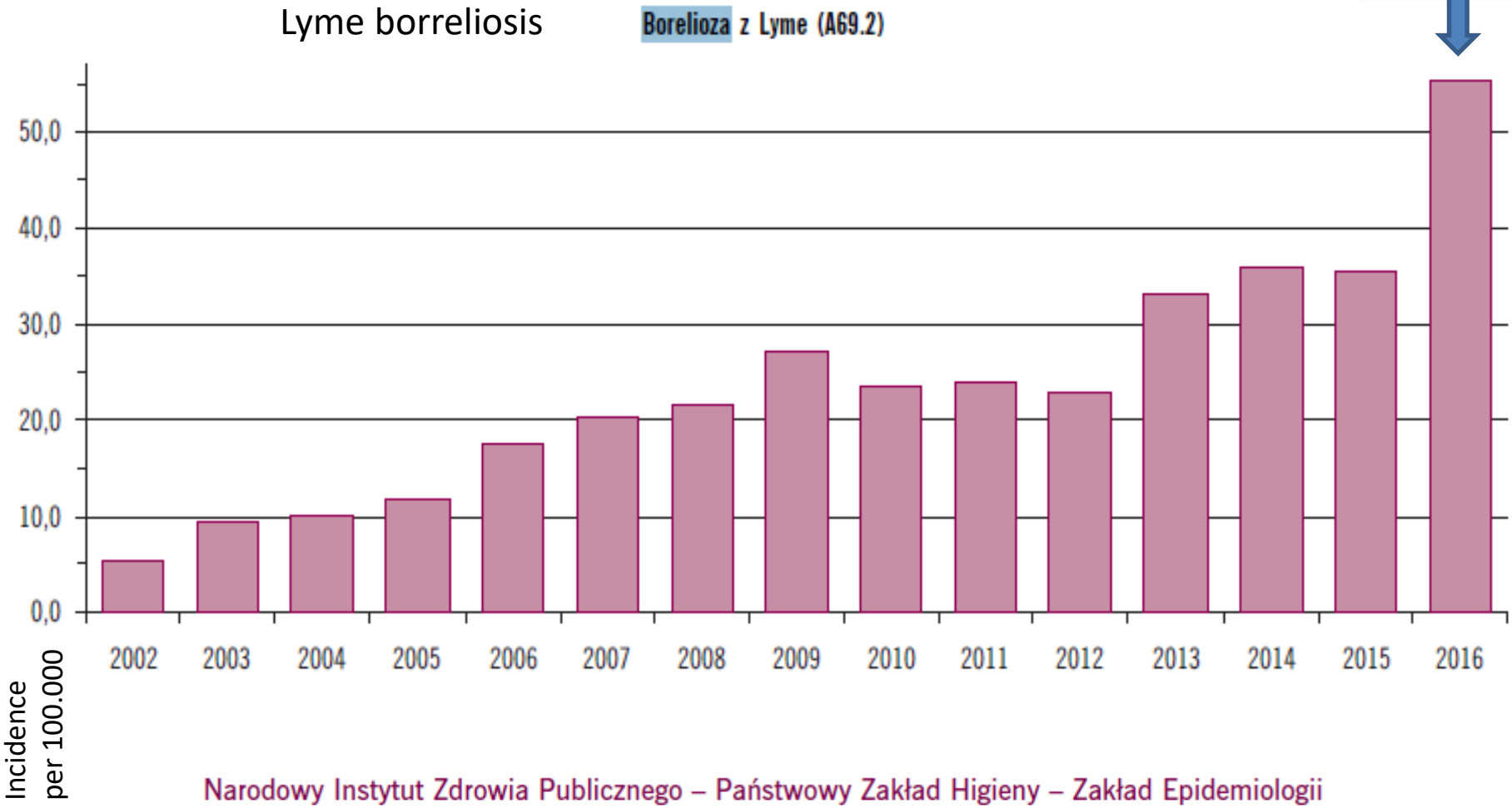
Prophylaxis
None.

CHOROBY ZAKAŹNE I ZATRUCIA W POLSCE W 2016 ROKU

Infectious diseases and poisonings in Poland in 2016

86,9% Confirmed cases

Lyme borreliosis



Narodowy Instytut Zdrowia Publicznego – Państwowy Zakład Higieny – Zakład Epidemiologii

National Institute of Public Health – National Institute of Hygiene – Department of Epidemiology

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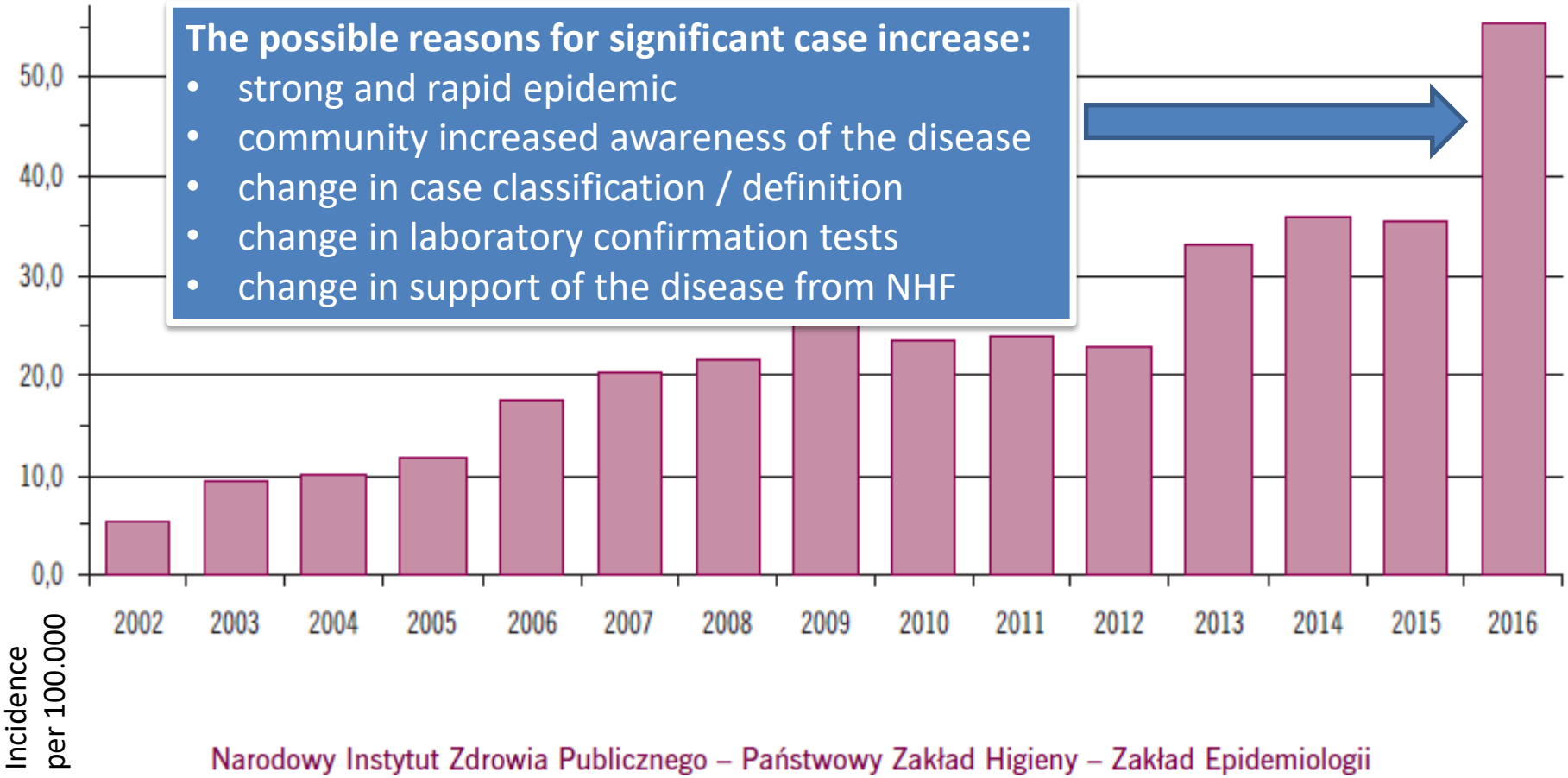
Lyme borreliosis

Borelioza z Lyme (A69.2)

The possible reasons for significant case increase:

- strong and rapid epidemic
- community increased awareness of the disease
- change in case classification / definition
- change in laboratory confirmation tests
- change in support of the disease from NHF



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ECDC comment: European Commission updates communicable disease surveillance list - Lyme neuroborreliosis now under EU/EEA surveillance

ECDC comment

2 Aug 2018

On 22 June 2018, the European Commission updated the communicable diseases list and related special health issues to be covered by epidemiological surveillance as well as the relevant case definitions.

ECDC comment

Lyme borreliosis is a prevalent tick-borne disease in Europe. A recent literature review estimated a population-weighted average incidence of Lyme borreliosis in Western Europe of 22 cases per 100 000 person-years[1]. However, it is widely recognised that the heterogeneity of surveillance across European countries remains a challenge to accurately assessing disease incidence, distribution and trend over time[2]. Collecting comparable EU data on Lyme neuroborreliosis would provide more comprehensive information on the incidence of the disease at the European level and a more reliable assessment of the trend of Lyme borreliosis among EU/EEA members.

Lyme borreliosis

BORELIOZA Z LYME (A69.2)

Liczba zachorowań (w kwartałach i ogółem), zapadalność oraz liczba i procent hospitalizowanych wg województw

Województwo		Liczba zachorowań w kwartałach				Liczba zachorowań w roku	Zapadalność na 100 tys.	Hospitalizacja	
		I	II	III	IV			Liczba	%
POLSKA	2015 r.	2236	2560	4806	4023	13625	35,4	1905	14,0
	2016 r.	2202	3571	8321	7106	21200	55,2	2635	12,4
1. Dolnośląskie		44	130	388	369	931	32,1	165	17,7
2. Kujawsko-Pomorskie		47	88	273	197	605	29,0	85	14,0
3. Lubelskie		229	391	718	568	1906	89,2	399	20,9
4. Lubuskie		73	100	212	261	646	63,5	15	2,3
5. Łódzkie		69	112	292	329	802	32,2	107	13,3
6. Małopolskie		304	533	1176	933	2946	87,3	200	6,8
7. Mazowieckie		232	333	891	728	2184	40,8	177	8,1
8. Opolskie		49	136	294	199	678	68,2	67	9,9
9. Podkarpackie		89	201	464	343	1097	51,6	179	16,3
10. Podlaskie		177	247	642	536	1602	134,9	236	14,7
11. Pomorskie		126	197	468	524	1315	56,9	227	17,3
12. Śląskie		365	575	1152	1172	3264	71,5	356	10,9
13. Świętokrzyskie		38	58	196	106	398	31,7	74	18,6
14. Warmińsko-Mazurskie		229	260	538	371	1398	97,2	156	11,2
15. Wielkopolskie		43	77	244	215	579	16,6	100	17,3
16. Zachodniopomorskie		88	133	373	255	849	49,7	92	10,8

Lyme borreliosis

BORELIOZA Z LYME (A69.2)

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Polska	2016 r.	2202	3571	8321	7106	21200	55,2	2635	12,4%
	2017 r.	3639	3948	7547	6382	21516	56,0	2332	10,8%
1. Dolnośląskie		134	118	350	250	852	29,4	114	13,4%
2. Kujawsko-Pomorskie		65	[illegible]	[illegible]	[illegible]	[illegible]5	26,2	49	9,0%
3. Lubelskie		417	[illegible]	[illegible]	[illegible]	[illegible]75	92,8	376	19,0%
4. Lubuskie		147	156	259	236	798	78,5	39	4,9%
5. Łódzkie		141	113	200	183	637	25,7	80	12,6%
6. Małopolskie		502	573	1190	1057	3322	98,1	230	6,9%
7. Mazowieckie		399	380	765	673	2217	41,3	160	7,2%
8. Opolskie		92	128	263	161	644	65,0	81	12,6%
9. Podkarpackie		197	260	547	477	1481	69,6	191	12,9%
10. Podlaskie		280	354	504	404	1542	130,1	170	11,0%
11. Pomorskie		263	242	550	411	1466	63,2	186	12,7%
12. Śląskie		546	501	894	838	2779	61,0	296	10,7%
13. Świętokrzyskie		70	93	146	141	450	36,0	46	10,2%
14. Warmińsko-Mazurskie		199	286	439	378	1302	90,7	142	10,9%
15. Wielkopolskie		82	82	257	234	655	18,8	84	12,8%
16. Zachodniopomorskie		105	148	358	240	851	49,9	88	10,3%

No further incidence increase in 2017

Lyme borreliosis

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16. Zachodniopomorskie		105	148	358	240	851	49,9	88	10,3%

Broad range distribution of LB incidence among administrative regions in Poland

Lyme borreliosis summary in EU:	Count
• *Historically present:* **YES**	**1**
• *Competent vector*: **PRESENT**	**1**
• *Infected host population density*: **MEDIUM to HIGH**	**1**
• *Animal reservoir*: **YES**	**1**
• *Asymptomatic infections:* **NO**	**0**
• *Non-vector transmission:* **NO**	**0**
	Total risk: 4

Climate change risk factors:

- *Increasing vector incidence*
- *Longer vector activity*

Tick-borne encephalitis (TBE) kleszczowe zapalenie mózgu

- The number of human cases of **TBE** in all endemic regions of Europe has increased by almost 400% in the last 30 years; the risk areas have spread.
- TBE virus is transmitted by the bite of infected ticks.
- Humans may acquire **infection by consumption of infected unpasteurised dairy products**

c.a. 75% TBE virus infections are non-symptomatic.

In clinical cases there are following steps:

- **first phase** lasts approximately 5 days, with **non-specific** symptoms (fever, fatigue, headache, myalgia, nausea);
- asymptomatic interval lasting 7 days;
- **second phase**, when the **central nervous system** is involved (meningitis, meningoencephalitis, myelitis, paralysis, radiculitis).

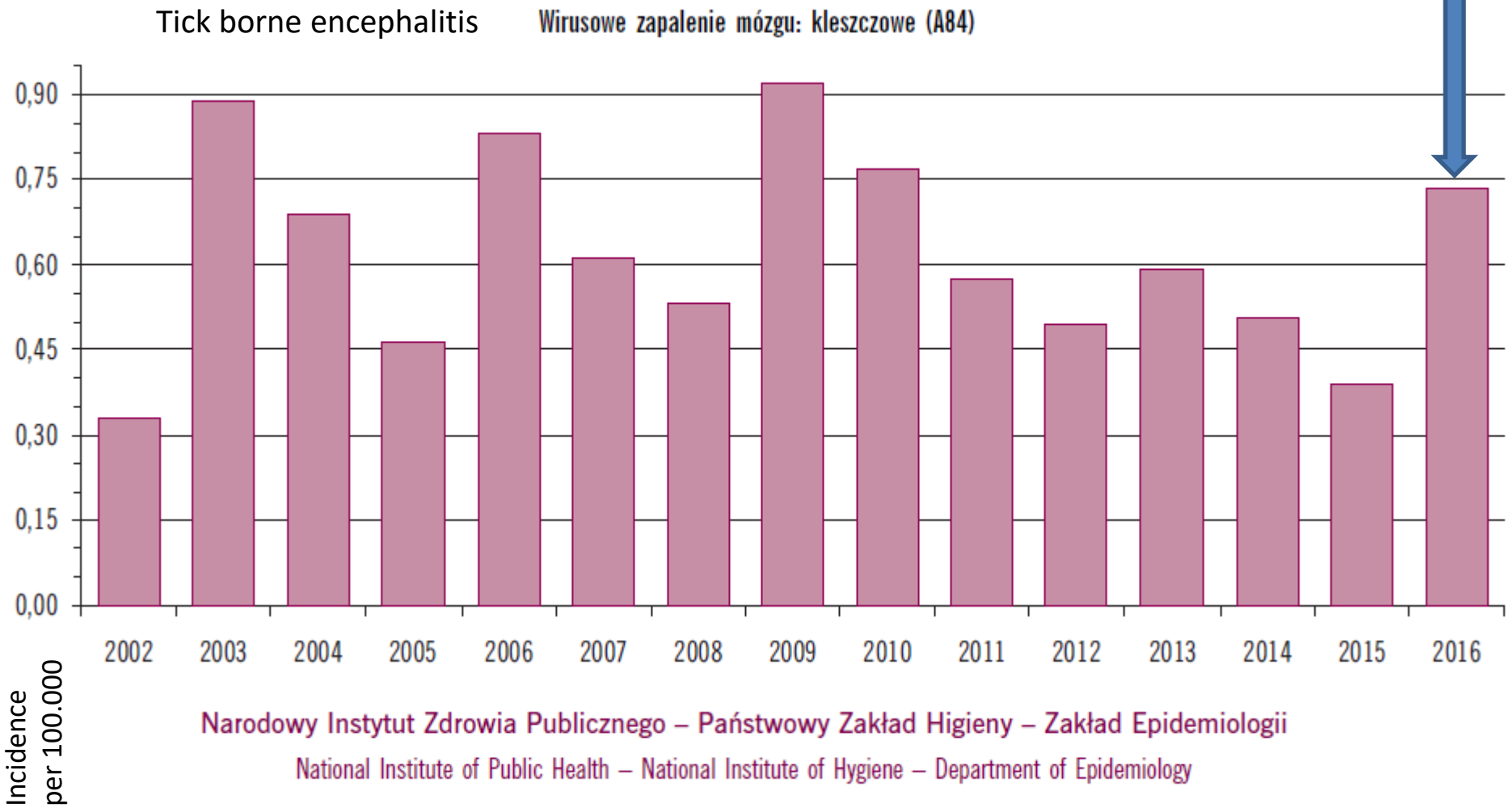
vaccination against TBE is considered to be the most effective means of preventing TBE in endemic countries;

CHOROBY ZAKAŹNE I ZATRUCIA W POLSCE W 2016 ROKU

Infectious diseases and poisonings in Poland in 2016

74,6% Confirmed cases

Tick borne encephalitis



WIRUSOWE ZAPALENIE MÓZGU: KLESZCZOWE (A84)

Liczba zachorowań (w kwartałach i ogółem), zapadalność oraz liczba i procent hospitalizowanych wg województw

Województwo		Liczba zachorowań w kwartałach				Liczba zachorowań w roku	Zapadalność na 100 tys.	Hospitalizacja	
		I	II	III	IV			Liczba	%
POLSKA	2015 r.	2	25	70	52	149	0,39	149	100,0
	2016 r.	4	18	163	98	283	0,74	283	100,0
1. Dolnośląskie		-	-	9	4	13	0,45	13	100,0
2. Kujawsko-Pomorskie		-	-	-	-	-	-	x	x
3. Lubelskie		-	2	3	1	6	0,28	6	100,0
4. Lubuskie		-	-	1	-	1	0,10	1	100,0
5. Łódzkie		-	1	2	1	4	0,16	4	100,0
6. Małopolskie		-	-	2	2	4	0,12	4	100,0
7. Mazowieckie		2	2	19	8	31	0,58	31	100,0
8. Opolskie		-	-	6	2	8	0,80	8	100,0
9. Podkarpackie		-	-	1	1	2	0,09	2	100,0
10. Podlaskie		2	10	81	67	160	13,47	160	100,0
11. Pomorskie		-	-	2	-	2	0,09	2	100,0
12. Śląskie		-	-	-	-	-	-	x	x
13. Świętokrzyskie		-	-	4	3	7	0,56	7	100,0
14. Warmińsko-Mazurskie		-	3	31	9	43	2,99	43	100,0
15. Wielkopolskie		-	-	1	-	1	0,03	1	100,0
16. Zachodniopomorskie		-	-	1	-	1	0,06	1	100,0

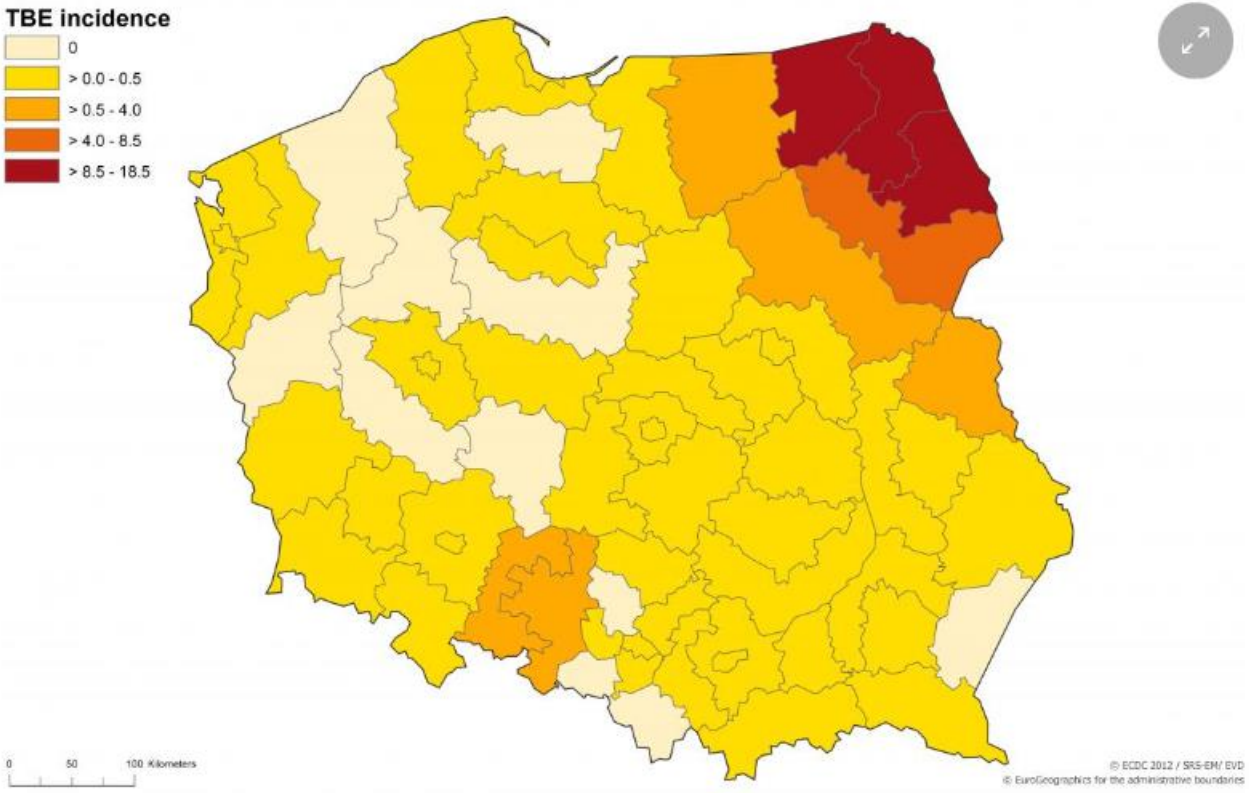
Country profile: Poland. Tick-borne encephalitis (TBE)

country profile | graph | map | table

1 Sep 2012

Period: 01 Jan 2000 - 01 Jan 2010

In Poland, TBE is endemic and 200–300 cases are reported annually, 90% from two provinces neighbouring the Baltic States. A surveillance case definition has been in use since 2005.



TBE summary in EU:	Count
• *Historically present:* **YES (NE regions)**	**1**
• *Competent vector*: **PRESENT**	**1**
• *Infected host population density*: **MEDIUM**	**1**
• *Animal reservoir*: **YES**	**1**
• *Asymptomatic infections:* **YES**	**1**
• *Non-vector transmission:* **YES** (food-milk)	**1**
	Total risk: 6

Climate change risk factors:

- *Increasing vector incidence*
- *Longer vector activity*

The risk assessment of Vector-Borne Diseases is multifactorial, usually more effective if data are reliable

Risk factor	Malaria	WNV	Lyme	TBE
Historically present	1	0	1	1
Competent vector	1	1	1	1
Infected host population density	0	1	1	1
Animal reservoir	0	1	1	1
Asymptomatic infections	0	1	0	1
Non-vector transmission	1	1	0	1
Total :	**3**	**5**	**4**	**6**

- We should carefully interpret new data, considering the whole picture of the disease, prevention measures, local habits.
- In prediction of climate change on VBD strong epidemiological surveillance is crucial.

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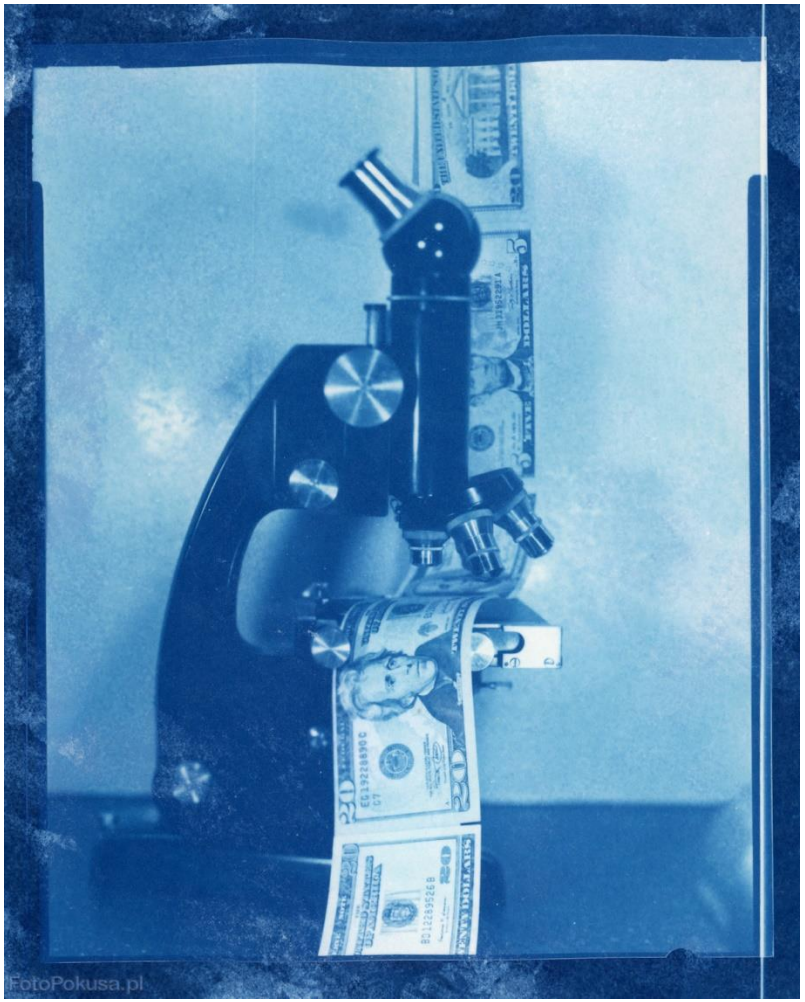
- We should carefully interpret new data, considering the whole picture of the disease, prevention measures, local habits.
- In prediction of climate change on VBD strong epidemiological surveillance is crucial.
- At present WNV seems to be the most potent threat VBD in EU in light of climate change. WNV wins with TBE because the latter can be controlled by vaccination.



Thank you for attention !

<u>NOTE</u>

If you are confused by the result of the VBD assessment please be informed that this presentation was nothing more than an exercise to show you the complexity of such assessments ☺.