

Protocol for a systematic review on the results of arbovirus sero-surveys

1. Objective

To provide up-to-date synthesis of the results of arbovirus sero-surveys globally.

2. Methods

a. Approach for the review

[Explain first search and search update with same inclusion/exclusion criteria and data extraction and modified search strategy] To conduct this review, we will use systematic review methods informed by Cochrane guidance.¹ Screening and data extraction will be completed by one reviewer and verified by a second. Discrepancies will be resolved by discussion.

b. Criteria for including evidence

Characteristics	Criteria for inclusion ^a
Population	<ul style="list-style-type: none">• Humans - any age
Condition	<ul style="list-style-type: none">• Previous arbovirus infection (Zika Virus, Dengue Virus, Chikungunya Virus, Yellow Fever, West Nile Virus, or Mayaro Virus), including symptomatic persons, vaccinated persons, and those with suspected disease
Types of evidence	<ul style="list-style-type: none">• Proposed or ongoing sero-surveys – defined as the collection and testing of serum (or proxy such as oral fluid) specimens from a sample of a defined population over a specified period of time in a specified location to estimate the prevalence of antibodies against one of the six arboviruses as an indicator of immunity• Cross-sectional, cohort, case reports, evaluations of serological tests, reviews and meta-analyses, and case control study designs, with serum measurements at single time points or repeated at multiple time points• Published or unpublished academic literature (only published literature included in first search), grey literature (government or institutional reports), or media reports. Slide deck presentations were included if we could identify the person giving the presentation and the date of the presentation.• Any sampling method

¹Cochrane guidance on rapid reviews <https://methods.cochrane.org/rapidreviews/cochrane-rr-methods>

Outcome measures	<ul style="list-style-type: none"> ● Reports or provides data to calculate seroprevalence estimates: <ul style="list-style-type: none"> ○ Seropositive prevalence (proportion with detectable antibodies) ○ Seronegative prevalence (proportion without detectable antibodies) ○ Seroprotected prevalence (proportion above protective antibody threshold) ○ Non-seroprotected prevalence (proportion with no detectable antibodies or below the protective antibody threshold) ● Reports the number of participants enrolled in the study (denominator) ● Reports study sampling end date/week ● Reports the location(s) at which the study took place such that they could be categorized as neighbourhood, city, state/province/territory, or country
Languages	<ul style="list-style-type: none"> ● Any

^aEvidence must meet all the criteria to be included.

c. Criteria for excluding evidence

Characteristics	Criteria for exclusion
Population	<ul style="list-style-type: none"> ● Non-human (e.g., <i>in silico</i>, animal, <i>in vitro</i>)
Condition	<ul style="list-style-type: none"> ● Not applicable
Types of evidence	<ul style="list-style-type: none"> ● Focus on one of the six arboviruses, but unrelated to serosurveillance (e.g., viral properties, general information about arboviruses) ● Serological study protocols without an implementation plan that includes a proposed region, sample size, and approximate start date ● Multimedia sources of data (audio/video clips) were excluded due to the feasibility of extracting. Slide deck presentations were excluded if we could not identify the person giving the presentation and the date of the presentation.
Outcome measures	<ul style="list-style-type: none"> ● Only reports incidence or prevalence of serum arbovirus antigen ● Does not report the number of participants included in the study (sample denominator) ● Does not report study sampling end date/week ● Does not report the location(s) at which the study took place
Languages	<ul style="list-style-type: none"> ● N/A

d. Search methods

The first search was completed on March 13, 2023 and included published academic studies in databases (Web of Science, Google Scholar, LILACS, PubMed). For the search update, we will search electronic data sources through May 2024 using search terms related to the six arboviruses and sero-surveillance. See Supplement 1 for the complete search strategy. We will search for published and unpublished academic studies in databases (Web of Science, Google

Scholar, LILACS, PubMed, MedRXiv, BioRXIV). The search strategy will be pilot-tested and validated using a key set of sero-surveillance studies from multiple countries.

e. Strategy for updating evidence

We will subscribe to daily automatic email alerts for the electronic databases, journals, and media resources. These will be directed to a common Gmail account. Each author will be assigned to an incoming source of evidence for updated screening and extraction.

f. Data extraction

We will extract the data elements listed in the table below from included articles.

Variable	Description
Source level	
Source title	Free text
First author	Free text
Publication date	Date
URL	Url
Study/estimate level	
Continent in which study was carried out	Free text
Country in which study was carried out	Free text
State in which study was carried out	Free text
City or cities in which study was carried out	Free text
Study design	Categorical: cross-sectional, repeated cross-sectional, cohort studies
Inclusion criteria	Free text
Exclusion criteria	Free text
Age	Numeric
Age group	Categorical
Sex	Categorical

Start date for testing	Date
End date for testing	Date
Sample frame	Categorical: Outpatients, Inpatients, Community, Blood donors, Pregnant or parturient women, Students and Daycares, Positive or suspected cases, Perinatal, Positive cases of a different arbovirus (e.g. tested for DENV in samples with ZIKV), Essential non-healthcare workers
Sampling method	Categorical: Simple random, Cluster random, Convenience, Non-probability sampling, Stratified random sampling, Multi-stage random sampling, Systematic random sampling, Probability sampling
Antibody	Categorical: IgG, IgA, IgM, IgD, IgE
Antigen	Free text
Assay	Categorical: ELISA, LFIA, VNT, PRNT, FRNT, MIA, HAI, MNT, Other
Assay producer	Categorical
Seroprevalence, %**	Numeric
Seroprevalence, 95% confidence interval upper	Numeric
Seroprevalence, 95% confidence interval lower	Numeric
Numerator value (number positive)	Numeric
Seroconversion cut-off, indicating how a test is defined as positive	Free text
Denominator value (n), indicating total sample size	Numeric

** Crude, population-adjusted and test-adjusted prevalence estimates will be extracted.

g. Duplicate articles and data

If articles report duplicate information, we will include the article that provides the most complete information and exclude the duplicates.

h. Sub-group estimates

If an article reports sub-group estimates stratified on more than one variable, it will be flagged. In order to rapidly update the review, we will first extract the summary estimate, as well as any sub-group estimates based on stratifications by one variable (sex, age, risk group, region).

i. Data analysis

Data will be summarized using counts and proportions.

j. Critical appraisal

We will add critical appraisal at a later date.

k. Data presentation

All data will be presented on a publicly accessible online platform (i.e., AirTable). We will design built-in filters that allow users to sort prevalence estimates by region (i.e., states, provinces) and population (i.e., age, sex, health care workers).

Supplement 1. Search strategies

Type of evidence: published academic work First search completed March 13, 2023			
Source	Search strategy		Hits
Web of Science	1	(arbovirus* OR "zika vir*" OR ZIKV OR "chikungunya vir*" OR CHIKV OR "dengue vir*" OR DENV OR "west nile vir*" OR WNV OR "mayaro vir*" OR MAYV OR "Yellow Fever" OR "Arbovirus Infections" OR "zika Virus" OR "chikungunya virus" OR "dengue virus" OR "west nile virus" OR "Yellow Fever" OR "Yellow fever virus")	
	2	((("sero diagnos*" OR serologic*) AND test*) OR "Serologic Tests") AND (prevalence* OR Prevalence))	
	3	1 AND 2 AND 3	239
Google Scholar	1	intext:(Arbovirus* OR "Zika vir*" OR ZIKV OR "chikungunya vir*" OR CHIKV OR "dengue vir*" OR DENV OR "west nile vir*" OR WNV OR "Mayaro vir*" OR MAYV)	
	2	intext:(Serologic*) AND intext:(Prevalence*)	
	3	1 AND 2 AND 3	235
LILACS	1	(arbovirus* OR "zika vir*" OR ZIKV OR "chikungunya vir*" OR CHIKV OR "dengue vir*" OR DENV OR "west nile vir*" OR WNV OR "mayaro vir*" OR MAYV OR "Yellow Fever" OR "Arbovirus Infections" OR "zika Virus" OR "chikungunya virus" OR "dengue virus" OR "west nile virus" OR "Yellow Fever" OR "Yellow fever virus")	
	2	((("sero diagnos*" OR serologic*) AND test*) OR "Serologic Tests") AND (prevalence* OR Prevalence))	
	3	1 AND 2 AND 3	66
PubMed	1	("arbovirus*"[Text Word] OR "zika vir*" [Text Word] OR "ZIKV"[Text Word] OR "chikungunya vir*" [Text Word] OR "CHIKV"[Text Word] OR "dengue vir*" [Text Word] OR "DENV"[Text Word] OR "west nile vir*" [Text Word] OR "WNV"[Text Word] OR "mayaro vir*" [Text Word] OR "MAYV"[Text Word] OR "Yellow Fever"[Text Word] OR "Arbovirus Infections"[MeSH Terms] OR "zika Virus"[MeSH Terms] OR "chikungunya virus"[MeSH Terms] OR "dengue virus"[MeSH Terms] OR "west nile virus"[MeSH Terms] OR "Yellow Fever"[MeSH Terms] OR "Yellow fever virus"[MeSH Terms])	
	2	((("sero* diagnos*" [Text Word] OR "serologic*" [Text Word]) AND "test*" [Text Word]) OR "Serologic Tests"[MeSH Terms]) AND ("prevalence*" [Text Word] OR "Prevalence"[MeSH Terms])	

	3	1 AND 2 AND 3	554
--	---	---------------	-----