TOENAME VAN MUGGENOVERDRAAGBARE VIRUSSEN IN NEDERLAND

HET BELANG VAN EEN ONE HEALTH AANPAK

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Date	Phase 1: Animal Outbreak
Sunday, 8/15/99	(Approx. date) Nassau County, N.Y., highway crew brings in a bag of dead crows to NYS Department of Environmental Conservation.
Monday, 8/16/99	ProMED (Internet bulletin board posting news of infectious disease outbreaks) posts news about bird poisonings in NYC, says NYS Department of Environmental Conservation is investigating.
Tuesday, 8/17/99	(Approx. date) Wildlife pathologist at NYS Department of Environmental Conservation performs necropsies (postmortem examinations, or autopsies) of dead birds, examines for aspergillosis (fungal infection), poison, bacteria.
Wednesday, 8/18/99	
Thursday, 8/19/99	Article in local Queens newspaper quotes NYS Department of Environmental Conservation wildlife pathologist as saying he has received many dead bird reports from NYC and Buffalo; reports are being investigated intensively. Veterinary assistant from Bronx Zoo phones NYS Department of Environmental Conservation requesting laboratory results on zoo samples; informed that NYS Department of Environmental Conservation wildlife pathologist is finding several causes but "no common thread."

NYC, USA – Juli 1999

Dierenarts vindt kraaien met neurologische symptomen

NYC, USA – Augustus 1999:

- Zak met dode kraaien verzameld langs snelwegen
- Berichten over vergiftigde vogels
- Bronx zoo vraagt diverse onderzoeken a

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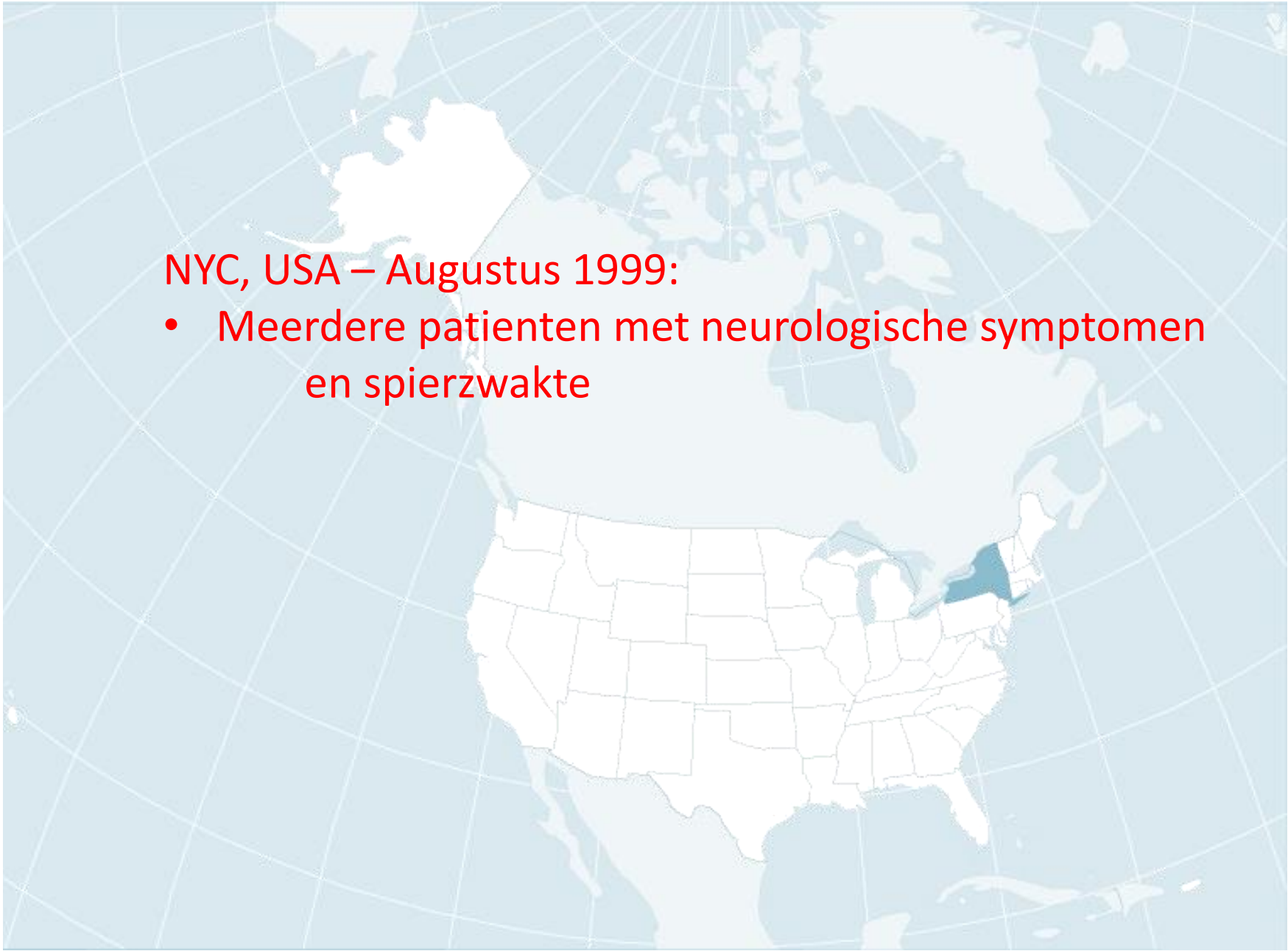
Phase 2: Human Outbreak
Flushing Hospital admits an elderly patient with heart failure; after a few days he develops neurologic symptoms, including muscle weakness.
Flushing Hospital admits another elderly patient with symptoms similar to those of the 8/12/99 admission.
Flushing Hospital admits a fourth elderly patient with possible viral symptoms, who, after a few days, develops neurologic symptoms. Flushing Hospital's chief of infectious diseases recognizes that in the past 1 to 2 weeks, an unusually large number of spinal fluid samples have been drawn to test for meningitis or encephalitis (usually only two or three per year). Patients' advanced age and pattern of muscle weakness also do not fit disease profile commonly seen at the hospital.



NYC, USA – Augustus 1999:

- Meerdere patienten met neurologische symptomen en spierzwakte

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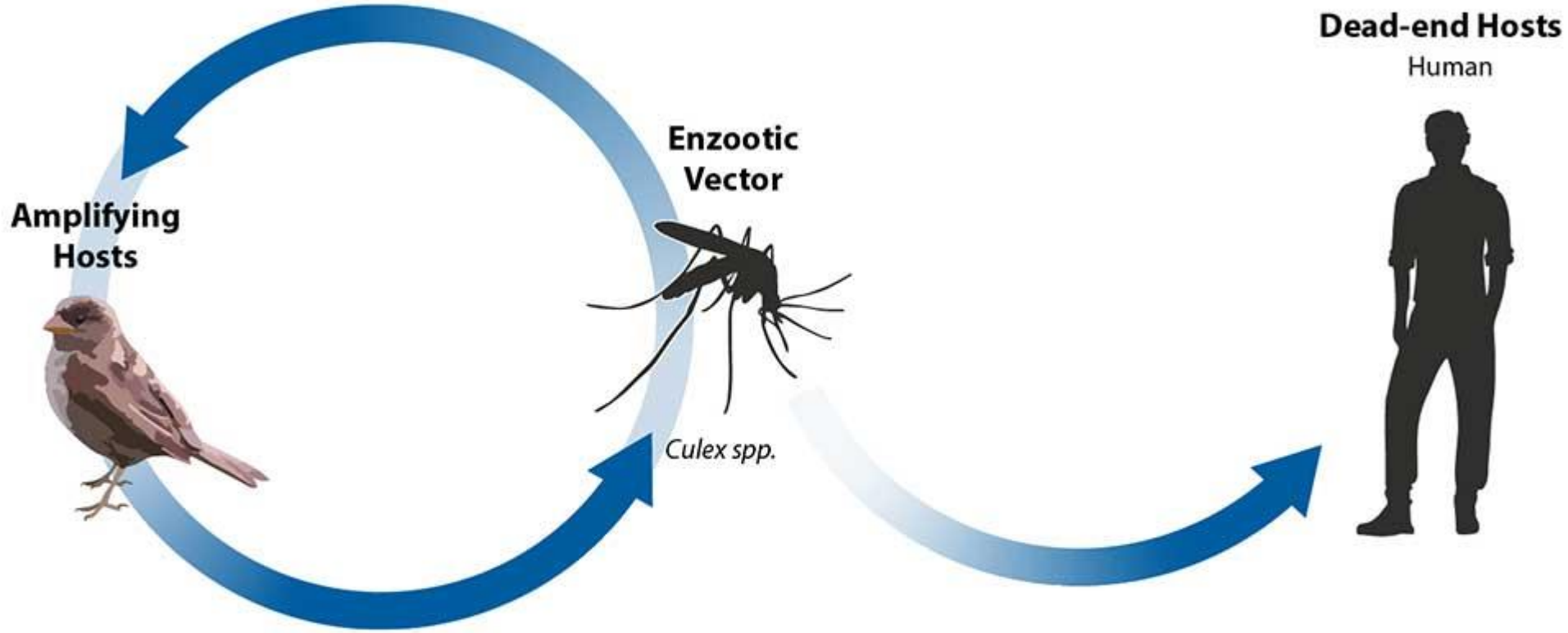
Date	Phase 3: Convergence
Tuesday, 9/21/99	Connecticut Agricultural Experiment Station reports isolating virus from brain tissue of a dead crow and from mosquitoes; they appear to be the same virus. Possible implication: If the virus is St. Louis encephalitis, it can kill and is killing birds; human and bird outbreaks may be related. Chief of arbovirus diseases branch at CDC Division of Vector-Borne Infectious Diseases contacts Connecticut Agricultural Experiment Station, determines testing protocols were not specific for St. Louis encephalitis. CDC requests that Connecticut Agricultural Experiment Station send virus isolates to the laboratory at CDC Division of Vector-Borne Infectious Diseases for confirmation. Vertebrate ecologist, CDC Division of Vector-Borne Infectious Diseases, returns to Fort Collins laboratory from NYC. CDC Division of Vector-Borne Infectious Diseases receives virus isolates from head veterinary medical officer at National Veterinary Services Laboratories and begins testing for several related viruses. Veterinary pathologists at U.S. Army Medical Research Institute of Infectious Diseases respond to contact from the head pathologist at the Bronx Zoo, agree to test bird samples. University of California researcher initiates genomic sequence studies on human brain samples.

NYC, USA – September 1999:

- Op basis van ELISA denkt CDC aan St. Louis encephalitis
- Eind september worden de humane cassussen en dode vogels met elkaar in verband gebracht en onderzocht


Amplifying Hosts
Enzootic Vector
Culex spp.
Dead-end Hosts
Human

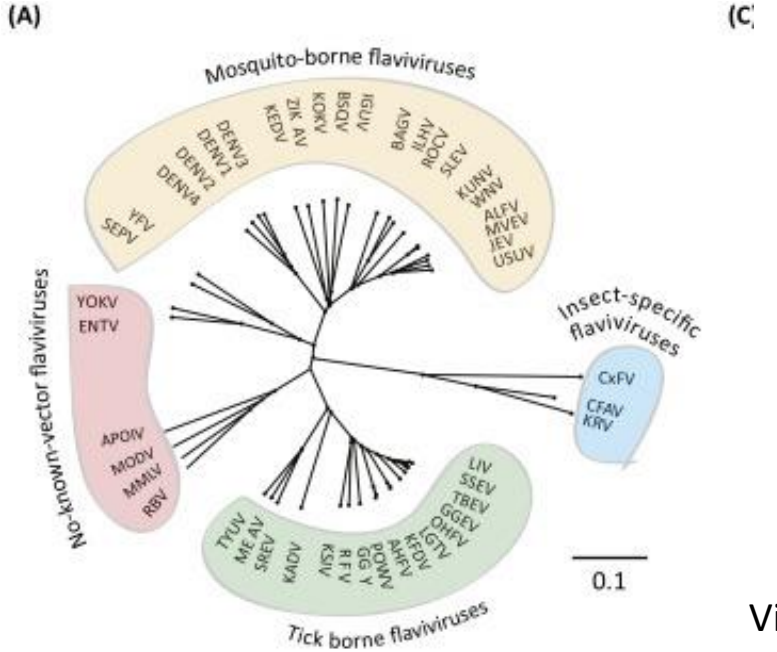
CS 321683

EIND SEPTEMBER: WEST NIJL VIRUS

- Sequencing leidde uiteindelijk tot de diagnose WNV

- Flavivirus gerelateerd aan Dengue ; Gele koorts ; Zika

	CDC announces it has established that human outbreak in New York is due to West Nile-like virus. Involved agencies receive a large number of news media contacts and requests for information from the public.
Tuesday, 9/28/99	Human serosurvey (collection of blood samples) in NYC area begins, supported by six Epidemic Intelligence Service (EIS) officers from CDC and over 100 personnel from the NYC health department. (Approx. date) Preliminary results from bird serosurvey indicate an infection rate greater than 50 percent for birds in northeast Queens, providing further evidence of where outbreak may have originated. Daily conference calls are initiated among agencies participating in the outbreak response. USDA/APHIS veterinary services headquarters notifies others in APHIS and the Secretary's Advisory Committee on Foreign Animal and Poultry Diseases about West Nile-like virus outbreak in NY area. (Approx. date) CDC and international scientists find a link between the NYC strain of West Nile virus and a recent strain from Israel.
Wednesday, 9/29/99	Briefing of staff for New York and Connecticut congressional representatives by CDC's acting deputy director for science and public health. USDA Animal and Plant Health Inspection Service (APHIS) coordinates with state officials and cooperating federal agencies to address impact of West Nile virus outbreak on agricultural industry.
Thursday, 9/30/99	USDA receives reports of a horse on Long Island possibly infected with West Nile virus. Division of Vector-Borne Infectious Diseases isolates virus from *Culex* mosquitoes collected in Queens on September 12 and 13, identifies West Nile virus.
Friday, 10/1/99	USDA Animal and Plant Health Inspection Service plans diagnostic testing, inoculation studies, surveillance. Foreign animal disease diagnostician at USDA Animal and Plant Health Inspection Service investigates a suspicious horse death on eastern Long Island and submits tissue samples to APHIS National Veterinary Services Laboratories for diagnosis.



Vilordo et al; 2016

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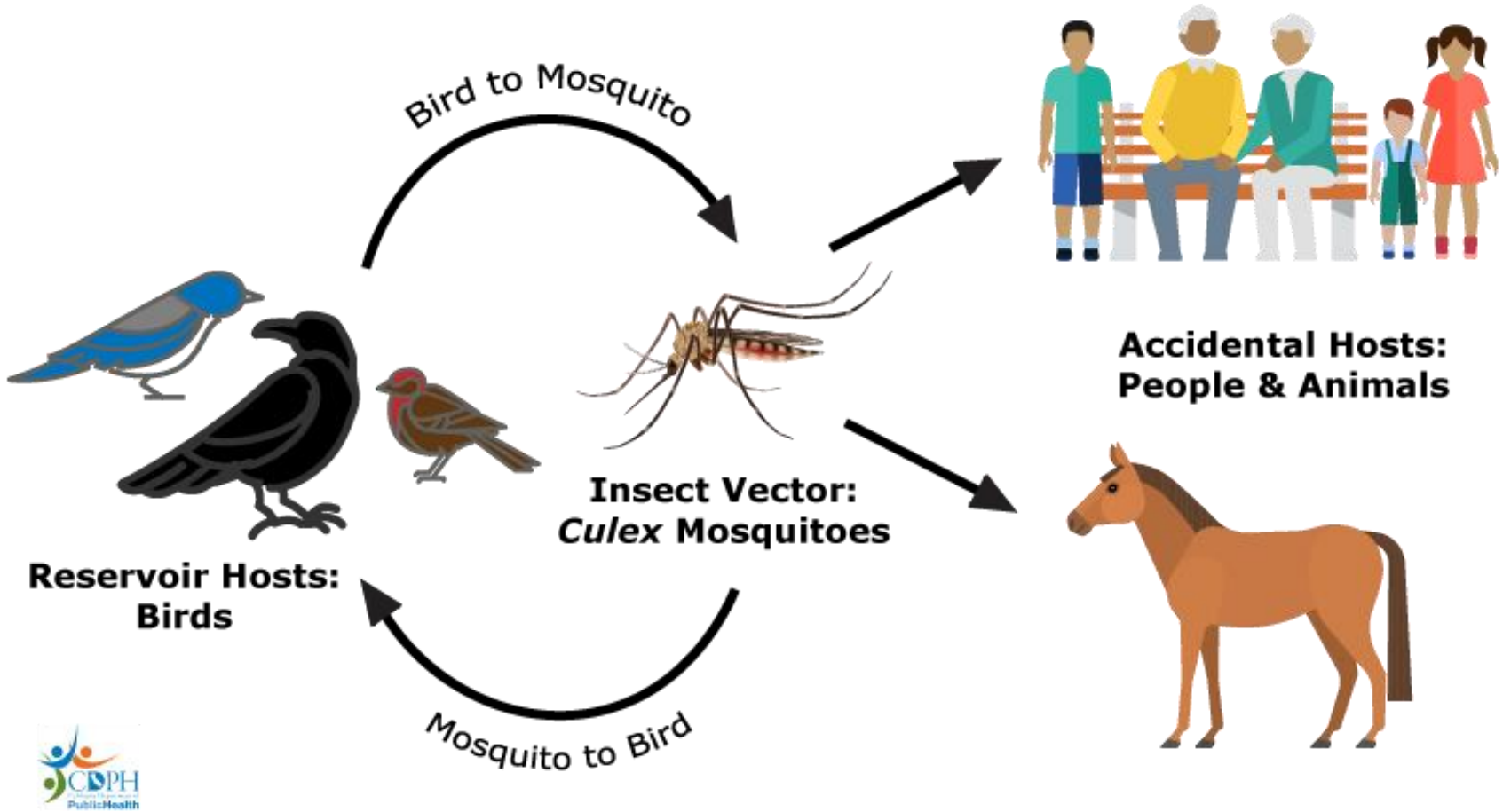
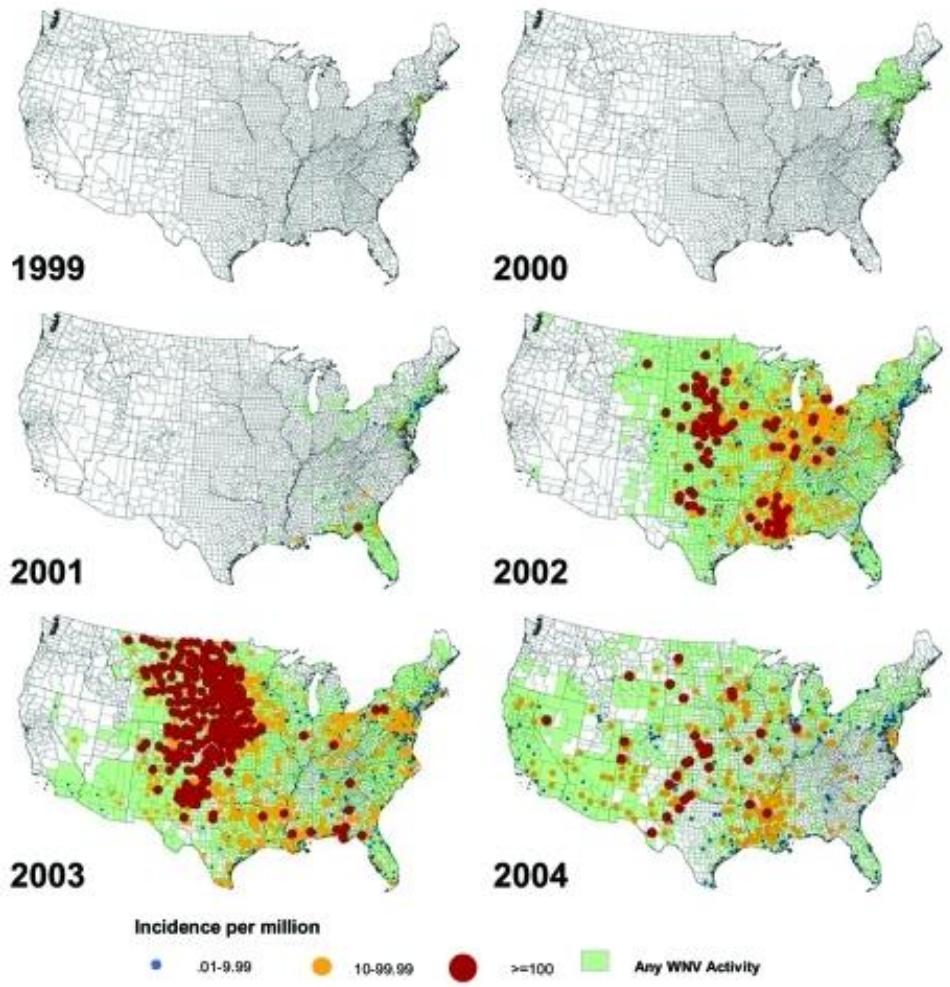
West Nile Virus Transmission Cycle



VERSPREIDING OVER DE V.S.

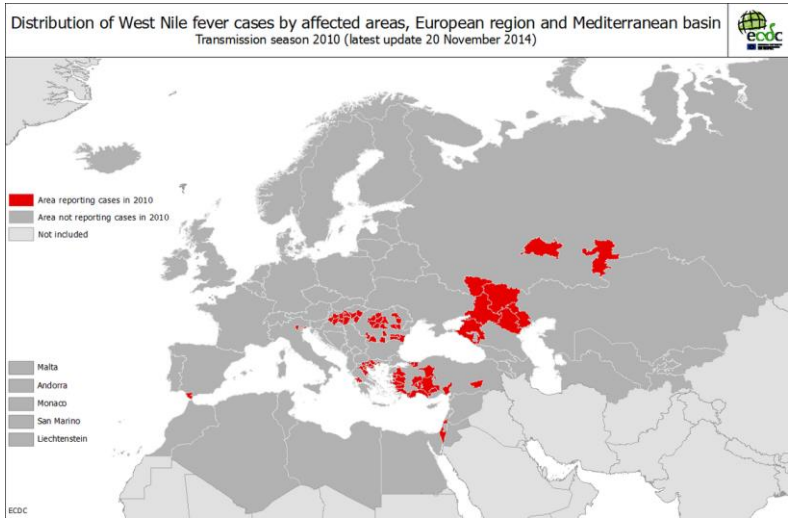
- 1999 -2004: >7000 neuroinvasieve WNV cases
- 1999-2006: >480.000 dode vogels van >200 soorten
- 1999-2002: >15000 paarden geinfecteerd

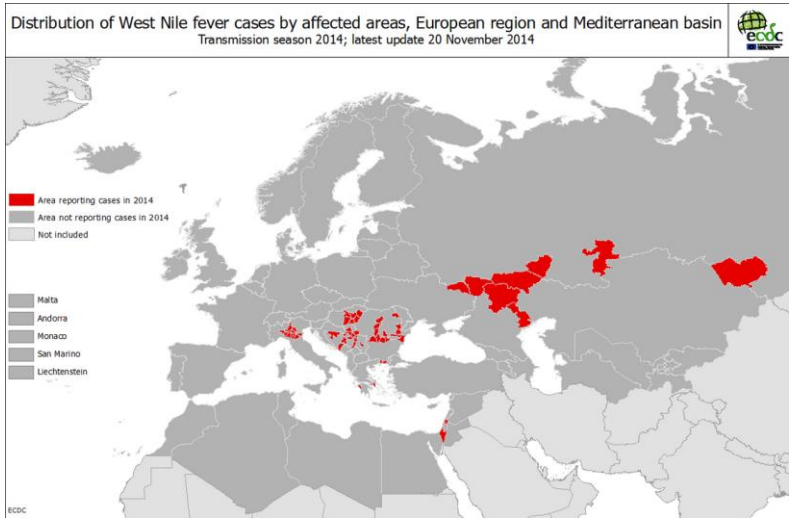


Hayes et al; 2005

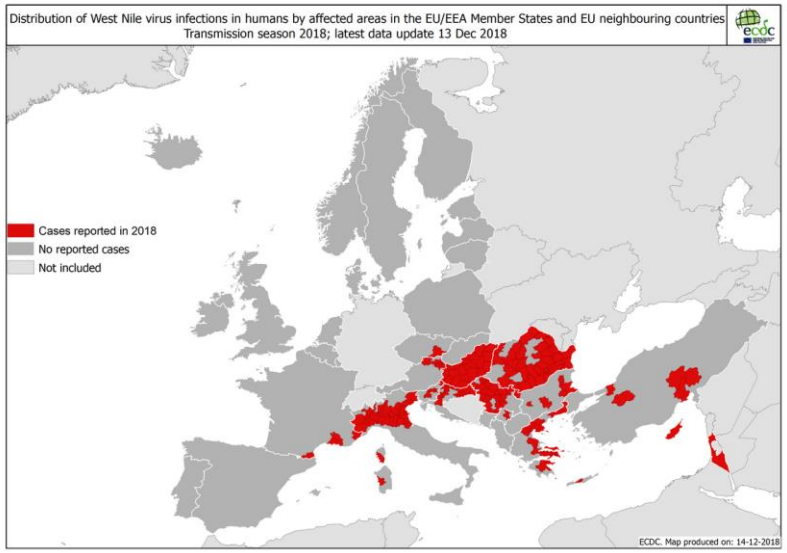
WEST NIJL VIRUS IN EUROPA

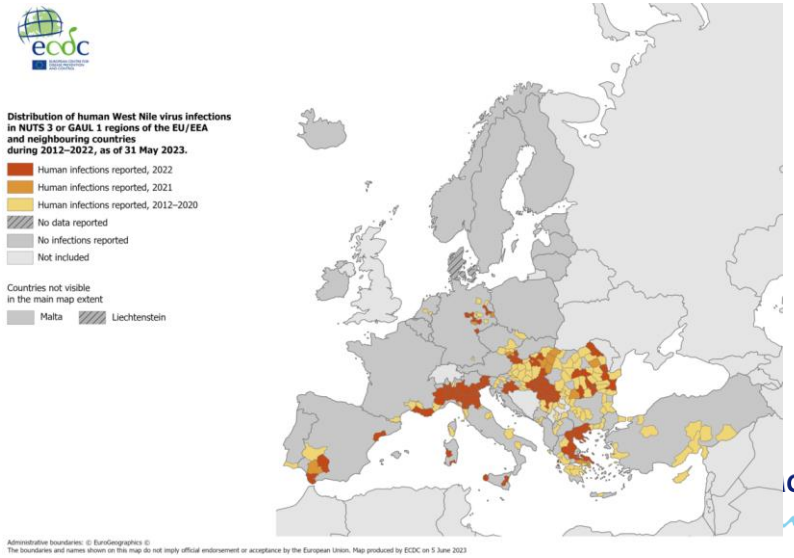
- Losse uitbraken in jaren 90 en 2000
- Sinds 2004: WNV lineage 2 verspreiding over Europa



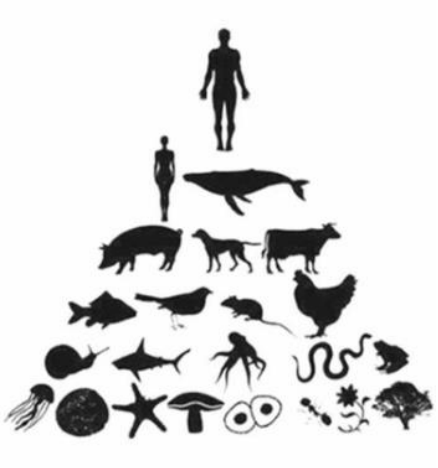


- Veel lagere mortaliteit onder vogels



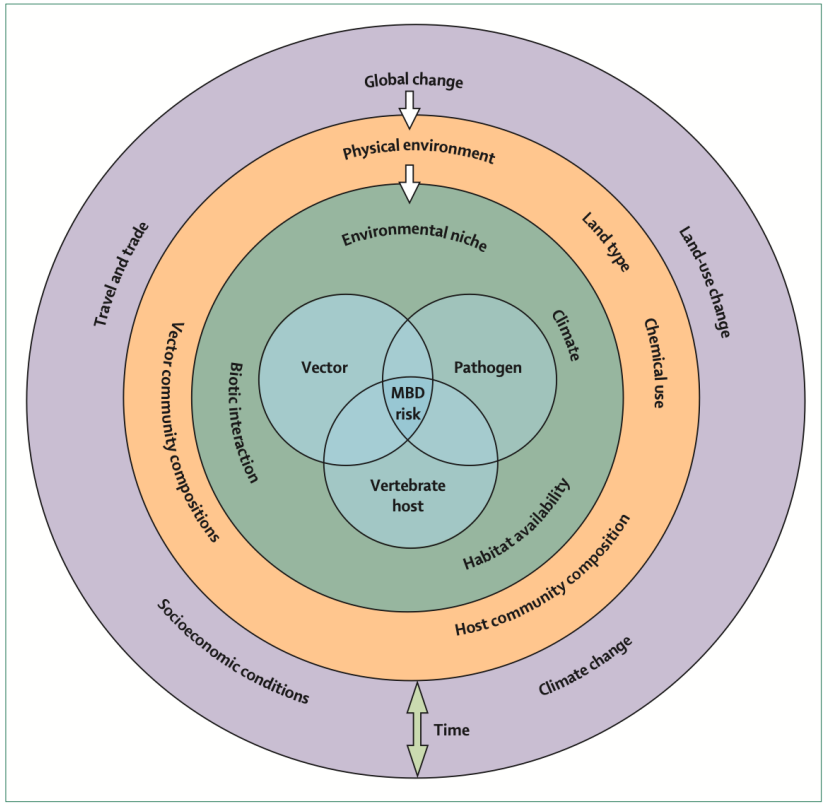


ONE HEALTH AANPAK NODIG



Anthropocentric

Ecocentric/One Health



Franklinos et al Lancet Infectious Diseases 2019
One Health High-Level Expert Panel ; https://journals.plos.org/plospathogens/article?id=10.1371/journal.ppat.1010537

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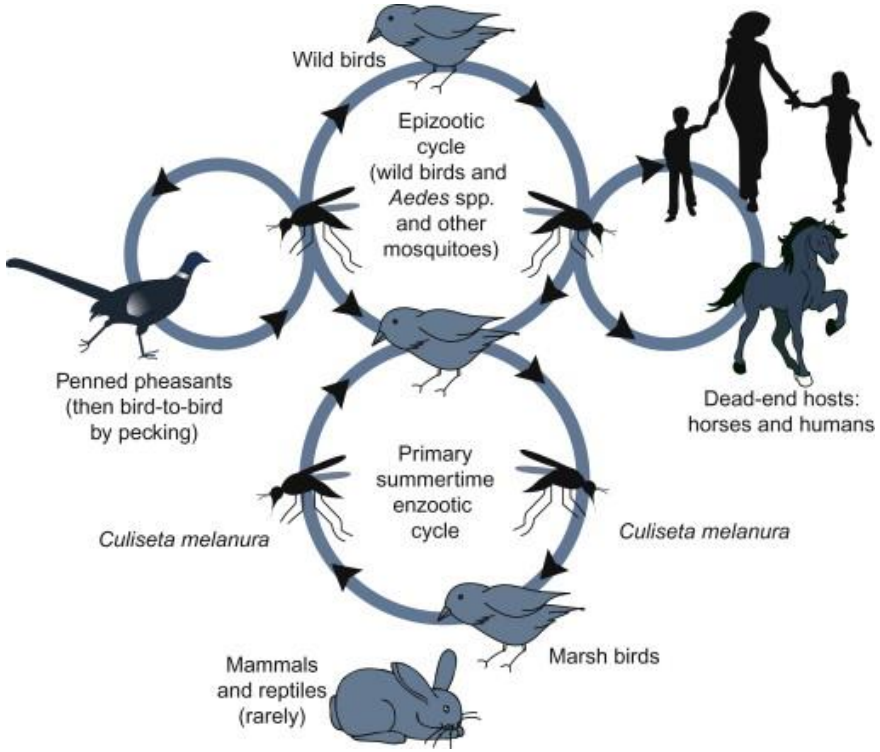
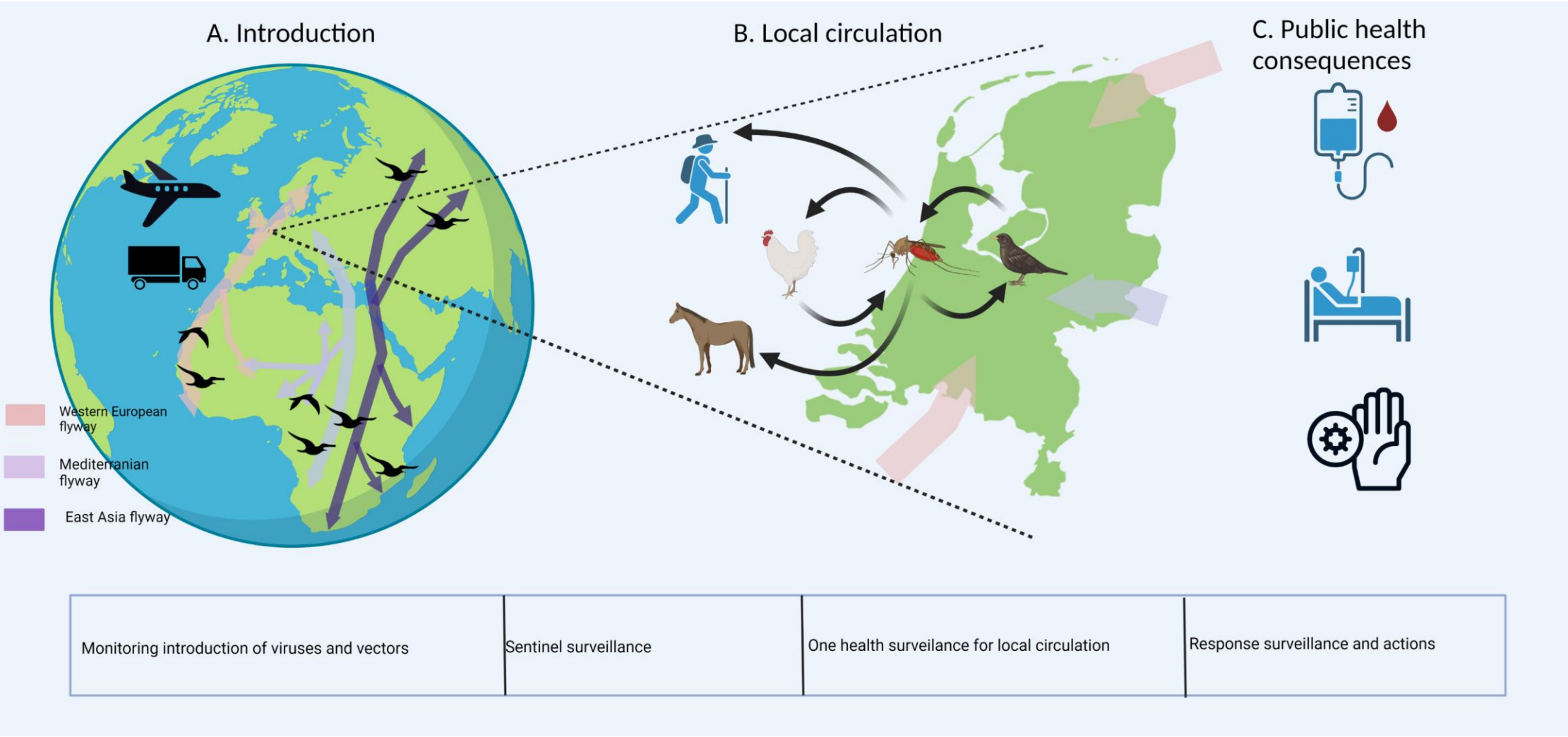
ANDERE ZOONOTISCHE VIRUSSEN MET WILDE VOGELS ALS GASTHEER

- Flavivirussen
  - Usutu Virus (USUV)
  - Japanese Encephalitis Virus (JEV)
- Alphavirussen
  - Sindbis Virus (SINV)
  - Equine Encephalitus Viruses (EEEV; VEEV; WEEV)
- Aviaire influenza
- Vogels kunnen teken en teekgebonden virussen introduceren en verspreiden





Monitoring introduction of viruses and vectors	Sentinel surveillance	One health surveilance for local circulation	Response surveillance and actions

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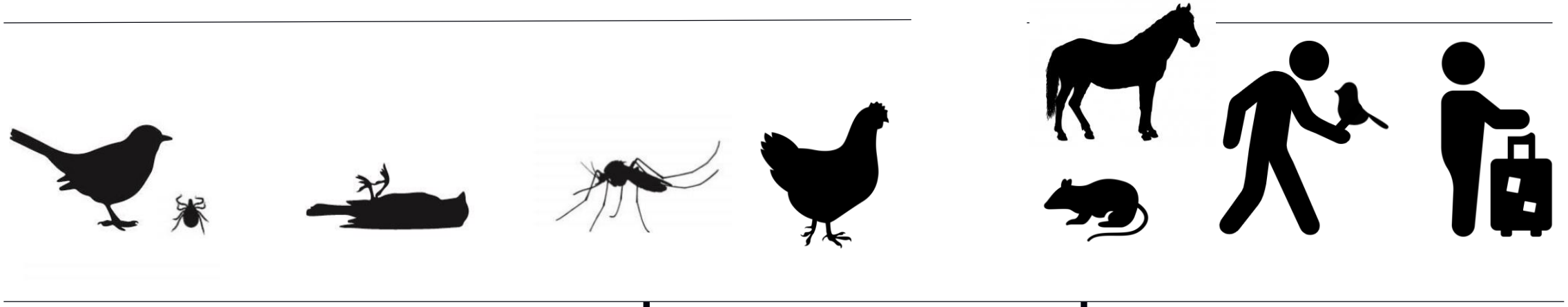
One Health surveillance



Molecular diagnostics

Serology

Sequencing

Phylogenetics

Epidemiological monitoring

one health pact

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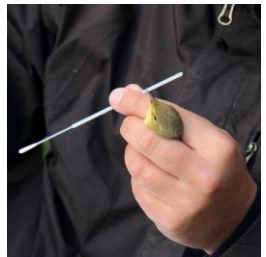
WILDE VOGELMONITORING VOOR ARBOVIRUSSEN

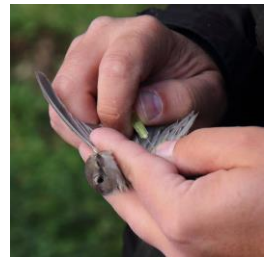
Dode wilde vogels

- Meldingen door burgers en professionals
- Pathologie bij DWHC
- Screening (PCR) USUV, WNV, SINV, JEV

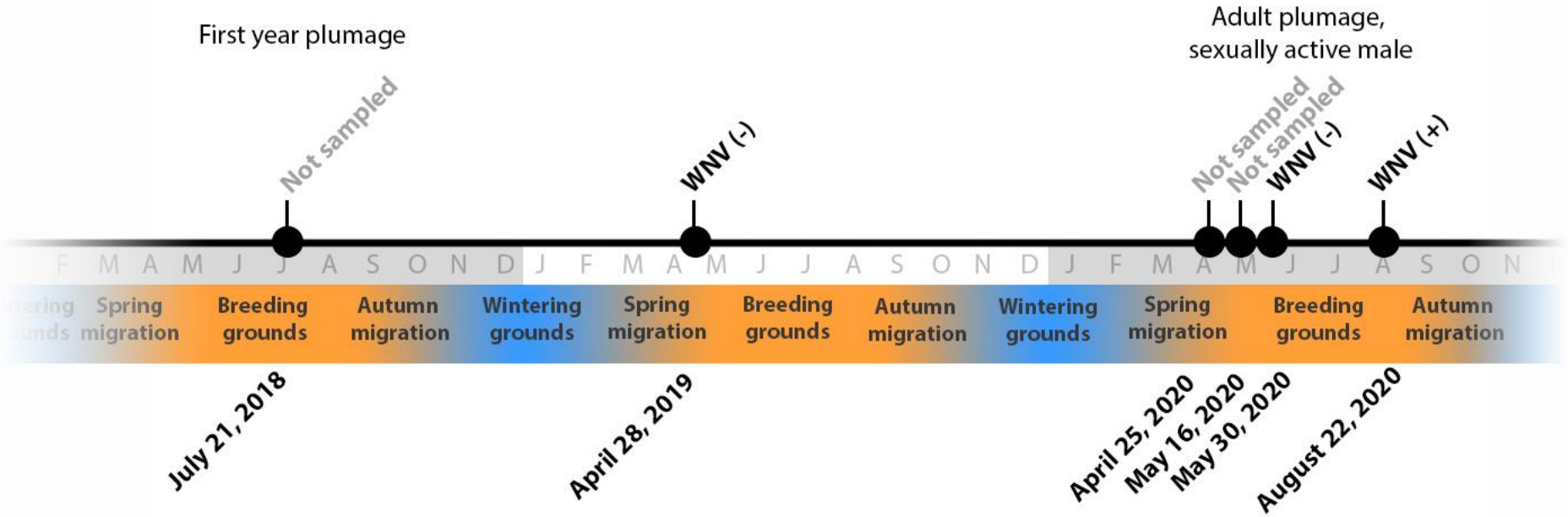
Levende wilde vogels

- >150 vogelringers getraind voor monsterafname
- Keel+cloacaswabs; veren; bloed; teken
- Screening (Antilichamen+PCR) USUV, WNV, SINV, JEV, AIV
- Teken: USUV, WNV, TBEV





2020: EERSTE WESTNIJL DETECTIE IN NEDERLAND



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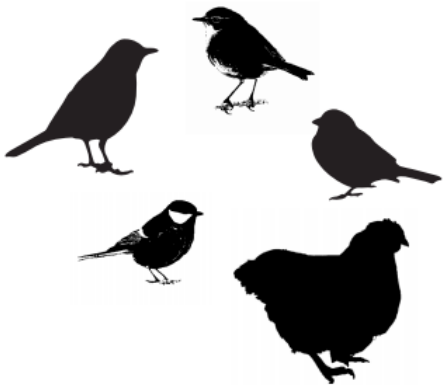
Common whitethroat, Haarzuilens, 22 August

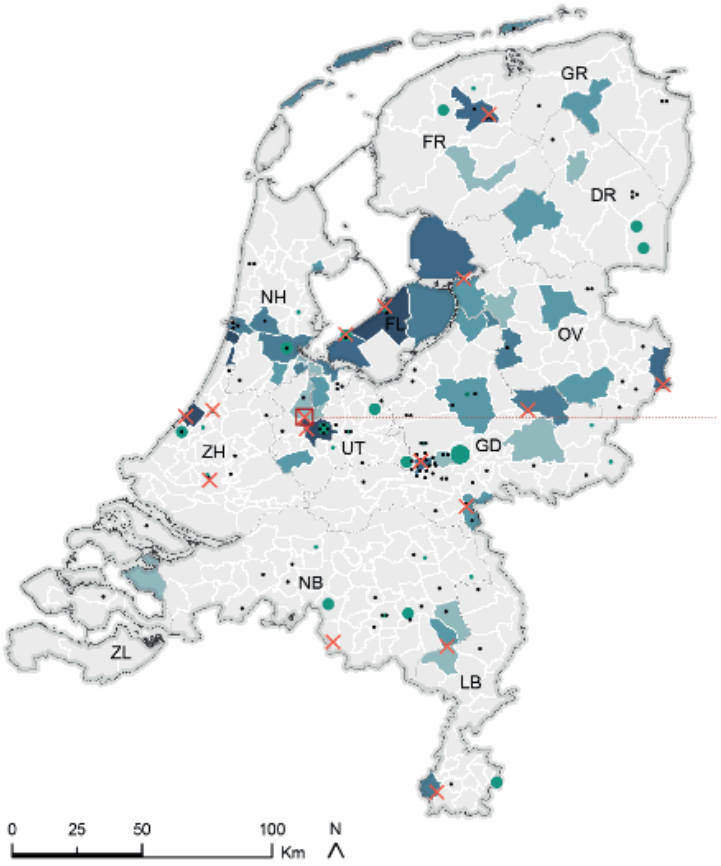
2/44 *Culex* mosquitoes pools from regular surveillance, Haarzuilens, August and September

3/101 *Culex* mosquitoes pools from increased surveillance, Haarzuilens, September



2 House sparrows, 2 Great tits, 1 Common chiffchaff, 1 Song thrush, 1 chicken

2020: EERSTE WESTNIJL DETECTIE IN NEDERLAND



Location of West Nile virus detection in Common Whitethroat and Culex mosquitoes

Mosquito trapping location

Dead birds surveillance
Dead found wild birds sampled and tested

Captive birds: number sampled and tested (aggregated for zoos)

Live wild bird surveillance
Number of birds sampled and tested per municipality

- 0
- 1 - 2
- 3 - 10
- 11 - 30
- 31 - 90
- 91 - 221

Sikkema et al 2020

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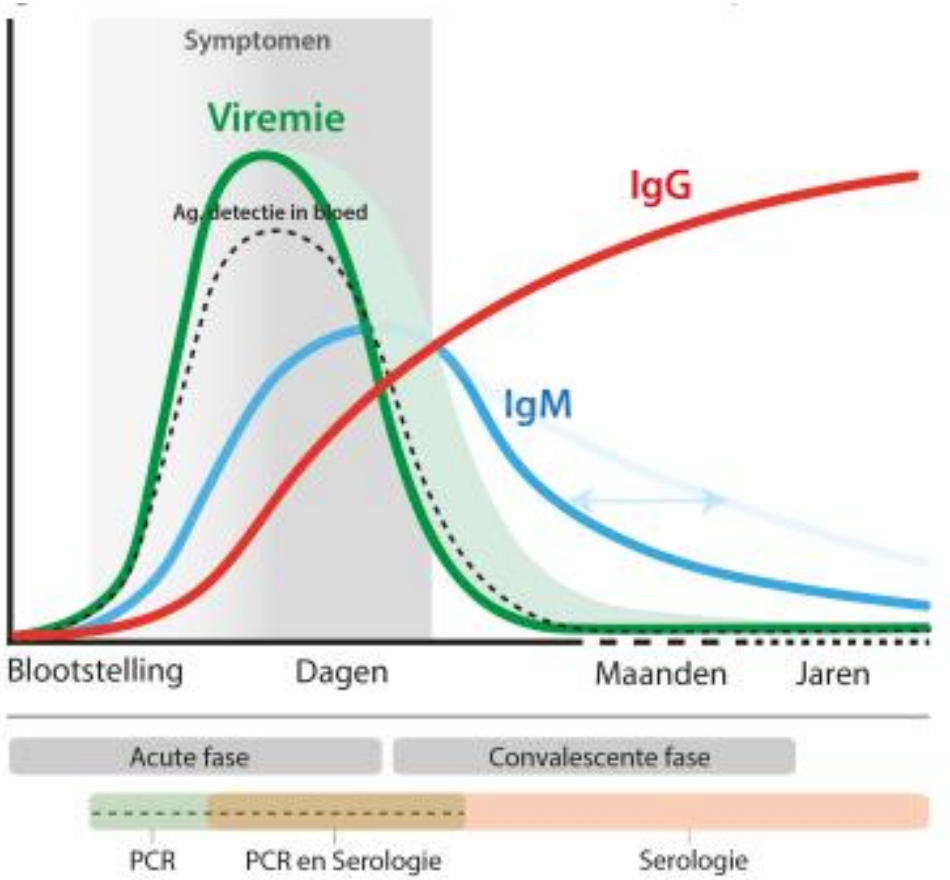
HUMANE PATIENTEN?

- Incubatietijd: 3 tot 15 dagen
- 20%: milde griepachtige symptomen zoals koorts, hoofdpijn en spierpijn.
- 1%: hersenontsteking (encefalitis) of hersenvliesontsteking (meningitis).
- Bij ernstige symptomen kans op overlijden 4 tot 14% (>70 jaar: 15- 29%)



→Bloeddonor screening

→Retrospectief screening van onbegrepen encephalitiden

→Toename aanvragen door communicatie WNV detectie

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HUMANE PATIENTEN?

Rapid communication

First autochthonous human West Nile virus infections in the Netherlands, July to August 2020

Check for updates

Danique RM Vlaskamp[1,2], Steven FT Thijsen[2,3], Johan Reimerink[2,4], Pieter Hilkens[1], Willem H Bouvy[5], Sabine E Bantjes[4], Bart JM Vlaminckx[6], Hans Zaaijer[7], Hans HTC van den Kerkhof[4], Stijn FH Raven[2,4,8], Chantal BEM Reusken[2,4]

View Affiliations

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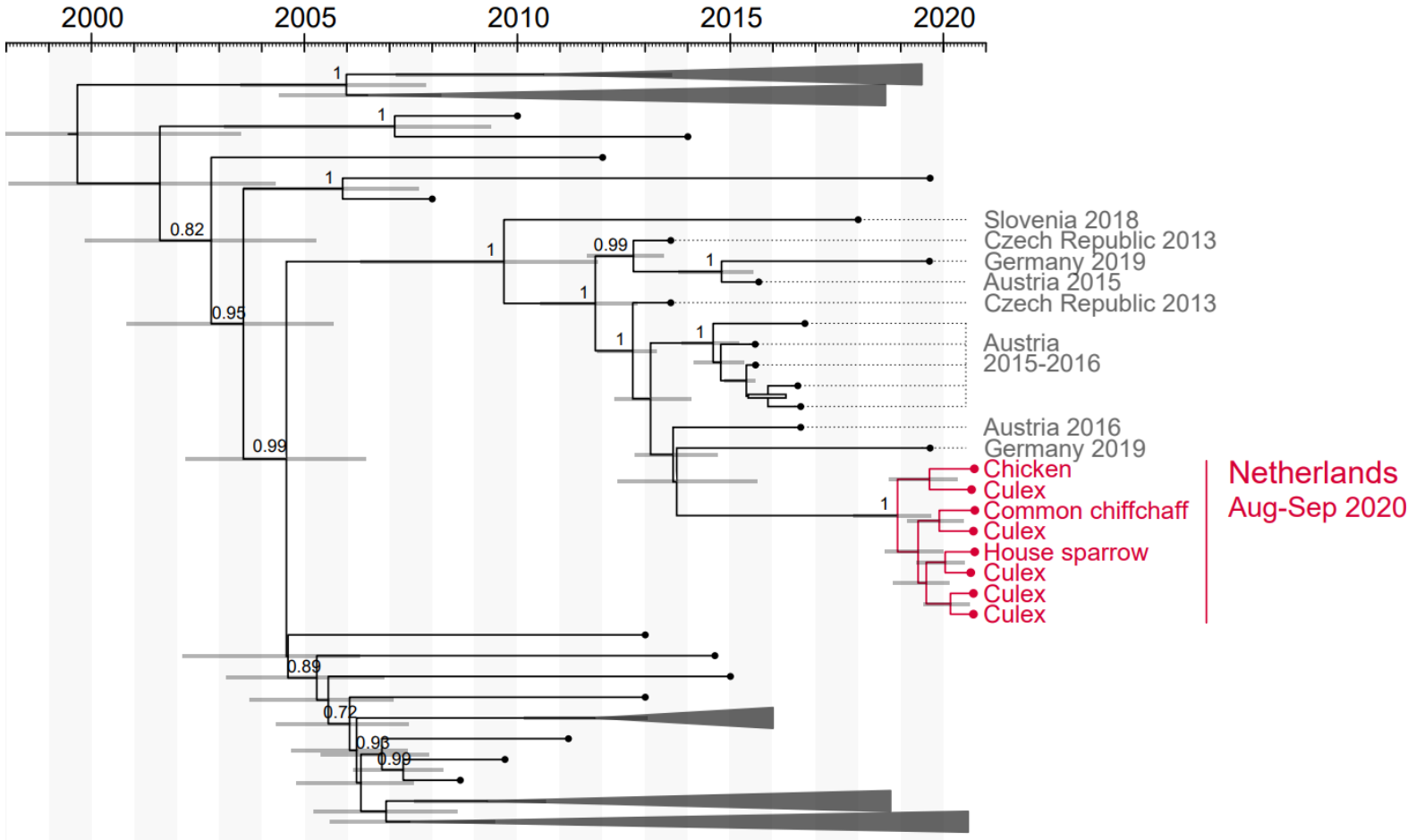
GENETISCHE ANALYSE

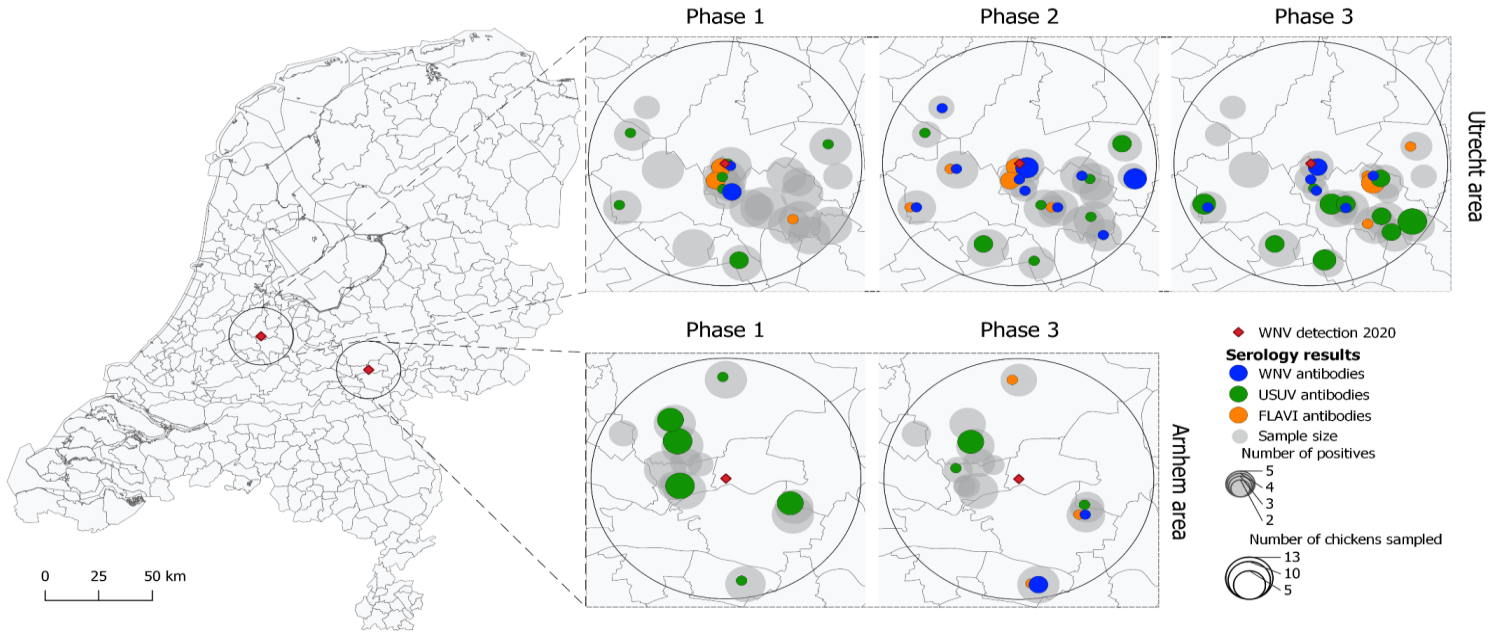


- Alle Nederlandse sequenties in 1 cluster (***single introduction?)***
- Lijkt het meest op sequenties uit Duitsland, 2019 ***(origin?)***
- MRCA (Nov 2017- Sep 2019, 95% CI) ***(moment van introductie?)***

WNV CIRCULATIE IN 2021

Kippen op kinderboerderijen als sentinel

- Kinderboerderijen in 15km radius van WNV lokaties in 2020
- Seroconversies in 2021
- **Geen** WNV RNA in mensen, paarden of vogels in dat jaar



Atama, Streng et al, unpublished

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WNV CIRCULATIE IN 2022

Blauwe reiger besmet met westnijlvirus

Publicatiedatum 31-10-2022 | 08:00

Onehealthpact.org;
RIVM

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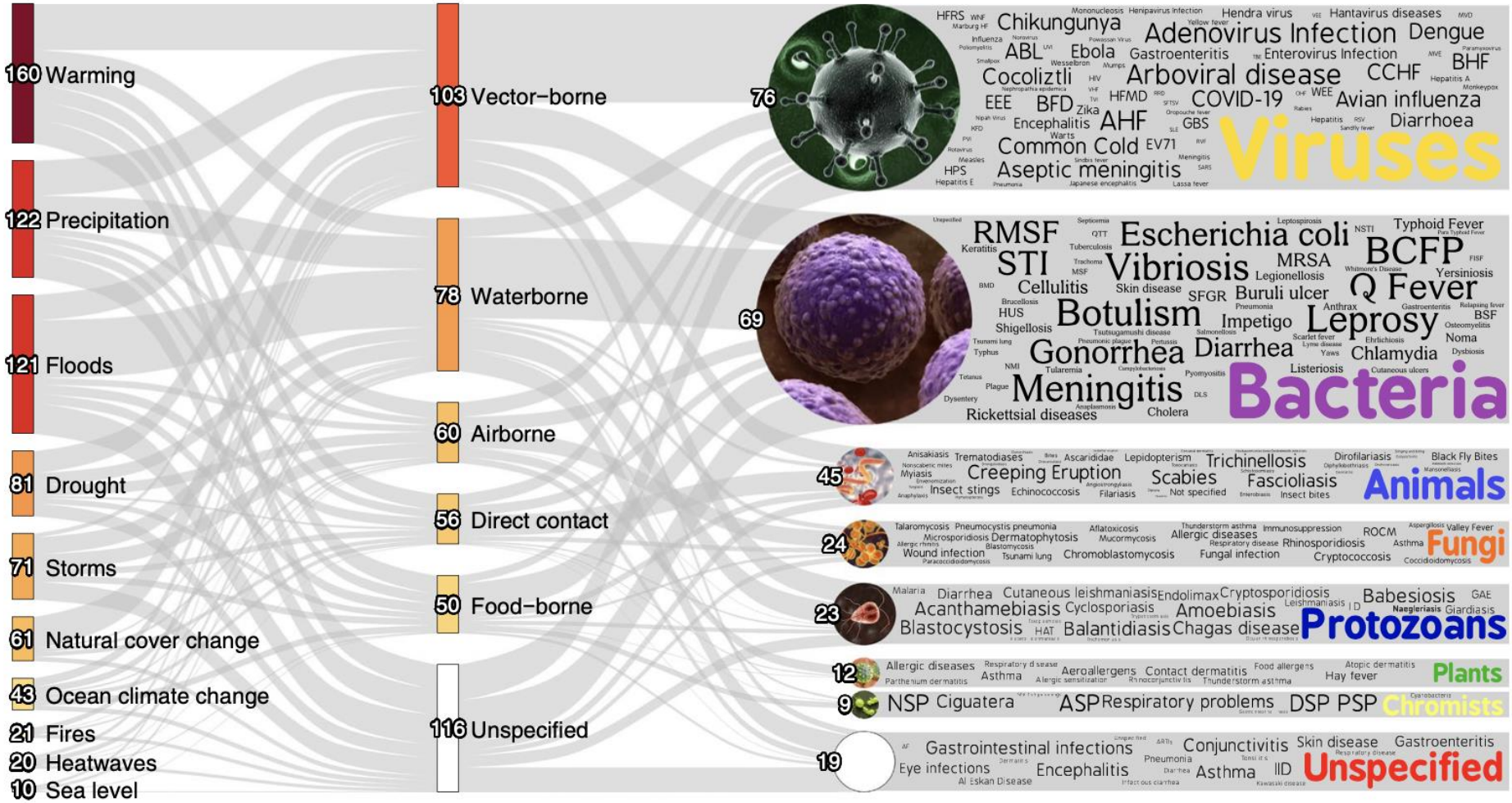
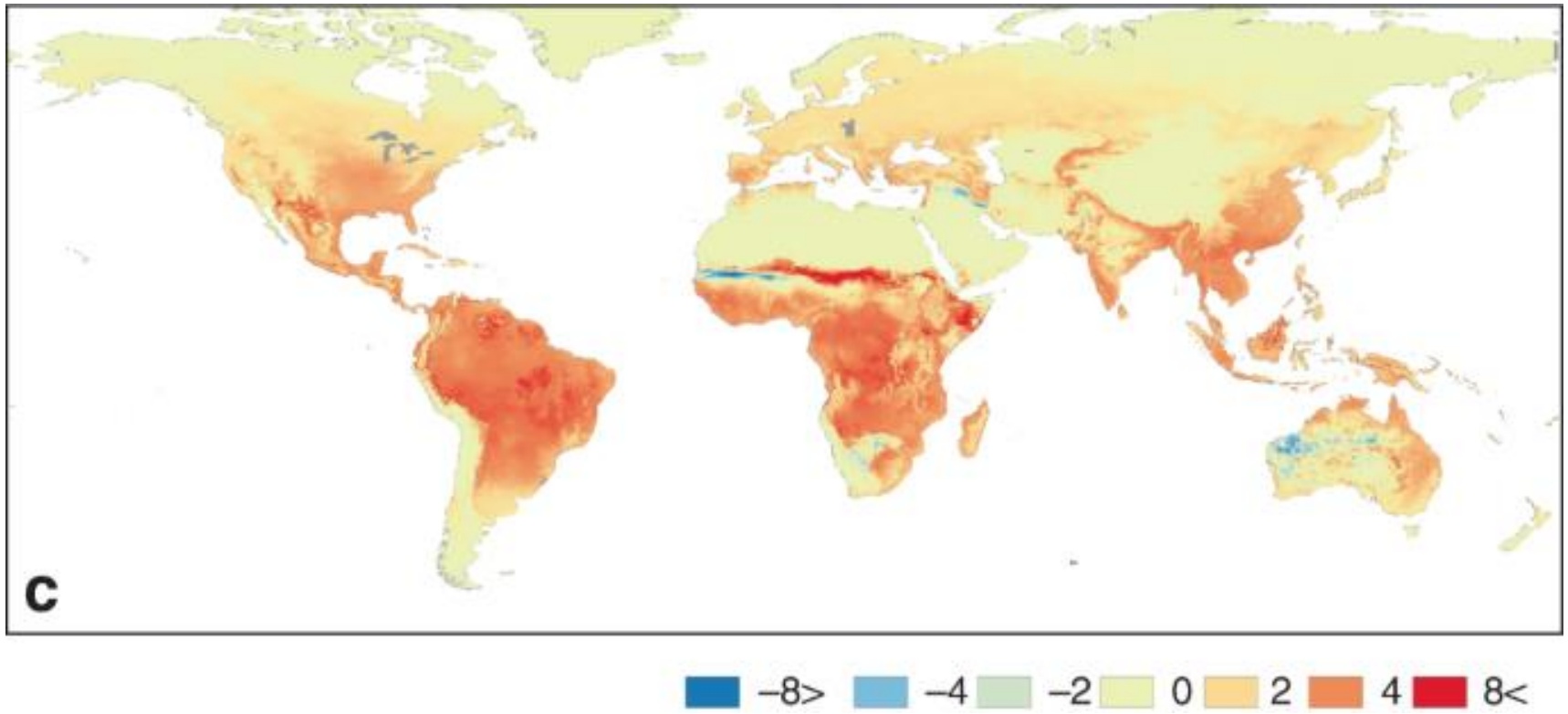
SLECHTS HET BEGIN?

Wereldwijde toename verwacht van arbovirussen door klimaatverandering



Mora et al, Nature climate change, 2022

TOENAME IN GEOGRAFISCHE VERSPREIDING VAN TIJGERMUG



Iwamura et al, Nature comm, 2020;
ECDC 2023

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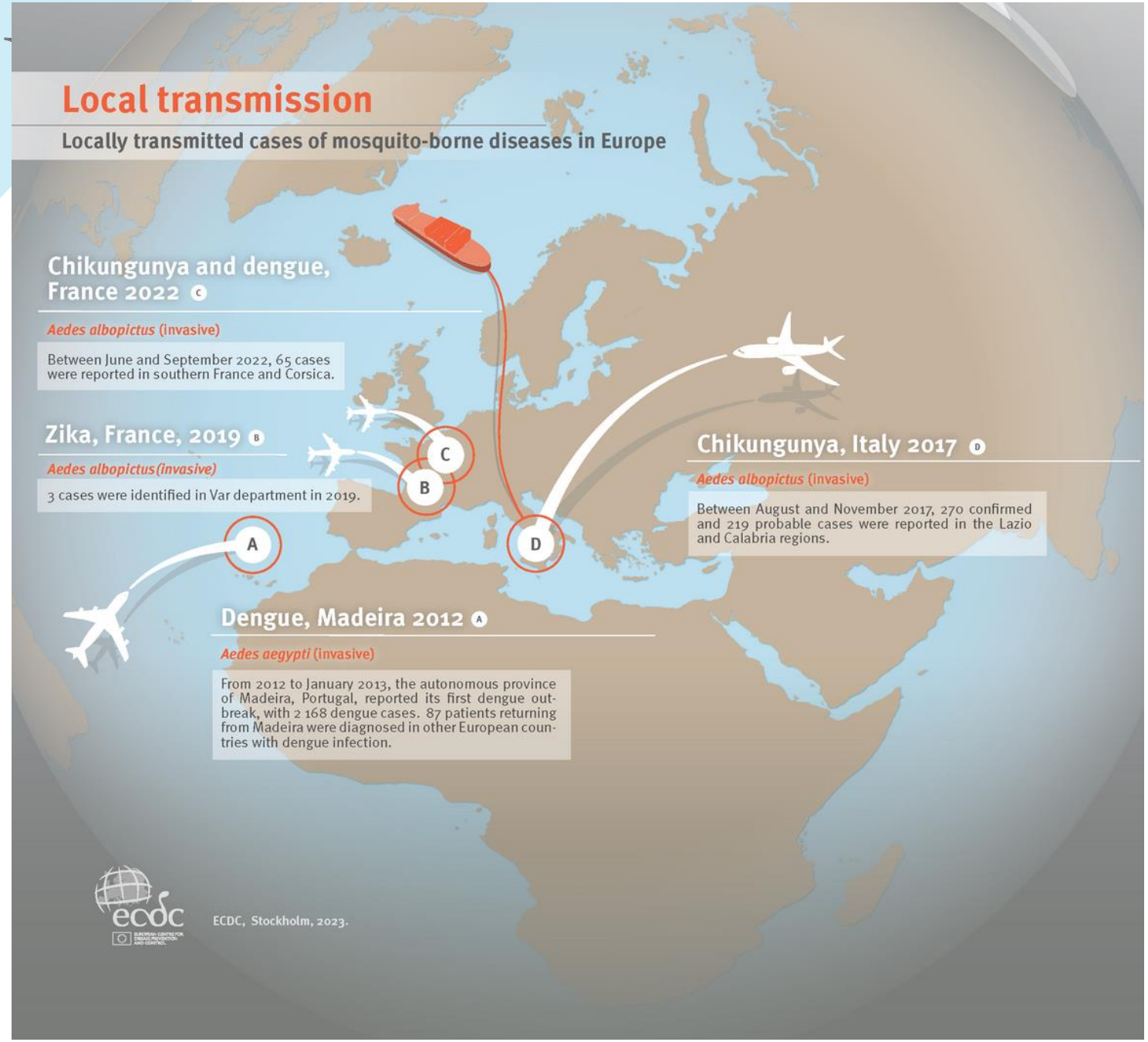

Knokkelkoorts (Dengue)

505 430 cases in 2000
→ 5.2 miljoen in 2019 *(WHO)*

Schattingen lopen op tot 390 miljoen cases/jaar waarvan 96 miljoen met symptomen (*Bhatt, S., et al.)*

global age-standardised death rate per 100 000: 0.53 (0.23–0•65) *(Zeng et al, 2021)*

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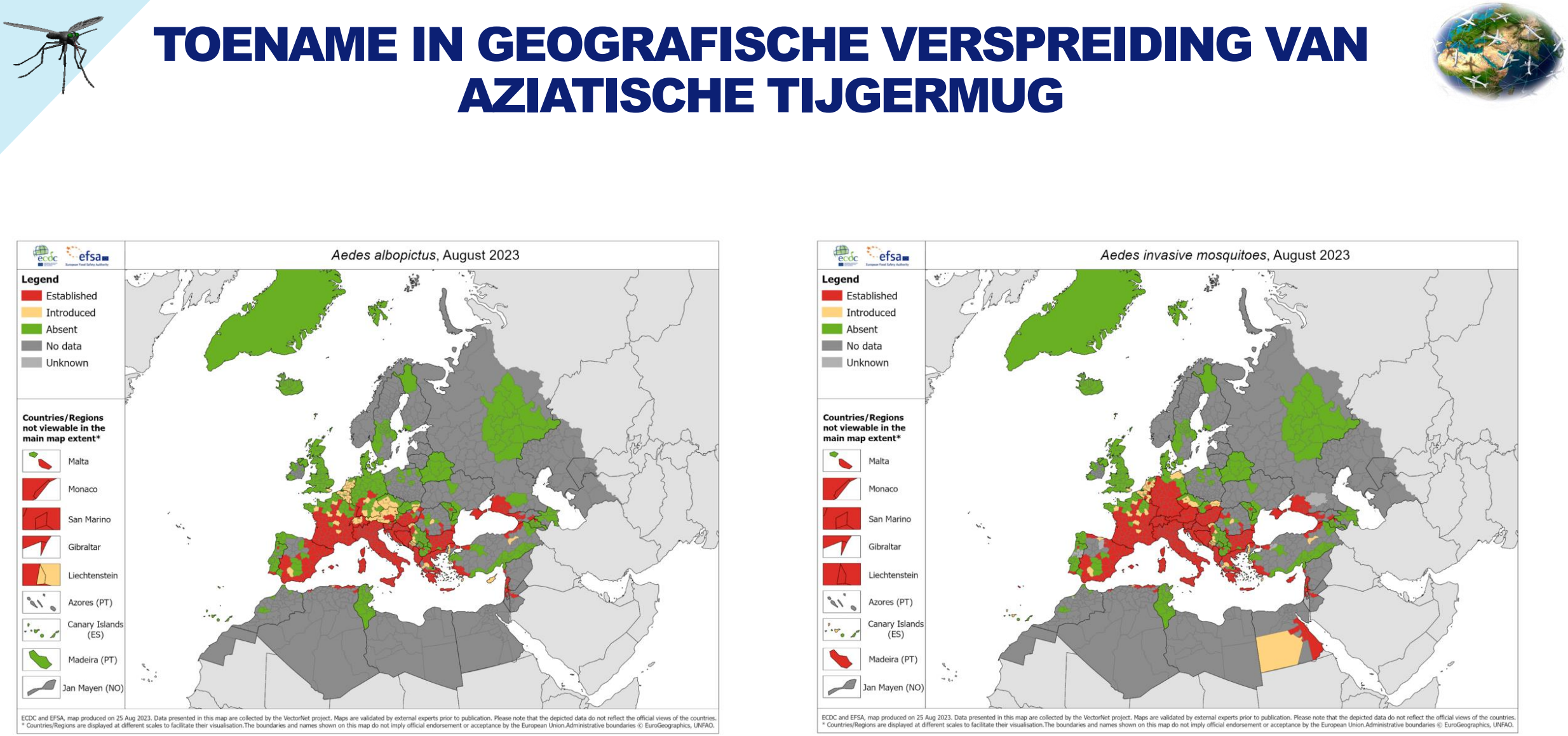
TOENAME IN GEOGRAFISCHE VERSPREIDING VAN AZIATISCHE TIJGERMUG



Ae. aegypti, Ae. albopictus, Ae. atropalpus, Ae. japonicus and Ae. koreicus

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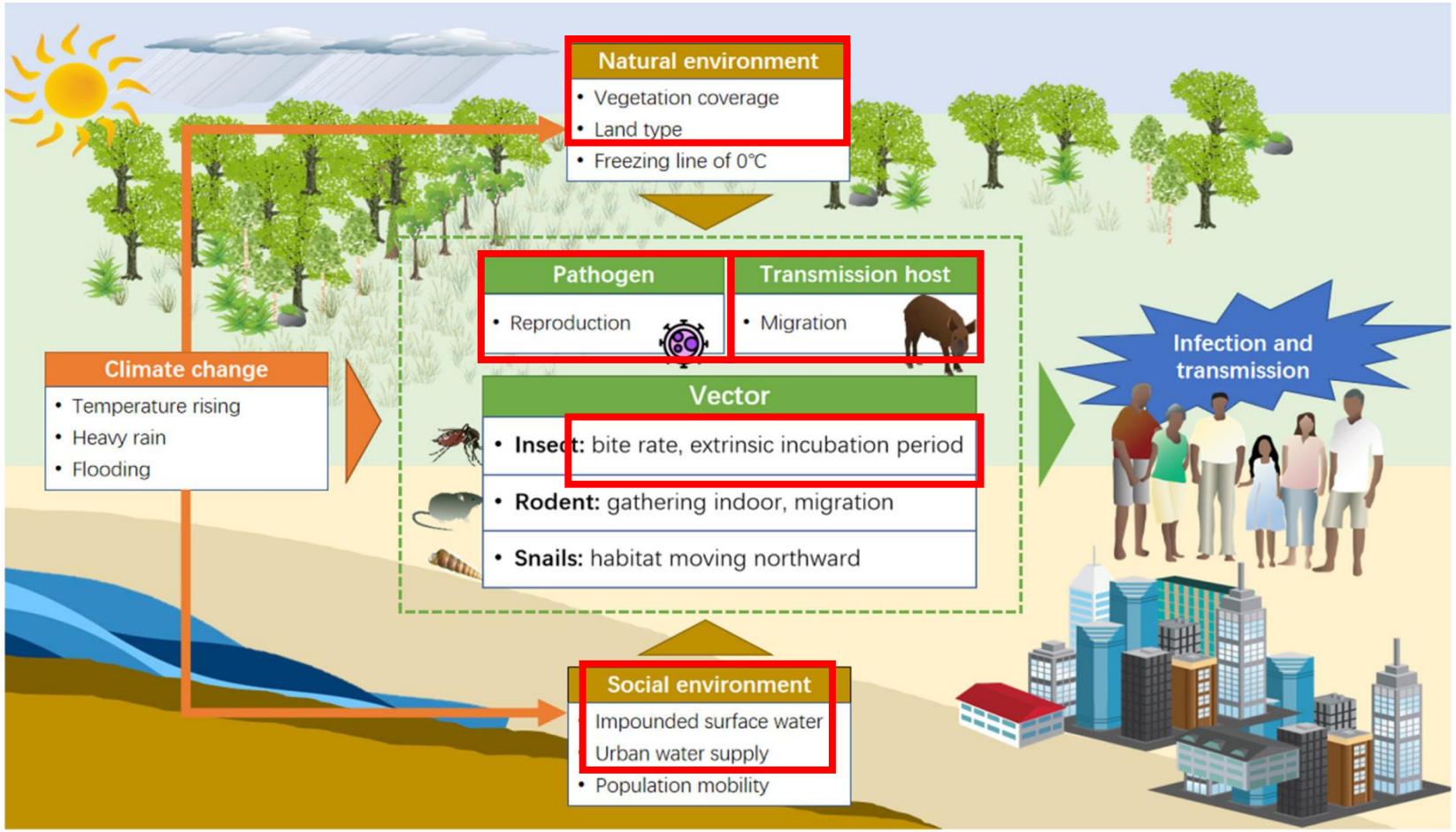
KLIMAATVERANDERING EN VECTOROVERDRAAGBARE AANDOEINGEN: MEER DAN ALLEEN VERSPREIDING VAN VECTOREN



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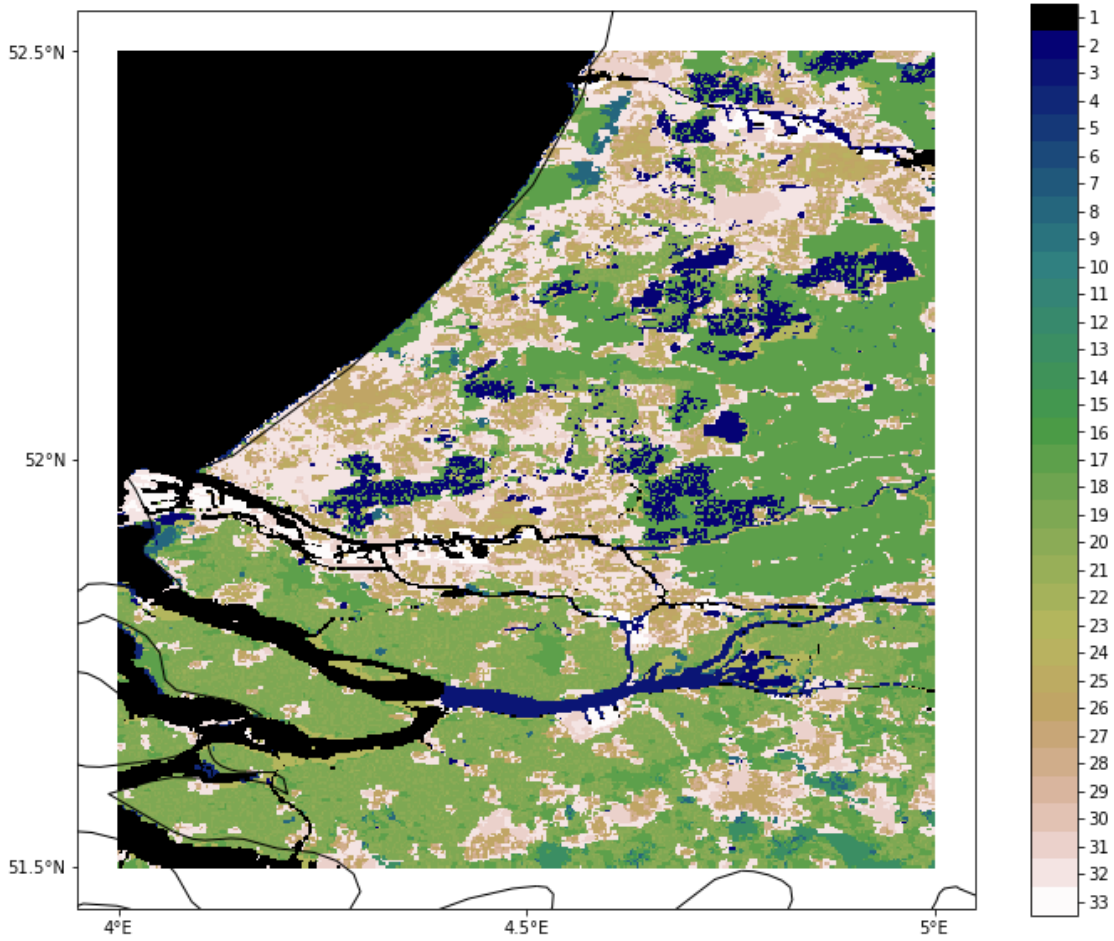
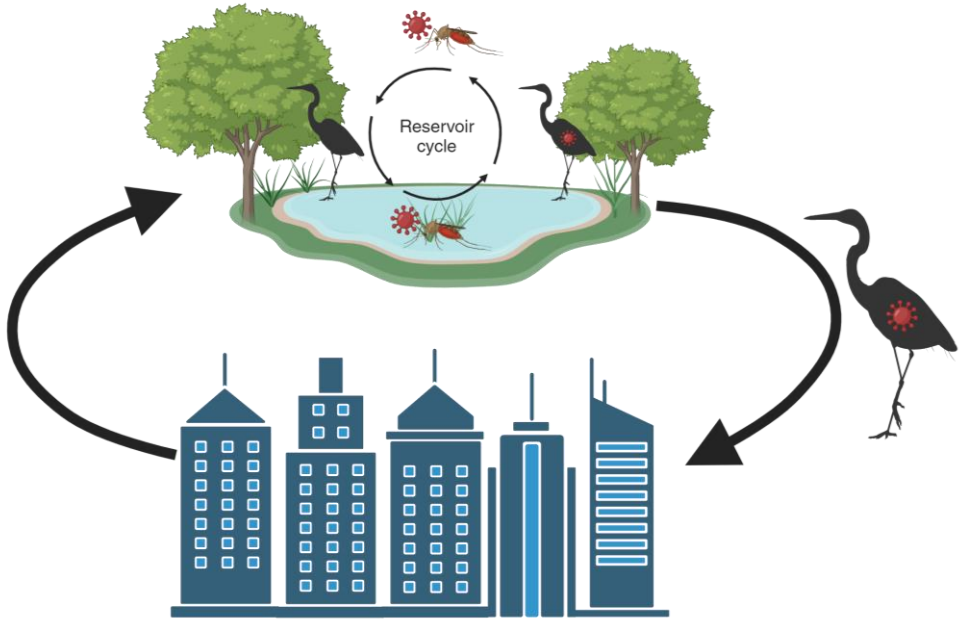
VERANDERINGEN IN HABITAT: GEPLANDE AANLEG WATERBUFFERS EN “ WETLANDS”





Climate Adaptation Services: water buffers around urban areas

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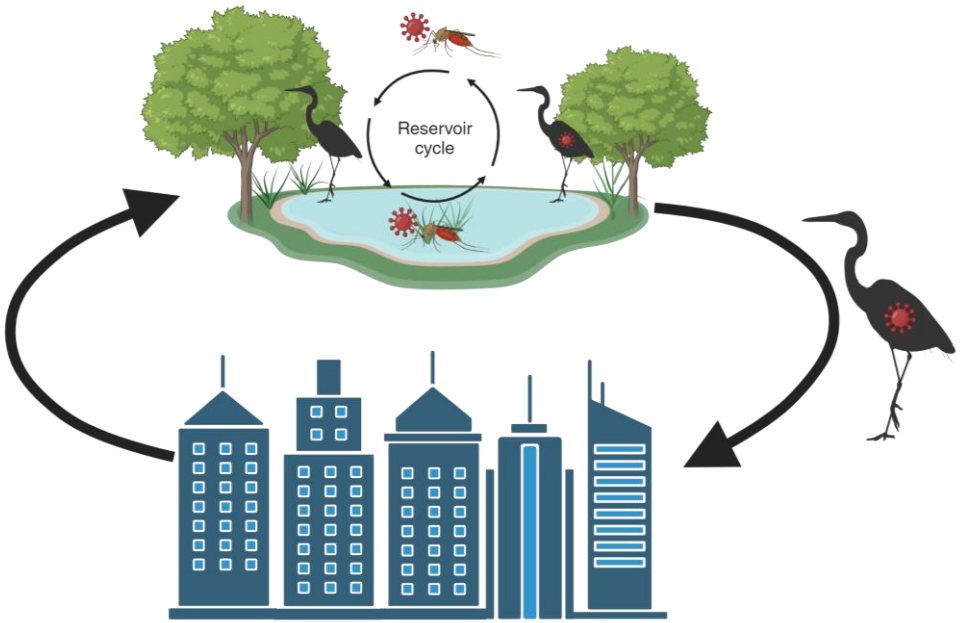
VERANDERINGEN IN HABITAT: VERGROENING EN VERBLAUWING VAN STEDEN

Maashaven -impressie



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CONCLUSIE

- Er is al endemische verspreiding van “ tropische” virussen in Europa
- In Europa, en ook Nederland, een verwachte toename aan arbovirussen
  - Nu ook al aanwezig TBEV, SINV
- Bewustzijn nodig bij burgers en gezondheidszorg
  - Maar ook: waterschappen, stadsplanning, veterinaire gezondheidszorg..
- Onderzoek nodig naar effecten klimaatadaptatiemaatregelen

iDAlert
Infectious Disease decision-support tools and Alert systems

PANDEMIC & DISASTER Preparedness Center (PDPC)

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CLIMATEHUB

REGIONAL KNOWLEDGE NETWORK ON CLIMATE ADAPTATION, HUMAN HEALTH AND BIODIVERSITY)

→ Limited connections between environmental, human and animal domain, on city level

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CLIMATEHUB

REGIONAL KNOWLEDGE NETWORK ON CLIMATE ADAPTATION, HUMAN HEALTH AND BIODIVERSITY)

- Robust learning network to foster collaboration and knowledge sharing among stakeholders in the Rotterdam-Rijnmond region
- Focusing on designing healthy and climate-resilient cities, taking into account the risk of climate sensitive diseases.
- Climate adaptation, biodiversity and infectious diseases, with a focus on mosquito borne diseases
- Healthy City Design toolbox

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Marion Koopmans
Bas Oude Munnink
Nnomzie Atama
Emmanuelle Munger
Irina Chestakova
Anne van der Linden
Felicity Chandler
Marjan Boter
Corine GeurtsvanKessel

Ron Fouchier
Oanh Vuong
Sanne Meeuwissen

NIOO-KNAW

Henk van der Jeugd
Tijs van der Berg
Natasja van Nijen

DWHC

Judith van der Brand
Andrea Grone

WUR

Sander Koenraadt

LU-CML

Jordy van Beek
Maarten Schrama

UvA

Eldar Rakhimberdiev
Judy Shamoun-Baranes
Willem Bouten

RIVM

RoyalGD

And many others..

veo

iDAlert
Infectious Disease decision-support tools and Alert systems

PANDEMIC & DISASTER Preparedness Center (PDPC)

one health pact

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