

Complete Quantitative Analysis

Total number of studies (n = 27)	CIHR		NIHR and Wellcome		LSHM		MRC		NIH and HHS/NIH		NSRF		UKRI		Other		Median Duration, CIHR years (IQR)	95% Skipped Interval	
	n	%	n	%	n	%	n	%	n	%	n	%	n	%	n	%			
<b>Study location</b>																			
USA	1	4	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
UK	1	4	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Canada	1	4	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Other	1	4	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
<b>Study design</b>																			
Randomised controlled trial	1	4	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Other	1	4	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
<b>Study population</b>																			
General population	1	4	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Other	1	4	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
<b>Study intervention</b>																			
Drug	1	4	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Other	1	4	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
<b>Study outcome</b>																			
Quality of life	1	4	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Other	1	4	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0

Complete Qualitative Analysis

Study Number	Study Name	Author	Year of Publication	Journal	Geography	Population	Design	Intervention	Study Population	Intervention Type	Model Type and/or Outcome Measure	Data Source	Methodology	Outcomes	Key findings relating to testing facilities	Are findings related to testing facilities?	Challenges/Comments
1	... (Study 1)	...	2017	...	...	...	...	...	...	...	...	...	...	...	...	...	...
2	...	...	2018	...	...	...	...	...	...	...	...	...	...	...	...	...	...
3	...	...	2017	...	...	...	...	...	...	...	...	...	...	...	...	...	...
4	...	...	2018	...	...	...	...	...	...	...	...	...	...	...	...	...	...
5	...	...	2018	...	...	...	...	...	...	...	...	...	...	...	...	...	...
6	...	...	2018	...	...	...	...	...	...	...	...	...	...	...	...	...	...
7	...	...	2018	...	...	...	...	...	...	...	...	...	...	...	...	...	...
8	...	...	2018	...	...	...	...	...	...	...	...	...	...	...	...	...	...
9	...	...	2018	...	...	...	...	...	...	...	...	...	...	...	...	...	...
10	...	...	2018	...	...	...	...	...	...	...	...	...	...	...	...	...	...
11	...	...	2018	...	...	...	...	...	...	...	...	...	...	...	...	...	...
12	...	...	2018	...	...	...	...	...	...	...	...	...	...	...	...	...	...
13	...	...	2018	...	...	...	...	...	...	...	...	...	...	...	...	...	...
14	...	...	2017	...	...	...	...	...	...	...	...	...	...	...	...	...	...
15	...	...	2017	...	...	...	...	...	...	...	...	...	...	...	...	...	...
16	...	...	2018	...	...	...	...	...	...	...	...	...	...	...	...	...	...
17	...	...	2018	...	...	...	...	...	...	...	...	...	...	...	...	...	...
18	...	...	2018	...	...	...	...	...	...	...	...	...	...	...	...	...	...
19	...	...	2018	...	...	...	...	...	...	...	...	...	...	...	...	...	...
20	...	...	2018	...	...	...	...	...	...	...	...	...	...	...	...	...	...
21	...	...	2018	...	...	...	...	...	...	...	...	...	...	...	...	...	...
22	...	...	2018	...	...	...	...	...	...	...	...	...	...	...	...	...	...
23	...	...	2018	...	...	...	...	...	...	...	...	...	...	...	...	...	...
24	...	...	2018	...	...	...	...	...	...	...	...	...	...	...	...	...	...
25	...	...	2018	...	...	...	...	...	...	...	...	...	...	...	...	...	...
26	...	...	2018	...	...	...	...	...	...	...	...	...	...	...	...	...	...
27	...	...	2018	...	...	...	...	...	...	...	...	...	...	...	...	...	...
28	...	...	2018	...	...	...	...	...	...	...	...	...	...	...	...	...	...
29	...	...	2018	...	...	...	...	...	...	...	...	...	...	...	...	...	...
30	...	...	2018	...	...	...	...	...	...	...	...	...	...	...	...	...	...
31	...	...	2018	...	...	...	...	...	...	...	...	...	...	...	...	...	...
32	...	...	2018	...	...	...	...	...	...	...	...	...	...	...	...	...	...
33	...	...	2018	...	...	...	...	...	...	...	...	...	...	...	...	...	...
34	...	...	2018	...	...	...	...	...	...	...	...	...	...	...	...	...	...
35	...	...	2018	...	...	...	...	...	...	...	...	...	...	...	...	...	...
36	...	...	2018	...	...	...	...	...	...	...	...	...	...	...	...	...	...
37	...	...	2018	...	...	...	...	...	...	...	...	...	...	...	...	...	...
38	...	...	2018	...	...	...	...	...	...	...	...	...	...	...	...	...	...
39	...	...	2018	...	...	...	...	...	...	...	...	...	...	...	...	...	...
40	...	...	2018	...	...	...	...	...	...	...	...	...	...	...	...	...	...
41	...	...	2018	...	...	...	...	...	...	...	...	...	...	...	...	...	...
42	...	...	2018	...	...	...	...	...	...	...	...	...	...	...	...	...	...
43	...	...	2018	...	...	...	...	...	...	...	...	...	...	...	...	...	...
44	...	...	2018	...	...	...	...	...	...	...	...	...	...	...	...	...	...
45	...	...	2018	...	...	...	...	...	...	...	...	...	...	...	...	...	...
46	...	...	2018	...	...	...	...	...	...	...	...	...	...	...	...	...	...
47	...	...	2018	...	...	...	...	...	...	...	...	...	...	...	...	...	...
48	...	...	2018	...	...	...	...	...	...	...	...	...	...	...	...	...	...
49	...	...	2018	...	...	...	...	...	...	...	...	...	...	...	...	...	...
50	...	...	2018	...	...	...	...	...	...	...	...	...	...	...	...	...	...



## Epidemic Forecasting of WHO's Blueprint list of diseases

### Epidemic\_Forecasting\_Models\_Systematic\_Literature\_Review

Search created by Nils Jonkmans, Cécile Jaques, Alexia Trombert
Purpose of the search : Scoping Review

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TO UPDATE THE DOCUMENT (NUMBERINGS, TABLE OF CONTENTS AND TOTALS UNDER RESULTS) **SELECT ALL THE TEXT** AND PRESS **F9**

## Search question

<b>Original question</b>	Epidemic Forecasting of WHO's Blueprint list of diseases
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<b>[P]opulation</b>	<b>[I]ntervention</b>	<b>[C]omparison</b>	<b>[O]utcomes</b>
WHO's Blueprint list of diseases	Epidemic Forecasting		Accuracy of Prediction Impact on policy Impact on Health

## 1. Articles of interest

PubMed	(29939284[uid] OR 28830111[uid] OR 15893110[uid] OR 29593941[uid] OR 28200111[uid] OR 26777915[uid])
Medline Ovid SP	(29939284 OR 28830111 OR 15893110 OR 29593941 OR 28200111 OR 26777915).ui.
Embase	(L624510525 OR L614977227 OR L40704522 OR L621334005 OR L620052059 OR L607774686):id

## 2. Preliminary search for systematic reviews

### Embase.com

Wong ZSY, Bui CM, Chughtai AA, Macintyre CR. A systematic review of early modelling studies of Ebola virus disease in West Africa. *Epidemiol Infect.* 2017;145(6):1069–94.  
<https://www.ncbi.nlm.nih.gov/pubmed/28166851>

## 3. Bibliographic data sources used

Embase

PubMed

Web of Science – Core collection

## 4. Vocabulary

<b>Concepts</b>	WHO's Blueprint list of diseases	Epidemic Forecasting
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<p><b>Free terms</b></p> <p>PubMed, Embase</p>	<p>(Lassa AND (fever* OR virus*))</p> <p>Ebola OR ebolavirus</p> <p>(Marburg AND (fever* OR virus*))</p> <p>Marburg-Disease*</p> <p>marburgvirus</p> <p>Crimean-Hemorrhagic-Fever*</p> <p>Crimean-Haemorrhagic-Fever*</p> <p>Congo-Virus*</p> <p>Crimean-Congo-Hemorrhagic-Fever*</p> <p>Crimean-Congo-Haemorrhagic-Fever*</p> <p>"Middle East respiratory syndrome"</p> <p>MERS</p> <p>"Severe Acute Respiratory Syndrome"</p> <p>SARS</p> <p>Henipavirus*</p> <p>Nipah-Virus*</p> <p>NiV-Infection*</p> <p>Rift-Valley-Fever*</p> <p>ZikV</p> <p>Zika</p> <p>Viral-hemorrhagic-fever*</p> <p>Viral-haemorrhagic-fever*</p> <p>"Disease X"</p>	<p>Forecast*</p> <p>Foreshadow*</p> <p>Predict*</p> <p>Project*</p> <p>Preempt*</p> <p>Pre-empt*</p> <p>Conject*</p> <p>((Prospect* OR Advance* OR Proactive) AND (warn* OR detect*))</p> <p>((Anticipat* OR Estim* OR Model*) AND futur*)</p> <p>Foretell*</p> <p>Foresee*</p> <p>Forewarn*</p> <p>"predictive modeling"</p>	<p>Outbreak*</p> <p>Epidemic*</p> <p>Pandemic*</p> <p>Spread*</p> <p>Futur*</p>
<p><b>Emtree</b></p>	<p>'virus hemorrhagic fever'/de</p> <p>'Lassa fever'/de</p> <p>'Lassa virus'/de</p> <p>'Ebola virus'/exp</p> <p>'Marburgvirus'/de</p> <p>'filovirus infection'/exp</p> <p>'Crimean Congo hemorrhagic fever'/de</p> <p>'Crimean-Congo hemorrhagic fever virus'/de</p> <p>'Coronavirus infection'/de</p> <p>'Middle East respiratory syndrome coronavirus'/de</p> <p>'severe acute respiratory syndrome'/de</p> <p>'SARS-related coronavirus'/exp</p>	<p>'prediction and forecasting'/de OR 'forecasting'/de OR 'prediction'/de OR 'early warning system'/exp</p>	<p>'epidemic'/de</p> <p>'pandemic'/de</p> <p>epidemiology:lnk</p>

	'Henipavirus infection'/exp 'Henipavirus'/exp  'Rift Valley fever'/de 'Rift Valley fever virus'/de  'Zika fever'/de 'Zika virus'/de		
<b>MeSH</b>	"Hemorrhagic Fevers, Viral"[Mesh:NoExp]  "Lassa Fever"[Mesh] "Lassa virus"[Mesh]  "Hemorrhagic Fever, Ebola"[Mesh] "Marburg Virus Disease"[Mesh] "Filoviridae Infections"[Mesh] "Filoviridae"[Mesh]  "Hemorrhagic Fever, Crimean"[Mesh] "Hemorrhagic Fever Virus, Crimean-Congo"[Mesh]  "Coronavirus Infections"[Mesh:NoExp] "Middle East Respiratory Syndrome Coronavirus"[Mesh] "Severe Acute Respiratory Syndrome"[Mesh] "SARS Virus"[Mesh]  "Henipavirus Infections"[Mesh] "Henipavirus"[Mesh]  "Rift Valley Fever"[Mesh] "Rift Valley fever virus"[Mesh]  "Zika Virus Infection"[Mesh] "Zika Virus"[Mesh]	"Forecasting"[Mesh:noexp]"  "Epidemics/prevention and control"[Mesh]	"Disease Outbreaks"[Mesh]  "Epidemiology"[Subheading]
<b>Web of Science</b> (free terms)	(Lassa NEAR/3 (fever* OR virus*)) OR Ebola OR ebolavirus OR (Marburg NEAR/3 (fever* OR virus*)) OR Marburg-Disease* OR Marburgvirus OR Crimean-H\$emorrhagic-Fever* OR Congo-Virus* OR Crimean-Congo-H\$emorrhagic-Fever* OR "Middle East respiratory syndrome" OR "MERS" OR "Severe Acute Respiratory Syndrome" OR SARS OR Henipavirus* OR Nipah-Virus*	Forecast* Predict* Project* Preempt* Pre-empt* Forewarn* Foretell* Foresee* ((Prospect* OR Advance* OR Proactive) AND (warn* OR detect*)) ((Anticipat* OR Estim* OR Model*) AND futur*) Conject*	Outbreak* Epidemic* Pandemic* Spread* Futur*

	OR NiV-Infection* OR Rift-Valley-Fever* OR ZikV OR Zika OR "Viral hemorrhagic fever" OR "Viral hemorrhagic fevers" OR "Disease X" OR "emerging infectious disease*")	Foreshadow*	
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## 5. Bibliographic database search – strategies

### Embase.com

Copy/paste the strategy with the adapted syntax in the search field of the database [here](#)

('virus hemorrhagic fever'/de OR 'Lassa fever'/de OR 'Lassa virus'/de OR 'Ebola virus'/exp OR 'Marburgvirus'/de OR 'filovirus infection'/exp OR 'Crimean Congo hemorrhagic fever'/de OR 'Crimean-Congo hemorrhagic fever virus'/de OR 'Coronavirus infection'/de OR 'Middle East respiratory syndrome coronavirus'/de OR 'severe acute respiratory syndrome'/de OR 'SARS-related coronavirus'/exp OR 'Henipavirus infection'/exp OR 'Henipavirus'/exp OR 'Rift Valley fever'/de OR 'Rift Valley fever virus'/de OR 'Zika fever'/de OR 'Zika virus'/de OR ((Lassa NEXT/5 (fever\* OR virus\*)) OR Ebola OR ebolavirus OR (Marburg NEXT/5 (fever\* OR virus\*)) OR Marburg-Disease\* OR marburgvirus OR Crimean-hemorrhagic-Fever\* OR Crimean-Haemorrhagic-Fever\* OR Congo-Virus\* OR Crimean-Congo-Hemorrhagic-Fever\* OR Crimean-Congo-Haemorrhagic-Fever\* OR "Middle East respiratory syndrome" OR MERS OR "Severe Acute Respiratory Syndrome" OR SARS OR Henipavirus\* OR Nipah-Virus\* OR NiV-Infection\* OR Rift-Valley-Fever\* OR ZikV OR Zika OR Viral-hemorrhagic-fever\* OR Viral-haemorrhagic-fever\* OR 'Disease X'):ab,ti,kw) AND ('prediction and forecasting'/de OR 'forecasting'/de OR 'prediction'/de OR 'early warning system'/de OR (Forecast\* OR Foreshadow\* OR Predict\* OR Project\* OR Pre-empt\* OR Preempt\* OR Conject\* OR ((Prospect\* OR Advance\* OR Proactive) AND (warn\* OR detect\*)) OR ((Anticipat\* OR Estimat\* OR Model\*) AND futur\*) OR Foretell\* OR Foresee\* OR Forewarn\* OR "predictive modelling"):ab,ti,kw) AND ('epidemic'/de OR 'pandemic'/de OR epidemiology:lnk OR (Outbreak\* OR Epidemic\* OR Pandemic\* OR Spread\* OR Futur\*):ab,ti,kw)

<b>2313 Résultats</b>	<b>of references found</b>	<b>4-Jul-19</b>
<b>Comments :</b>		

### PubMed

Copy/paste the strategy with the adapted syntax in the search field of the database [here](#)

("Hemorrhagic Fevers, Viral"[Mesh:NoExp] OR "Lassa Fever"[Mesh] OR "Lassa virus"[Mesh] OR "Hemorrhagic Fever, Ebola"[Mesh] OR "Marburg Virus Disease"[Mesh] OR "Filoviridae Infections"[Mesh] OR "Filoviridae"[Mesh] OR "Hemorrhagic Fever, Crimean"[Mesh] OR "Hemorrhagic Fever Virus, Crimean-Congo"[Mesh] OR "Coronavirus Infections"[Mesh:NoExp] OR "Middle East Respiratory Syndrome Coronavirus"[Mesh] OR "Severe Acute Respiratory Syndrome"[Mesh] OR "SARS Virus"[Mesh] OR "Henipavirus Infections"[Mesh] OR "Henipavirus"[Mesh] OR "Rift Valley Fever"[Mesh] OR "Rift Valley fever virus"[Mesh] OR "Zika Virus Infection"[Mesh] OR "Zika Virus"[Mesh] OR (Lassa[tiab] AND (fever\*[tiab] OR



virus\*[tiab])) OR Ebola[tiab] OR ebolavirus[tiab] OR (Marburg[tiab] AND (fever\*[tiab] OR virus\*[tiab])) OR Marburg-Disease\*[tiab] OR marburgvirus[tiab] OR Crimean-hemorrhagic-Fever\*[tiab] OR Crimean-Haemorrhagic-Fever\*[tiab] OR Congo-Virus\*[tiab] OR Crimean-Congo-Hemorrhagic-Fever\*[tiab] OR Crimean-Congo-Haemorrhagic-Fever\*[tiab] OR "Middle East respiratory syndrome"[tiab] OR MERS[tiab] OR "Severe Acute Respiratory Syndrome"[tiab] OR SARS[tiab] OR Henipavirus\*[tiab] OR Nipah-Virus\*[tiab] OR NiV-Infection\*[tiab] OR Rift-Valley-Fever\*[tiab] OR ZikV[tiab] OR Zika[tiab] OR Viral-hemorrhagic-fever\*[tiab] OR Viral-haemorrhagic-fever\*[tiab] OR "Disease X"[tiab]) AND ("Forecasting"[Mesh:noexp] OR "Epidemics/prevention and control"[Mesh] OR Forecast\*[tiab] OR Foreshadow\*[tiab] OR Predict\*[tiab] OR Project\*[tiab] OR Preempt\*[tiab] OR Pre-empt\*[tiab] OR Conject\*[tiab] OR ((Prospect\*[tiab] OR Advance\*[tiab] OR Proactive[tiab]) AND (warn\*[tiab] OR detect\*[tiab])) OR ((Anticipat\*[tiab] OR Estimat\*[tiab] OR Model\*[tiab]) AND futur\*[tiab]) OR Foretell\*[tiab] OR Foresee\*[tiab] OR Forewarn\*[tiab] OR "predictive modelling"[tiab]) AND ("Disease Outbreaks"[Mesh] OR "epidemiology"[Subheading] OR Outbreak\*[tiab] OR Epidemic\*[tiab] OR Pandemic\*[tiab] OR Spread\*[tiab] OR Futur\*[tiab])

<b>2256</b>	<b>of references found</b>	<b>4-Jul-19</b>
<b>Comments :</b>		

### Web of Science – Core collection\*

Copy/paste the strategy with the adapted syntax in the search field of the database [ici](#)

TS=(((Lassa NEAR/3 (fever\* OR virus\*)) OR Ebola OR ebolavirus OR (Marburg NEAR/3 (fever\* OR virus\*)) OR Marburg-Disease\* OR Marburgvirus OR Crimean-H\$emorrhagic-Fever\* OR Congo-Virus\* OR Crimean-Congo-H\$emorrhagic-Fever\* OR "Middle East respiratory syndrome" OR "MERS" OR "Severe Acute Respiratory Syndrome" OR SARS OR Henipavirus\* OR Nipah-Virus\* OR NiV-Infection\* OR Rift-Valley-Fever\* OR ZikV OR Zika OR "Viral h\$emorrhagic fever" OR "Viral h\$emorrhagic fevers" OR "Disease X" OR "emerging infectious disease\*") AND (Forecast\* OR Predict\* OR Project\* OR Preempt\* OR Pre-empt\* OR Forewarn\* OR Foretell\* OR Foresee\* OR ((Prospect\* OR Advance\* OR Proactive) AND (warn\* OR detect\*)) OR ((Anticipat\* OR Estimat\* OR Model\*) AND futur\*) OR conject\* OR Foreshadow\*) AND (Outbreak\* OR Epidemic\* OR Pandemic\* OR Spread\* OR Futur\*))

<b>2473</b>	<b>of references found</b>	<b>4-Jul-19</b>
<b>Comments :</b>		

\* The Core Collection includes the following databases: Science Citation Index Expanded (1900-present), Social Sciences Citation Index (1900-present), Arts & Humanities Citation Index (1975-present), Conference Proceedings Citation Index- Science (1990-present), Conference Proceedings Citation Index- Social Science & Humanities (1990-present), Book Citation Index- Science (2005-present), Book Citation Index- Social Sciences & Humanities (2005-present), Emerging Sources Citation Index (2015-present), Current Chemical Reactions (1985-present), (Includes Institut National de la Propriete Industrielle structure data back to 1840), Index Chemicus (1993-present)

## 6. Results

The order of import follows the order below :

Databases and web portals	Date	Number of references	
		found	after deduplication*
PubMed	04.07.19	2256	
Embase.com	04.07.19	2313	
Web of Science – Core collection	04.07.19	2473	
<b>Total</b>		<b>7042</b>	<b>3959</b>
<b>Supplementary search results</b>			
	not searched		
<b>Total</b>			<b>0</b>

\* Dédoublonnage terminé

**Comments for the researcher**

Disregarded terms, to be tested, etc.

- (1) **Comment** : WHO's Blueprint list of diseases vocabulary based <https://www.who.int/blueprint/priority-diseases/en/>  
 Crimean-Congo haemorrhagic fever (CCHF)  
 Ebola virus disease and Marburg virus disease  
 Lassa fever  
 Middle East respiratory syndrome coronavirus (MERS-CoV) and Severe Acute Respiratory Syndrome (SARS)  
 Nipah and henipaviral diseases  
 Rift Valley fever (RVF)  
 Zika  
 Disease X
- (2) 11-Apr-19 **Comment** : Model\* → bruit (+1300) si employé seul en terme libre.
- (3) 11-Apr-19 **Les termes en rouge ont été discutés lors de l'entretien et doivent être introduits ou testés**
- a. **Rajouté**:
    - i. Futur\*, Forewarn\*, Preempt\*, "Disease X" en Free terms
    - ii. ((Future OR New) NEAR/3 (outbreak\* OR epidemic\* OR pandemic\* OR Virus OR Viral))
    - iii. '?' en PubMed et '\$' en Web of Science pour appellations différentes
  - b. **Incertain**:
    - i. "communicable diseases, emerging"[Mesh]
  - c. **Enlevé**:
    - i. et "computer simulation"[Mesh]
    - ii. Tout relié au models
    - iii. Knowledge managment
    - iv. Disease outbreaks/prevention and control
- (4) 25.04.2019 Après entretien:
- a. Futur\* à garder dans le 3ème concept
  - b. Suppression des filtres pour éviter de manquer des articles pertinents  
 NOT ([animals]/lim NOT [humans]/lim)  
 NOT (animals[mh] NOT humans[mh])
  - c. PubMed: "Epidemiologic Methods/prevention and control"[Mesh] non retenu  
 Voir pour faire un choix de termes MeSH concernant les modèles ou les supprimer (Les termes en rouge actuellement dans tableau vocabulaire ont été introduits dans l'équation)
  - d. WOS: équation corrigée
  - e. Embase: vocabulaire, notamment pour les concepts 2 et 3 et équation doivent être testés par le chercheur (seules, les corrections (Hemorrhagic OR Haemorrhagic) ont été apportées sur le concept 1)
  - f. Bases de données sélectionnées par chercheur : PubMed, Embase, Web of Science
- (5) 13.06.2019
- a. Rationale not to use technical terms: articles about various mathematical *predictive* models, should have a variation of *prediction/project/forecasting* as qualifying words if their primary themes are modelling/forecasting techniques. The search query is looking at **any** type of forecasting, whether that be mathematical models or demographic, climactic predictive models.

<b>Removed Terms</b>			
<b>Concepts</b>	WHO's Blueprint list of diseases	Epidemic Forecasting	
<b>Free terms</b>  PubMed, Embase		Embase Foresee* (+0) Foretell* (+0) Forewarn (+0)	
<b>Emtree</b>		'computer prediction'/de 'predictive value'/de  'knowledge management'/de OR 'spatial analysis'/exp OR 'statistical model'/exp	
<b>MeSH</b>		" "Models, Statistical"[Mesh] → Gives 200 more but not included as gives results under 'Quality of Health Care' overheading  "Models, Statistical"[Mesh:NoExp] → models & also includes quality of health care Overheading → is included under epidemiological methods  OR "Linear Models"[Mesh] → already included  OR "Models, Spatial Interaction"[Mesh] → spatial analysis already included under epidemiological methods → linear models ?	
<b>Web of Science</b> (free terms)		Foreshadow* (adds nothing)	

## **Supplementary Material - Definitions**

### **Country of Origin**

Middle East: includes Turkey

South America: includes Latin & Middle America

### **Prediction Method**

Risk Mapping: a visual representation of risk over a defined spatial region, or set of geographical co-ordinates.

Regression analysis: the effect of one or several explanatory variables (e.g., exposures, subject characteristics, risk factors) on a response variable such as mortality or cancer (1).

Time Series Forecasting/Analysis: an analysis on the basis of the fact that "data points taken over time may have an internal structure (autocorrelation, trend or seasonal variation) that should be accounted for"(2) and that "(p)rediction of future events by analysing the trends of the past, on the assumption that future trends will hold similar to historical trends"(3).

Qualitative model: models using descriptive, non-quantitative methods (e.g., expert opinion) to infer relationships and/or causality between two parameters.

Quantitative model: modelling relationships between parameters through equations and/or numerical data.

Serological Study: Studies evaluating serological parameters of immunity to assess susceptibility to infection (e.g., IgG antibody level in a host population).

Species niche models: epidemiological model based on distribution of species of host/vectors over a defined spatial region, or set of geographical co-ordinates.

Machine Learning: computer systems that are able to learn patterns and understand relationships in data through the use of algorithms and statistical analysis, without the use of explicit instructions.

Spatio-temporal modelling: analysis of how something varies over space and over time. "Analysis of data collected over space and over time"(4).

Computer or App-based systems: Prediction methods driven by mobile phone or computer based applications or internet-based programs.

Map Overlay: superimposing different parameters over the same defined spatial region, or set of geographical co-ordinates.

Agent-Centered: A system comprised of autonomous decision-making entities modelling the interaction between individuals.

Early Warning System: A system meant to detect events and signal their detection to relevant decision-makers or authorities before such an event occurs. (E.g., hurricane-warning systems, animal mortality monitoring network).

Incidence modelling: Modelling of current dynamics or prediction of future dynamics of case numbers by population size.

### **Model Type**

Deterministic: A model in which parameter output is determined by the initial values, in which no randomness is involved.

Stochastic: A model possessing inherent randomness in the output through the same parameter input.

Mixed: Models comprising features of both stochastic and deterministic models.

### **Data Sources**

Case Count: The number of patients diagnosed with a specific disease and their health information.

Other Patient Data/Personal Health information: Various information on the health of persons unrelated to a specific disease (e.g., frequency of respiratory infections in a certain population, or comorbidities of persons).

Meteorological: Climate and weather data (e.g., seasonality, temperature, rainfall, NDVI).

Vector/Host: Information concerning members of the transmission cycle of a disease (e.g., mosquito habitat, livestock information, behaviour of vector).

Demographic & Social data: Household size, socio-economic data, age, weight, # of settlements in a region, human population density, ethnic groups, occupation).

**Behavioural data/Way of infection:** Information gained from contact tracing regarding pathway of transmission, known infection sources (e.g., zoonotic contact (camel contact), cultural celebrations (e.g., greater bairam), household transmission).

**Health care data:** Data obtained from health care centers (e.g., number of hospitalized patients, emergency room admissions).

**Transportation:** Data on transportation methods (e.g., traffic density, distance to nearest airport)

**Internet:** Data retrieved from the Internet (e.g., google search terms, location of other app users)

**Geographic:** spatial covariates (altitude, latitude, longitude).

**Economic:** Information includes trade data, GDP

**Ecological data:** Data on terrain type and land usage, natural or artificial (e.g., agricultural data: agricultural land, crop land, poplar land, pasture land, land cover index (LND), crop yields. Mining locations, hydrologic climate data (irrigation), river discharge, wetland, total land used for X plant type, total number of buildings).

**Expert opinion/Evidence consensus:** Data input into models consistent with valuations by expert groups (e.g., subjective expert-decided risk of outbreak).

**Other\*:** Data types not categorizable to a particular group (e.g., *astronomical data, plant phenology data, nighttime luminescence of a region*).

### **Outcome**

**Future Cases:** Number of cases of disease in the future.

**Outbreak Predictors/Risk Factors:** Factors/aspects increasing risk of an outbreak (e.g., excess rainfall in RVF risk regions).

**Immunity Parameters:** Inherent parameters of the epidemiological dynamics propagating the disease in question (e.g., Basic Reproduction Number, reproductive rate).

**Immunity:** Parameters reflecting immunity or lack thereof to a disease (e.g., antibody levels, percentage population immune to population).

**Risk Maps:** Cartographical depiction a parameter (e.g., outbreak location, risk, transmission risk)

**Spatial prediction:** Prediction of spatial characteristic of outbreaks (e.g., location, density of cases).

**Temporal prediction:** Prediction of temporal characteristic of outbreaks (ex: precise time, seasonality).

**Outbreak risk:** probability of future outbreak, whether quantitative or qualitatively assessed.

**Spillover events:** viral transmission from one species to another.

**Biological-Economical-Environmental Consequences:** Health, economical, or environmental consequences of an outbreak. (e.g., mortality level, loss in trade or GDP, impact of an outbreak of another species).

**Zoonotic transmission/environmental susceptibility:** Environmental predisposition to viral transmission between human and/or non-human species.

**Population at Risk:** The number of people at risk of infection were an outbreak to occur.

**Introduction risk:** probability of introduction of virus into a particular environment.

**Effect of climate change:** Evaluation of effects of climate change on certain parameters, including risk, of future outbreaks.

**Epidemic dynamics:** manifestation of different phases of an outbreak/epidemic dynamic.

### **Implementation of Prediction/Methods by decision-makers**

Whether the prediction methods or models were applied in real life scenarios. For example, the prediction of RVF outbreaks in early 2006 mitigated the economical consequences of the RVF outbreak in 2006

**Suggested:** explicitly suggested application or implementation of model/predictions by the authors.

### **Predictions validated against future outbreak data**

Whether outbreak predictions were compared to real data of the predicted outbreaks.

### **Challenges/limitations cited by authors**

Challenges intrinsic to the prediction or to the research involved in creating outbreak predictions.

### **References**

(1) Bender R. *Cancer Epidemiology. Methods Mol Biology.* 2009;471:179–95.

(2) *Time Series Forecasting Methods* [cited 2021 Jan 28]. Available from:

<https://www.influxdata.com/time-series-forecasting-methods/>

(3) Introduction to Time Series Analysis [cited 2021 Jan 28]. Available from:

<https://www.itl.nist.gov/div898/handbook/pmc/section4/pmc4.htm>

(4) Spatiotemporal Analysis | Columbia Public Health |[cited 2021 Jan 28]. Available from:

<https://www.publichealth.columbia.edu/research/population-health-methods/spatiotemporal-analysis>.

Vector based data sources:

- CCHF: Livestock importation (Turkish regional/provincial government organisation), CCHF vector presence (Iranian surveillance system), Environmental vector suitability maps (Messina et al 2015)
- Ebola: Environmental suitability maps (Pigott et al 2017), Community-member based fruit bat location survey, IUCN databases, Niche model (various literature sources).
- Lassa: Environmental suitability maps (Mylne et al 2015), Phylogenetic niche models (Redding et al 2016), Global Biodiversity Information Facility (GBIF).
- Nipah: Human-bat contact (various literature sources), vector data assumed by author.
- RVF: Egyptian ministry of health literature, Vector biology literature (aedex and culex lifecycles), field serological studies of cattle/sheep/goats by authors themselves (Al-afaleq et al 2010), field serological studies of mosquitos by authors (Abdelgadir et al 2009), mosquito habitat (various literature sources), livestock units (UN Food and Agriculture Organisation), vector presence through previous author surveys and HEALTHY FUTURES (Taylor et al 2015), livestock population risk factors (bibliometric review - a wide variety of different authors), MosquitoMap (Army mosquito vector map, in conjunction with the US armed forces), ProMed mail electronic surveillance system (International Society of Infectious Diseases), other livestock data (various platforms: CIESIN, IUCN, Gridded Livestock of the World {GLW}), Mosquito species range africa (Global Biodiversity Information Facility {GBIF}), discussion with local experts at Kenya International Livestock Institute (ILRI), SPOT satellite (mosquito habitat through Système pour l'observation de la terre), Synthetic aperture radar and Landsat, Global livestock occurrence records (EMPRES-i).
- Zika: Mosquito niche models mostly produced following the 2015-16 Zika epidemic in South America (variety of bibliometric sources), distribution maps of mosquito vectors (Kraemer's 2015 study on *Aedes aegypti* and *Ae. albopictus*), occasionally WHO reports.

Climate based data sources:

- CCHF: high resolution grids of global climate observations (Harris et al., 2014 Royal Met Soc), SPOT satellite (Belgian Meteo Institute), Iranian meteo organisation.
- Ebola: Google Earth Engine and NASA LP DAAC and USGS/EROS, Global Aridity Index (GeoSpatial database by Antonio Trabucco), NASA AHVRR MODIS for NDVI (Tatem et al 2004), Global Historical Climatology Network, local weather stations, AfriClim Dataset.
- Lassa: NASA MODIS Terra satellite, global climate projections (different literature sources).
- Nipah: WorldClim, AHVRR satellite.
- RVF: Egyptian ministry of water resources and irrigation, author assumptions, variety of different global weather datasets (often satellite based), Saudi arabian "presidency of meteorology and environment" (al-afaleq et al 2010), Kenya meteorological department, NOAA AHVRR satellite (National Oceanic and Atmospheric Administration), ERA-interim dataset and TRMM (Satellite temperature measurements), International Research institute for Climate and Society at Columbia University as well as National Oceanic and Atmospheric Association Climate Prediction Center (<http://www.cpc.noaa.gov/>), farmer knowledge on climate of Rift Valley, Kenya airport and local weather stations, Global climate surface grids (Hijmans 2005 et al), Intergovernmental Panel on Climate Change (IPCC), various other literature sources concerning climate variables as risk factors, Lake Victoria lake levels.
- Zika: Climatic Research Unit of the University of East Anglia, WorldClim (precipitation), Hijmans et al 2005 IJC, Nasa Surface Meteorology and Solar Energy (humidity), NASA Landsat/USGS (<https://eosweb.larc.nasa.gov/>), WorldClim, Globalweather.com (online weather platform), local weather stations, Wunderground.com (online weather platform).