



Prioritizing climate-sensitive infectious diseases for public health interventions

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Valerie Hongoh*, Pierre Gosselin, Pascal Michel, Céline Campagna, André Ravel,
Jean-Philippe Waaub, Karim Samoura



Background

- Evidence accumulating on the effects of climate change (CC) on certain infectious diseases

- Local variations in temperature and precipitation:

- Change in distribution of certain vectors

- (IPCC: medium confidence)**

- E.g.: Expansion of Lyme disease, malaria

- Ogden et al., 2005, 2006, 2008, 2014; Pascual et al., 2006; Patz & Olson 2006;

- CC can also facilitate disease transmission

- Ex.: Longer transmission season

- Ex.: West Nile virus and other arboviruses

- Githeko et al., 2000; Gubler et al., 2001; Rogers & Randolph, 2003;

- Import risk of vectors and pathogens

- Ex.: Dengue, Chikungunya, WNV, Bluetongue

- Purse et al., 2005; Medlock & Leach 2015;

- Animal disease risk

- Ex.: African Trypanosomiasis

- Greer et al., 2008;

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+ Adapting to Climate Change and infectious diseases:

Multiple potential levels of intervention

- Many factors to take into account:
 - Awareness of local populations, suitable vectors and reservoir hosts, state of existing infrastructure, population resilience and adaptive capacity.

- **Challenge:** how to reconcile adaptation among other priorities?
 - What diseases should be prioritized?
 - Shortcomings of cost-benefit analysis alone

Objectives:

1. Identify the primary concerns (criteria) to take into account in prioritizing diseases.

2. Examine whether concerns and priorities vary by intervention domain (e.g. research vs. surveillance vs. prevention & control) ?

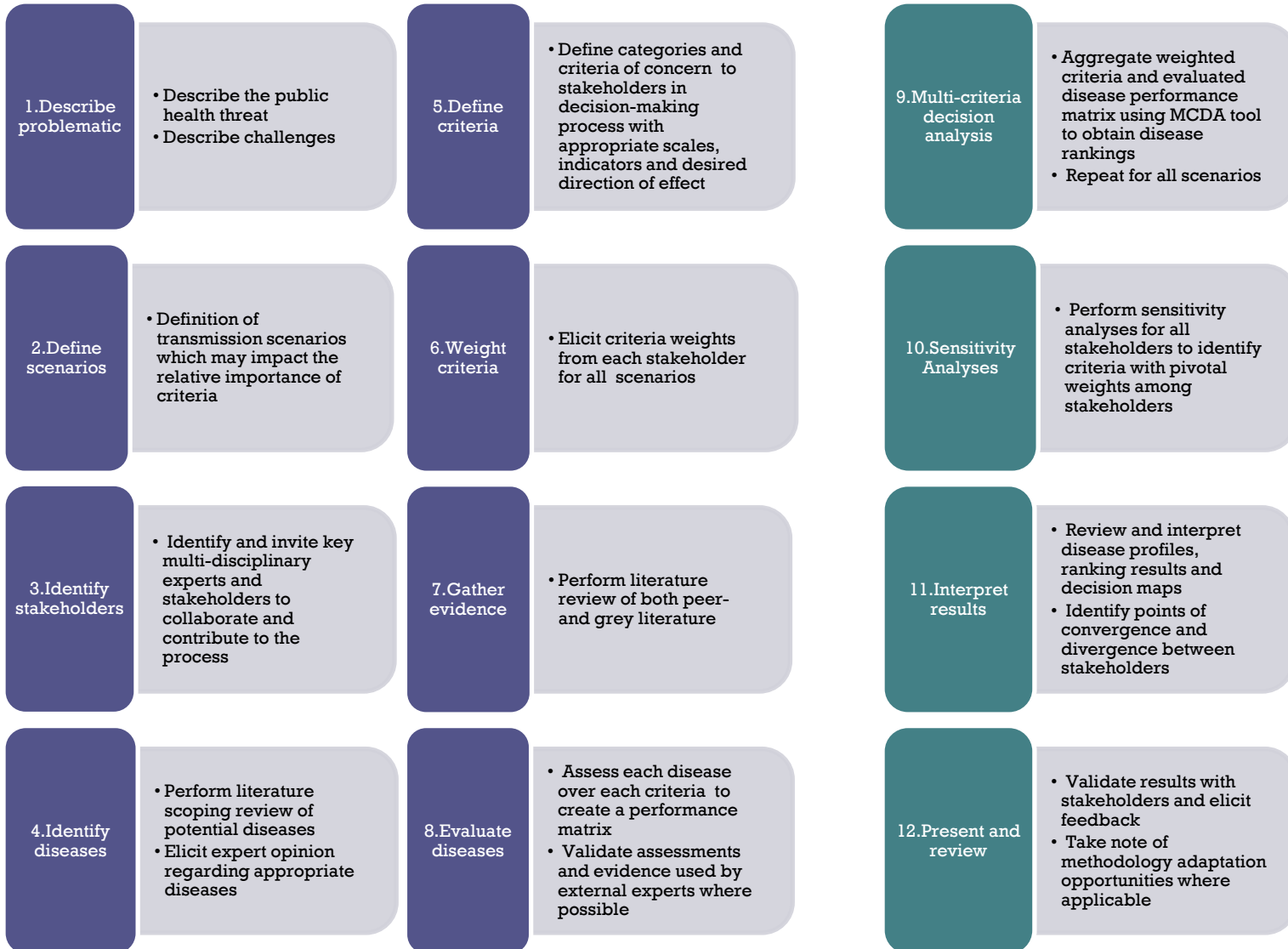


Photo Credit: Spooky Pooka

+ Methods: MCDA approach

Problem structuring phase

Decision Analysis phase





Methods:

Literature review and Criteria synthesis



Photo credit: Wellcome Library, London

Cat	#	Criteria	1991	1998	1999	2000	2001	2003	2006	2007	2008	2009	2010	2010	2010	2010	2011	2012	2012	2013	2013	2013	2013	2014	2015	New criteria
			1	1	-	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	
PH	21	Incidence or prevalence, burden of ill health, illness rate	1	1	-	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	PHC-01
PH	19	Morbidity, severity of symptoms, Clinical course	1	-	-	1	-	-	-	1	1	1	1	1	1	1	1	1	2	1	1	1	1	1	1	PHC-02
SP	16.5	Public concern & perception of risk, public attention	1	1	-	1	1	1	1	1	-	0.5	-	-	-	0.5	2	1	2	2	-	0.5	-	1	-	SIC-01

Focus group discussions



- Public health
- Experts in microbiology
- Experts in entomology
- Academic experts
- Environmental management experts



Results: prioritization criteria



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Category	Criteria	Quebec (Canada)
Public Health Criteria (PHC)	PHC-01 – Current incidence of human cases in country	X
	PHC-02 – Severity of the disease (both physically and mentally)	X
	PHC-03 – Vulnerable groups	X
	PHC-04 – Potential to increase social inequality	X
Social Impact Criteria (SIC)	SIC-01 – Risk perception of the public	X
	SIC-02 – General level of knowledge, attitude and behaviour of the public	X
Risk and Epidemiology Criteria (REC)	REC-01 – Existence of favourable conditions for disease transmission	X
	REC-02 – Epidemic potential	X
	REC-03 – Current global trend of disease over last 5 years	X
	REC-04 – Proportion of susceptible population	X
Animal and Environmental Health Criteria (AEC)	AEC-01 – Incidence of animal cases	X
	AEC-02 – Severity of disease	X
	AEC-03 – Can infect environment	X
Economic Criteria (ECC)	ECC-01 – Cost to the government	X
	ECC-02 – Cost to private sector (and NGOs)	X
	ECC-03 – Cost to individuals (and families)	X
Strategic and Operational Criteria (SOC)	SOC-01 – Capacity to detect and diagnose	X
	SOC-02 – Existence and effectiveness of current treatments	X
	SOC-03 – Level of scientific knowledge of the disease	X
	SOC-04 – Optimization opportunities	X
	SOC-05 – Reportable disease	X



+ Methods

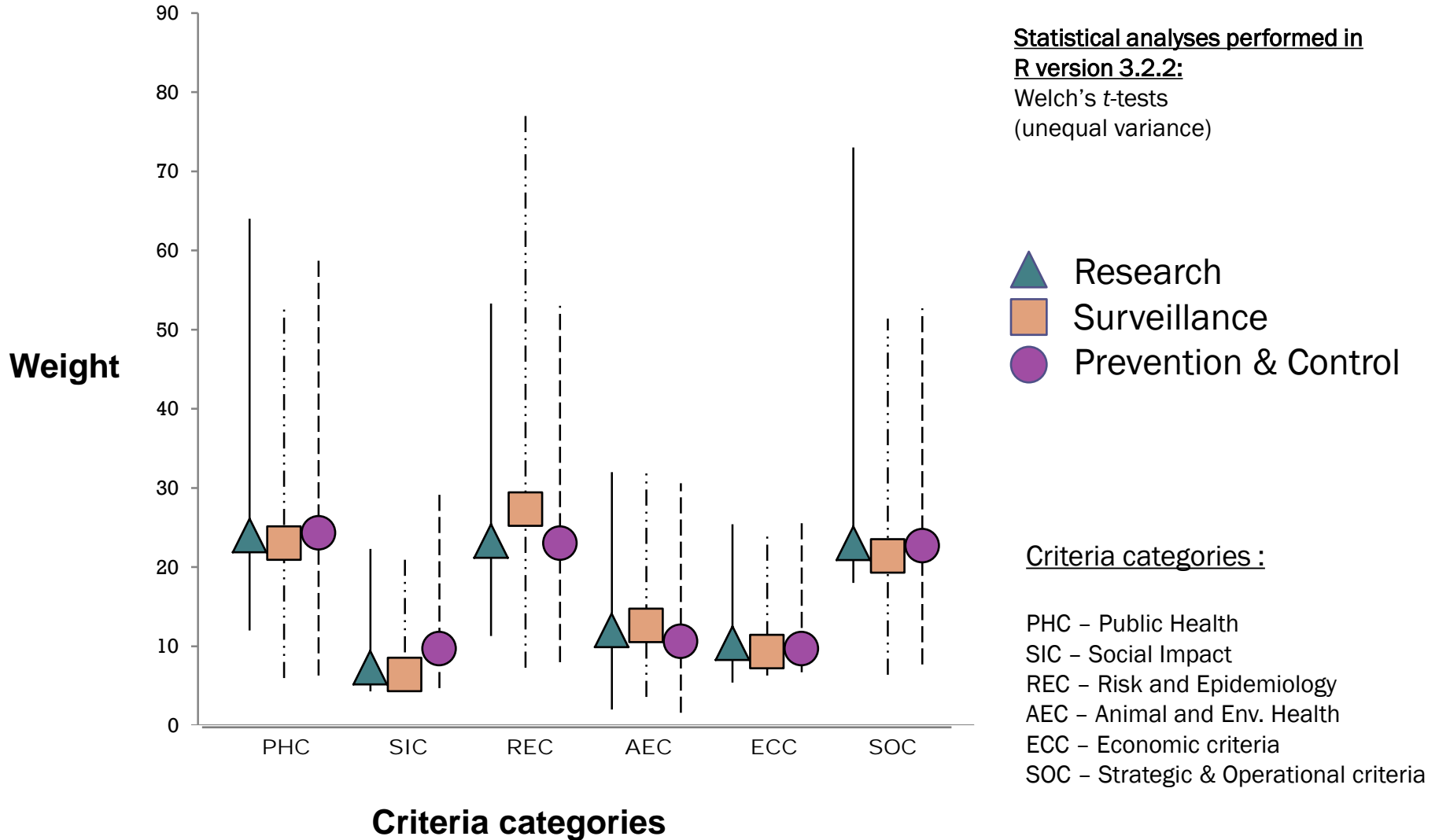
■ Criteria weighting



Photo credit: Wellcome Library, London

Criteria categories	Weight	Criteria	Weight
Public health criteria	30	Human Incidence	10
		Entomological risk	15
		Social equity	5
Social Impact criteria	10	Acceptability	7
		Effect on confidence	3
Economic criteria	20	Government cost	15
		Private sector cost	5
Strategic and operational criteria	15		...
			...
Animal and Environmental health criteria	5		...
Total	100		100

+ Criteria weight avg. by intervention domain



+ Pilot prioritization of diseases



Photo credit: Wellcome Library, London

Diseases	Rank	Phi
West Nile virus	1	0.10
Lyme	2	0.06
Dengue	3	-0.02
Malaria	4	-0.02
Chikungunya	5	-0.11

+ Pilot prioritization of diseases



Photo credit: Wellcome Library, London

Diseases	S1		S2		S3		S4		S5		S6		S7		S8		S9		S10	
	Rnk	Φ	Rnk	Φ	Rnk	Φ	Rnk	Φ	Rnk	Φ	Rnk	Φ	Rnk	Φ	Rnk	Φ	Rnk	Φ	Rnk	Φ
WNV	1	0.13	3	0.01	2	0.03	3	0.01	1	0.10	1	0.20	1	0.12	1	0.09	3	0.00	1	0.31
LYM	2	0.11	1	0.11	3	0.03	4	-0.04	3	-0.02	2	0.16	4	0.01	4	-0.06	4	-0.01	2	0.24
DEN	3	-0.02	4	-0.04	4	-0.03	2	0.04	4	-0.03	3	-0.07	3	0.02	2	0.09	2	0.01	4	-0.15
MAL	5	-0.11	2	0.05	1	0.05	1	0.05	2	0.00	4	-0.08	2	0.02	5	-0.18	1	0.02	3	-0.05
CHIKV	4	-0.11	5	-0.13	5	-0.08	5	-0.06	5	-0.06	5	-0.20	5	-0.16	3	0.07	5	-0.03	5	-0.35

MCDA software used: Visual PROMETHEE

+ Discussion



Photo credit: Wellcome Library, London

- Disease prioritization in CC context complex
 - Many perspectives to take into account
 - Potentially conflicting tradeoffs to reconcile
- Common criteria & categories recur across studies
 - Cumulative learning from previous studies?
 - Shared core concerns?
- Similar weighting tendencies among diverse stakeholders
 - Different groups have different priorities (intuitive)
 - Diffs between PH & others = Diffs in perceived immediate responsibility?
- Values evoked under CC not very different from other contexts
 - What changes are which diseases come into range,
 - Data willing, these can be assessed
 - Prioritization given to proximal, severe diseases with few treatment options

+ Limits



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- Small groups of stakeholders consulted, convenience sample
 - MCDA based on socio-constructivist
 - Aim to include a socially representative group of relevant “experts”
- Pilot prioritization for illustration purposes only
 - Should not be interpreted as formal assessment of local priorities
- Data from literature used to score diseases
 - Additional data and discussion warranted to verify validity of findings



Key messages



Photo credit: Brenda Clarke

- General models that can be calibrated depending on the context
 - Common criteria categories
 - Importance of assessing local priorities as these may differ from one intervention context to another & from one prioritization objective to another

- MCDA – interesting tool for public health
 - Compatible with an evidence based approach
 - Adds transparency to the process
 - Each step produces an interesting result

- Participatory approach facilitates rich exchange between multiple actors, enabling better collaboration and common constructed understanding of the health problem

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