

Supplementary Material - Prioritization of Zoonoses for Health Professional Knowledge Building in Canada, Canadian Journal of Public Health

List of zoonoses and criteria (including current environmental climate algorithms) used for prioritization and disease ranking according to the health professional capacity building scenario

Table 1 List of non-enteric zoonoses for prioritization (diseases in bold text have been classified as endemic to Canada^a)

Alveolar echinococcosis	Ebola disease	Powassan virus disease
American trypanosomiasis (Chagas disease)	Ehrlichiosis	Psittacosis
Anthrax	Hantavirus - hantavirus pulmonary syndrome	Q Fever
Avian (zoonotic) influenzas: H5N1 and H7N9	Hantavirus - hemorrhagic fever with renal syndrome	Rabies
Babesiosis	Human granulocytic anaplasmosis	Rift Valley fever
Bartonellosis - Cat Scratch Disease	Jamestown Canyon virus disease	Rocky mountain spotted fever
Bovine tuberculosis	Japanese encephalitis	Snowshoe hare encephalitis
Brucellosis	La Crosse encephalitis	St. Louis encephalitis
Cache Valley virus	Lassa hemorrhagic fever	Tick-borne encephalitis
California encephalitis	Leptospirosis	Toxocariasis
Chikungunya	Louse-borne relapsing fever	Toxoplasmosis
Crimean-Congo hemorrhagic fever	Lyme disease	Tularemia
Cryptosporidiosis	Marburg virus disease	Typhus (endemic)/Murine typhus
Cutaneous larva migrans	MERS-CoV	West Nile virus disease
Cystic echinococcosis	Mpox	Western equine encephalitis
Dengue virus (1, 2, 3, 4)	Nipah virus disease	Yellow fever
Eastern equine encephalitis	Plague	Zika virus disease

^a Endemic diseases were defined as those with human cases in Canada for two or more consecutive years.

Table 2 Criteria, with complete definitions and score matrices

Criteria	Description	Score
Incidence: number of new cases in Canada in the last 5 years	0-10 cases reported	0
	11-100 cases reported	1
	101-1000 cases reported	2
	1001+ cases reported	3
Disease Trend: disease trend in Canada in the last 5 years (includes travel-related) within the context of current available Canadian data	Declining	0
	Stable	1.5
	Increasing or Emerging in Canada	3

Case Fatality Rate: case fatality rate in humans (natural progression of the disease)	<1%	0
	≥1% to <5%	1
	5 to <50%	2
	≥50%	3
Capacity to Detect and Diagnose: ability to diagnose the disease in humans in Canada, considering factors such as the possibility of clinical diagnosis, and the availability of lab tests and other diagnostic procedures (e.g., imaging)	The disease can be diagnosed reliably based on clinical history or physical examination throughout its course	0
	The disease cannot be diagnosed clinically. However, there is a gold standard ^a laboratory test/other procedure to diagnose the disease	1.5
	The disease cannot be diagnosed clinically AND the laboratory test/other procedure is NOT a gold standard	3
Treatability: ability to treat the disease in humans in Canada, using drugs, interventions or procedures. This includes the following indicators: effectiveness (primary indicator), availability of the treatment/supportive therapies as well as their specificity (secondary indicators)	Treatment is not effective, regardless of specificity and availability	0
	Treatment is effective, but it is neither available nor specific	0.75
	Treatment is effective. It is specific but not available	1.5
	Treatment is effective. It is available, but not specific	2.25
	Treatment is effective. It is available and specific	3
Mode of Transmission – Animal-to-Human: potential of spread of a disease from animals to humans, considering common modes of transmission Animal-to-human modes of transmission were divided into the following groupings: GROUP A – direct contact - Physical contact - Scratches - Animal bites - Contact with animal bodily fluids, organs, or tissues GROUP B – direct contact (droplet) - Respiratory tract droplets entering new host directly GROUP C – indirect contact (common vehicle) - Contaminated soil, vegetation or water (recreational use) where animals live and roam - Ingestion of soil, water or food contaminated with fecal matter of infected animal	A only	0
	B only Or A and B	0.6
	C only Or Any combination of C with A or B	1.2
	D only Or any combination of D with A, B, or C	1.8
	E only Or Any combination of E with A, B, C, or D	2.4
	F only Or Any combination with F	3

- Feco-oral GROUP D – Indirect contact (droplet) - Fomites (contaminated inanimate object) GROUP E – Airborne - Dust or small particles floating in air GROUP F – Vector-borne - Infections transmitted via insects		
Mode of Transmission – Human-to-Human: potential spread of disease between humans, under the condition that there is animal to human transmission also occurring Human-to-human modes of transmission were divided into the following groupings: GROUP A – Direct contact - Sexual - Biologic products - Vertical and/or breast-feeding - Skin-to-skin GROUP B – Indirect contact (common vehicle) - Feco-oral - Fomites (non-respiratory biologic products) GROUP C – Indirect droplet (longer range droplet) - Fomites (inanimate objects contaminated by respiratory droplets) GROUP D – Direct contact (shorter range droplet) - Respiratory tract droplets entering new host directly GROUP E – Air-borne - Dust or small particles floating in air	Humans are dead-end hosts	0
	A only	0.6
	B only <i>or</i> A and B	1.2
	C only <i>or</i> C with A or B	1.8
	D only <i>or</i> D with A, B and/or C	2.4
	E only <i>or</i> E with A, B, C and/or D	3
Preventability: ability to prevent the disease in humans; consider the effectiveness of vaccination and other forms of chemoprophylaxis, personal protective measures, public health measures; and control measures in animals and/or vectors	No possibility for prevention	0
	Low prevention possibility (e.g., no vaccine; however, personal preventive measures or public health measures are available but they may not be affordable, acceptable and/or effective) <i>or</i> Control measures for animals and/or vectors may be non-existent or not affordable or acceptable or effective	1
	Moderate prevention possibility	2

	(e.g., vaccine may be available but effectiveness is sub-optimal; personal preventative measures or public health measures are available and they are affordable and acceptable) <i>or</i> There is limited availability of control measures for animals and/or vectors; they are affordable or acceptable or effective	
	High prevention possibility (e.g., effective vaccine, chemo-prophylaxis) ^b Control measures for animals and/or vectors are available	3
Risk perception: level of risk perceived by the public (personal or societal) based on the current state of knowledge, media influence and coverage (news and entertainment), and controllability over exposure Three indicators were used to measure risk perception: • Information available to the public is limited, inconsistent, or not trusted. • High likelihood of public attention • The disease has identifiable victims	0 indicators met	0
	1 indicator met	1
	2 indicators met	2
	3 indicators met	3
Severity of Illness: severity of disease in humans (natural progression of disease). Consider the extent to which the disease compromises the state of health of infected individuals Long-term sequelae: persistent signs or symptoms that may develop during or after the acute phase of the illness, while they can still be linked to the same etiology	Asymptomatic Illness effects are not noticeable	0
	Mild clinical symptoms Illness requiring leave from work/personal care at home or outpatient care Examples: • Low-grade fever • Chills • Mild headache • Myalgia • Diarrhea • Anorexia • Cough • Localized rash • Arthralgia/osteoarticular pain	1
	Moderate clinical symptoms Illness necessitating urgent medical care, or hospital admission	2

	Examples: • Moderate grade fever • Dehydration • Shortness of breath • Chest pain • Severe headache • Disseminated rash • Arthralgia/osteoarticular pain (limiting mobility)	
	Severe clinical symptoms Illness necessitating ICU admission Examples: • High grade fever • Hyperpyrexia • Seizures • Respiratory failure/ARDS • Coma • Paralysis (non-permanent) • Disorientation • Symptoms consistent with coagulopathies: ○ Thrombocytic purpura	3
	Long-term sequelae^c Illness resulting in: • Prolonged home recovery • In-patient or out-patient rehabilitation • Inability to return to work Examples: • Paralysis (permanent) • Residual neurologic sequelae, including focal neurologic, cognitive, and behavioural deficits • Long-term psychological symptoms (anxiety, sleep disorders)	No = 0 Yes = 1
Current environmental climate: the influence of the present climate of Canada in the introduction, establishment and expansion of endemic and non-endemic diseases. Algorithms were created for reproducibility and consistency in determining whether the current climate was suitable to the introduction, establishment or expansion of a disease (Figure 1-4)	Current climate is not suitable to the introduction, establishment, or expansion of disease	0
	Current climate is somewhat suitable to the introduction, establishment, or expansion of disease	1
	Current climate is moderately suitable to the introduction, establishment or expansion of disease	2

	Current climate is very suitable to the introduction, establishment, or expansion of disease	3
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^a Gold standard: for the purpose of this project, a gold standard test is any diagnostic test used to confirm an illness; it is the best available test to diagnose a particular disease with acceptable sensitivity

^b The affordability and acceptability (e.g., vaccines) can be addressed in the educational materials

^c For this criterion, a bonus point was added to the severity of illness score if there was evidence of long-term sequelae for a given disease. The resulting score was normalized to a scale of 0-3

Table 3 List of diseases ranked in order of importance for knowledge building for health professionals in Canada; the total scores of the health professional knowledge building scenario; the baseline scenario scores; the baseline ranks; and the change in rank between the health professional knowledge building and baseline rank

Rank	Disease	Health Professional Knowledge Building Score	Baseline Score	Baseline Rank	Change in Rank (from baseline)
1	Bovine tuberculosis	150.86	22.75	1	0
2	Alveolar echinococcosis	144.54	21.55	2	0
3	Typhus (endemic)/ Murine typhus	139.68	21.27	3	0
4	MERS-CoV	137.45	20.19	5	1
5	Nipah virus disease	133.89	19.73	9	4
6	Plague	133.46	20.75	4	-2
7	Eastern equine encephalitis	131.90	20.00	7	0
8	Dengue	130.81	19.89	8	0
9	Yellow fever	130.71	20.13	6	-3
10	St. Louis encephalitis	130.28	19.25	15	5
11	Leptospirosis	130.10	19.35	12	1
12	Lyme disease	129.37	19.53	10	-2
13	Avian influenza A (H5N1) - zoonotic influenza	128.84	19.41	11	-2
14	Japanese encephalitis	128.16	19.30	14	0
15	American trypanosomiasis (Chagas disease)	126.69	18.65	17	2
16	Mpox	125.98	18.98	16	0
17	California encephalitis	123.81	18.59	18	1
18	Western equine encephalitis	123.80	18.40	22	4
19	Rabies	123.55	18.50	21	2
20	Babesiosis	123.55	19.30	13	-7

21	Jamestown Canyon virus disease	123.28	17.89	29	8
22	West Nile virus disease	122.71	18.39	23	1
23	Ebola disease	121.77	18.06	26	3
24	Louse-borne relapsing fever	120.94	18.15	24	0
25	Tularemia	120.90	18.53	20	-5
26	Crimean-Congo hemorrhagic fever	120.90	18.12	25	-1
27	La Crosse encephalitis	120.69	18.55	19	-8
28	Marburg virus disease	119.62	17.65	31	3
29	Tick-borne encephalitis	119.54	17.70	30	1
30	Avian influenza A (H7N9) - zoonotic influenza	119.48	18.00	27	-3
31	Rocky mountain spotted fever	117.35	17.24	36	5
32	Brucellosis	117.09	17.36	32	0
33	Zika virus disease	116.74	17.91	28	-5
34	Snowshoe hare encephalitis	115.85	17.33	33	-1
35	Hantavirus - Hantavirus pulmonary syndrome	115.30	17.31	34	-1
36	Ehrlichiosis	115.28	17.22	37	1
37	Anthrax	113.41	17.29	35	-2
38	Hantavirus - hemorrhagic fever with renal syndrome	112.36	17.16	38	0
39	Cryptosporidiosis	109.56	15.44	41	2
40	Cystic echinococcosis	109.31	15.69	39	-1
41	Lassa hemorrhagic fever	108.14	15.60	40	-1
42	Powassan virus disease	101.44	15.15	43	1
43	Psittacosis	101.28	14.83	45	2
44	Human granulocytic anaplasmosis	101.09	15.16	42	-2
45	Cache Valley fever	99.00	15.00	44	-1
46	Q Fever	97.22	13.94	48	2
47	Toxocariasis	94.58	13.70	49	2
48	Cutaneous larva migrans	92.07	14.45	46	-2
49	Chikungunya	90.92	14.16	47	-2
50	Toxoplasmosis	84.26	12.35	50	0
51	Rift Valley fever	81.98	11.90	51	0
52	Bartonellosis - cat scratch disease	73.91	11.11	52	0

Algorithms used for the current environmental climate criterion

For the purposes of these algorithms, cases referred to cases of the disease in humans.

Fig. 1 Algorithm to determine whether to assess the influence of the present environmental climate in Canada in the introduction, establishment, or expansion of a disease

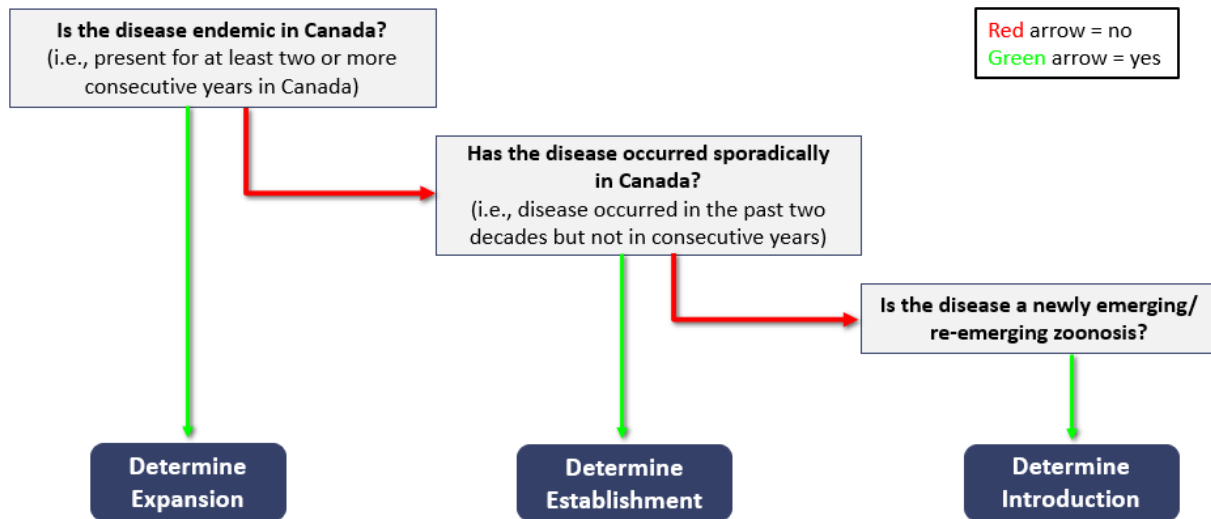


Fig. 2 Algorithm to determine the influence of the present environmental climate in Canada in the introduction of non-endemic diseases

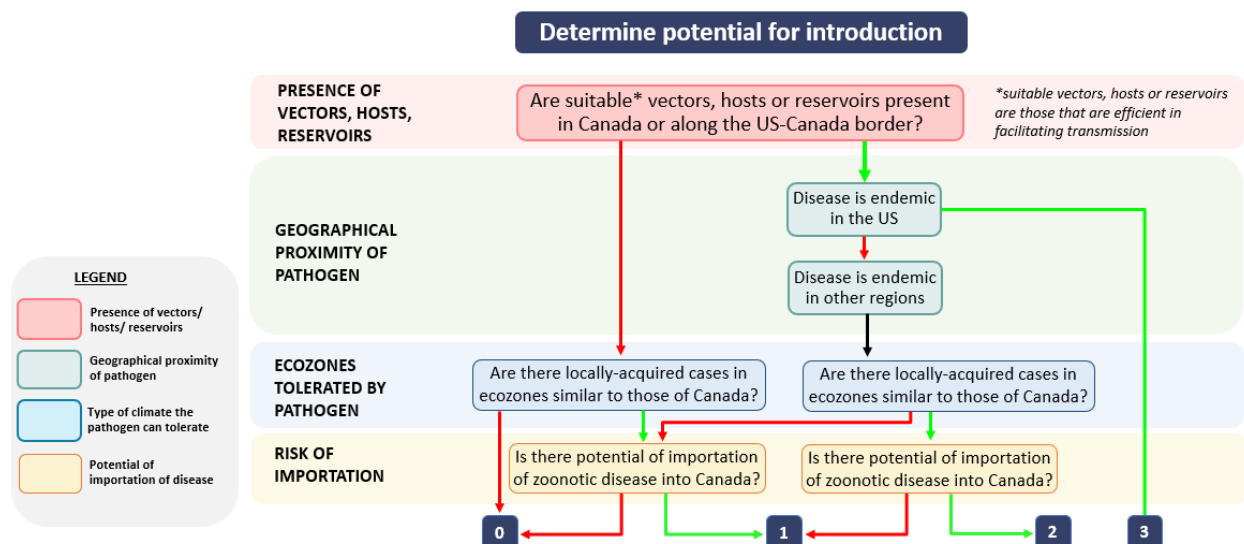


Fig. 3 Algorithm to determine the influence of the present environmental climate in Canada in the establishment of non-endemic diseases

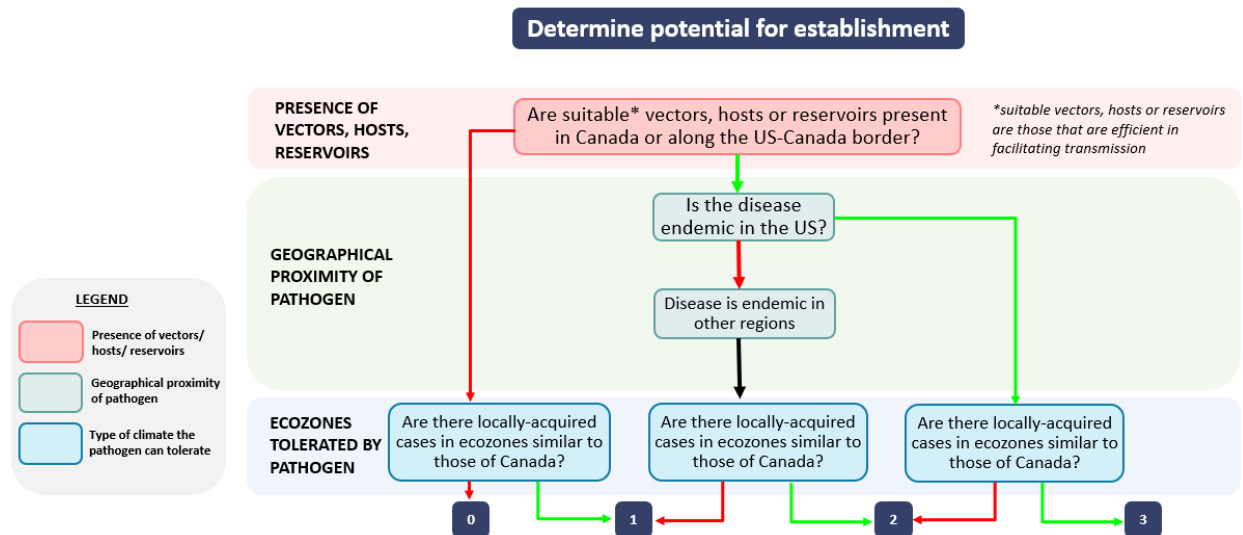


Fig. 4 Algorithm to determine the influence of the present environmental climate in Canada in the expansion of endemic diseases

