

Prioritizing Zoonotic Diseases in North America (including a demonstration of a Disease Prioritization Tool)

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Disclaimer

Although I currently work for the Public Health Agency of Canada, the work that I am presenting today was conducted during my Postdoc and Research Scientist tenure at the University of Guelph.



Presentation outline

- Disease prioritization
 - Conjoint analysis (CA)
min)
 - Using CA to prioritize zoonoses
- 
- (30
- Quick poll; comparison to 2010/11 results (5 min)
 - Disease prioritization tool demonstration (10 min)
 - Questions (10 min)

Disease prioritization

Group of diseases to prioritize:

	C1	C2	C3	...	Total score
• Disease A	1	2	1		24
• Disease B	3	1	4		39
• Disease C	4	4	1		45
• Disease D	1	3	3		24
• Disease E	2	2	2		35
• ...					

Disease prioritization

Group of diseases to prioritize:

2. Criteria considered equal

	C1	C2	C3	...	Total score
• Disease A	1	2	1		24
• Disease B	3	1	4		39
• Disease C	4	4	1		45
• Disease D	1	3	3		24
• Disease E	2	2	2		35
• ...					

1. Arbitrary scoring

3. Criteria and levels are independent

Disease prioritization

Group of diseases to prioritize:

	C1	C2	C3	...	Total score
	2.7	1.2	3.3		
• Disease A	1	2	1		18.4
• Disease B	3	1	4		49.2
• Disease C	4	4	1		35.9
• Disease D	1	3	3		26.2
• Disease E	2	2	2		24.4
• ...					

Disease prioritization

Group of diseases to prioritize:

Weights may be arbitrary

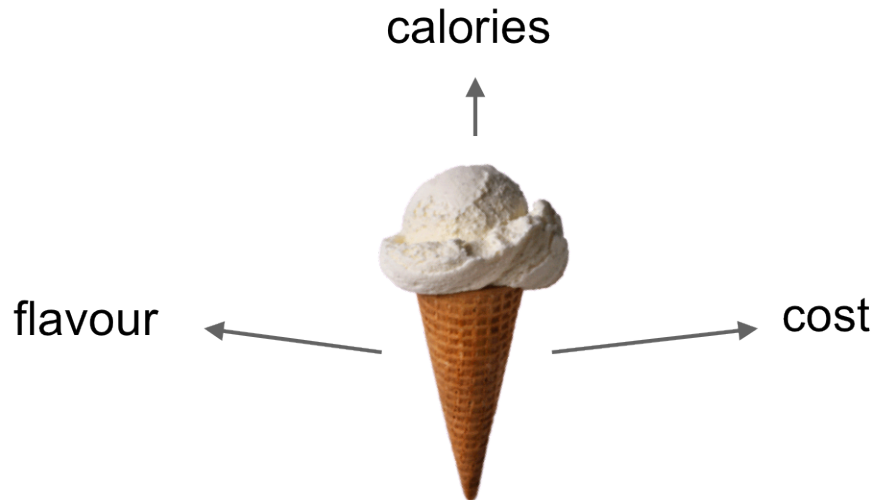
	C1	C2	C3	...	Total score
Weights	2.7	1.2	3.3		
• Disease A	1	2	1		18.4
• Disease B	3	1	4		49.2
• Disease C	4	4	1		35.9
• Disease D	1	3	3		26.2
• Disease E	2	2	2		24.4
• ...					

Still arbitrary scoring

Criteria and levels are still independent

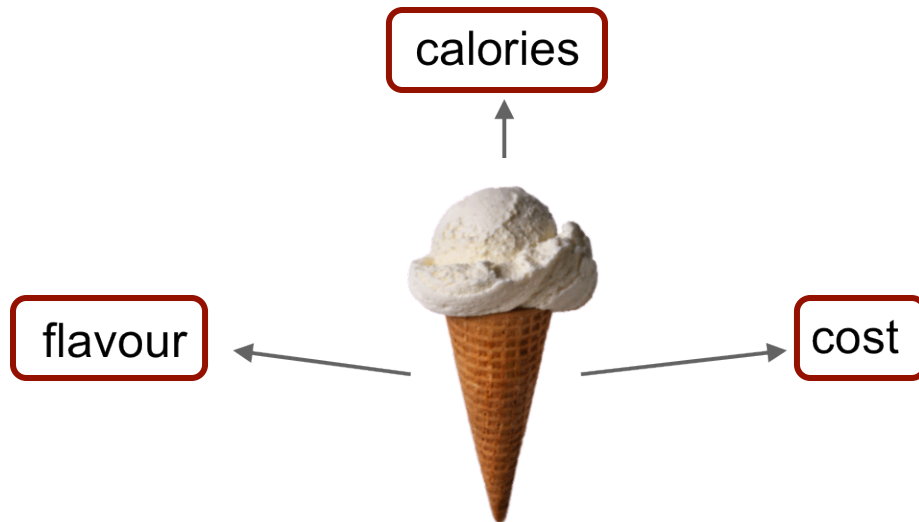
Conjoint analysis (CA)

- Market research technique
- Value of product = characteristics combined (but not equal)



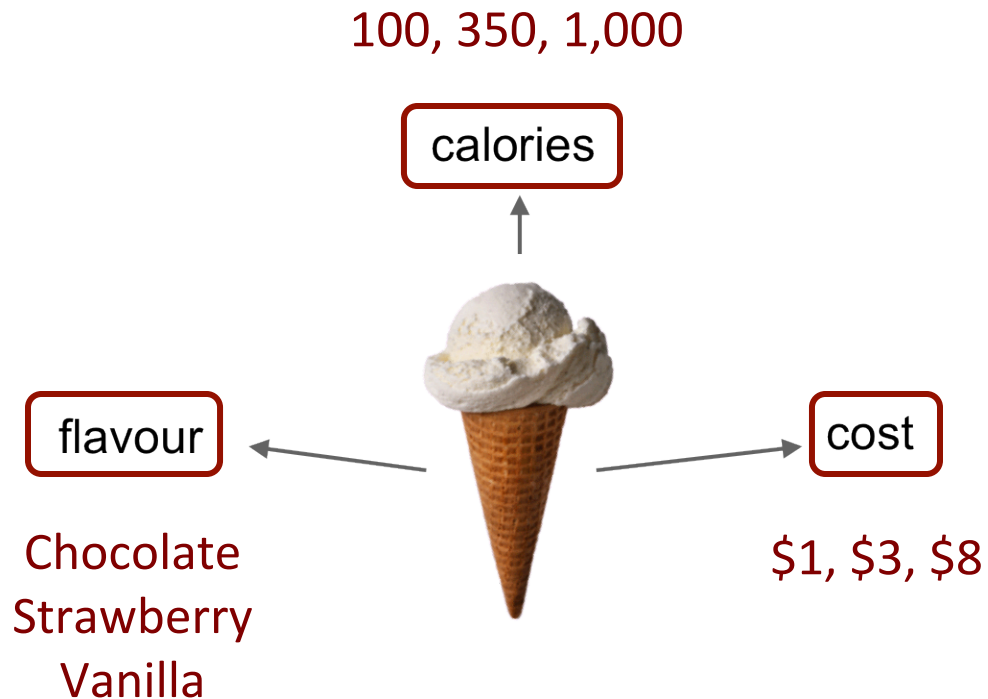
Conjoint analysis (CA)

- Market research technique
- Value of product = characteristics combined (but not equal)



How important are these **characteristics** in the **decision to purchase?**

Conjoint analysis (CA)



How much value are these **levels** of characteristics worth in the **decision to purchase**?

How does CA work?

1. Present combinations of products

Combination #1



Chocolate
\$1
350 calories

Combination #2



Strawberry
\$3
100 calories

Combination #3



Vanilla
\$8
1,000 calories

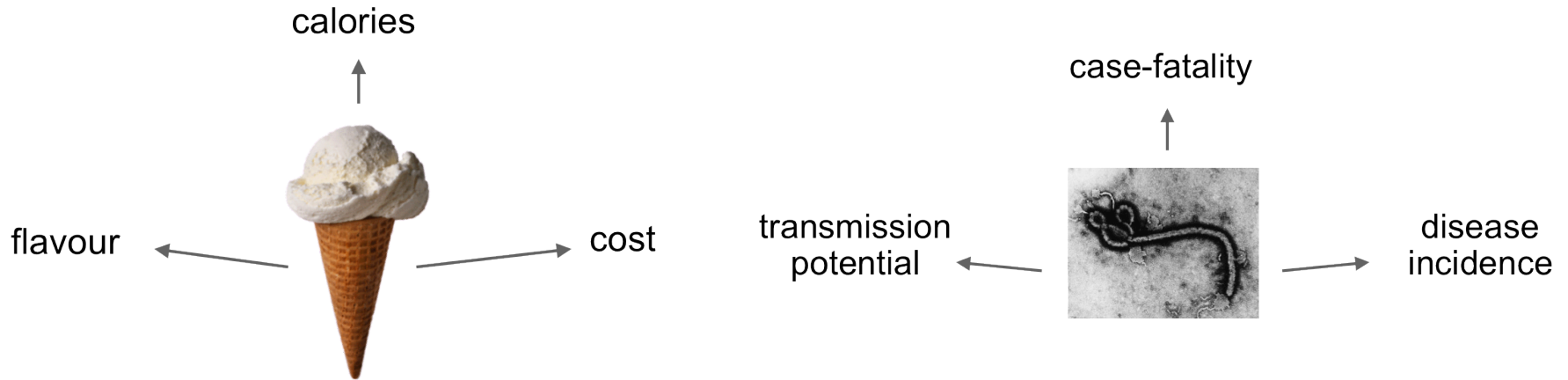
How does CA work?

1. Present combinations of products
2. Elicit preference by rank, rate or choice
3. Based on respondent's evaluation, the utility (value) for each level can be derived

Combination #1	Combination #2	Combination #3
		
Chocolate \$1 350 calories	Strawberry \$3 100 calories	Vanilla \$8 1,000 calories

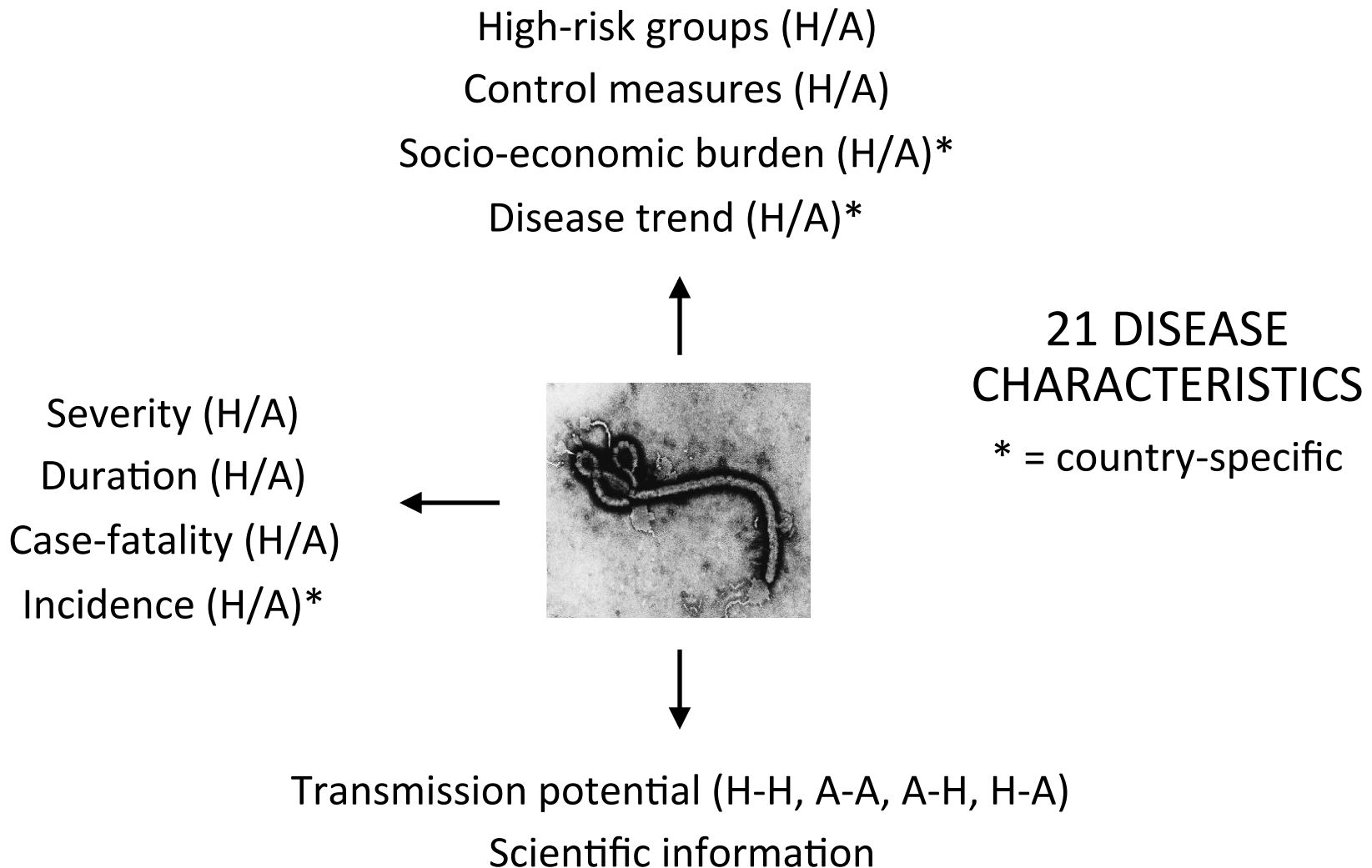
Choose one ice cream to purchase

What does ice cream have to do with diseases?

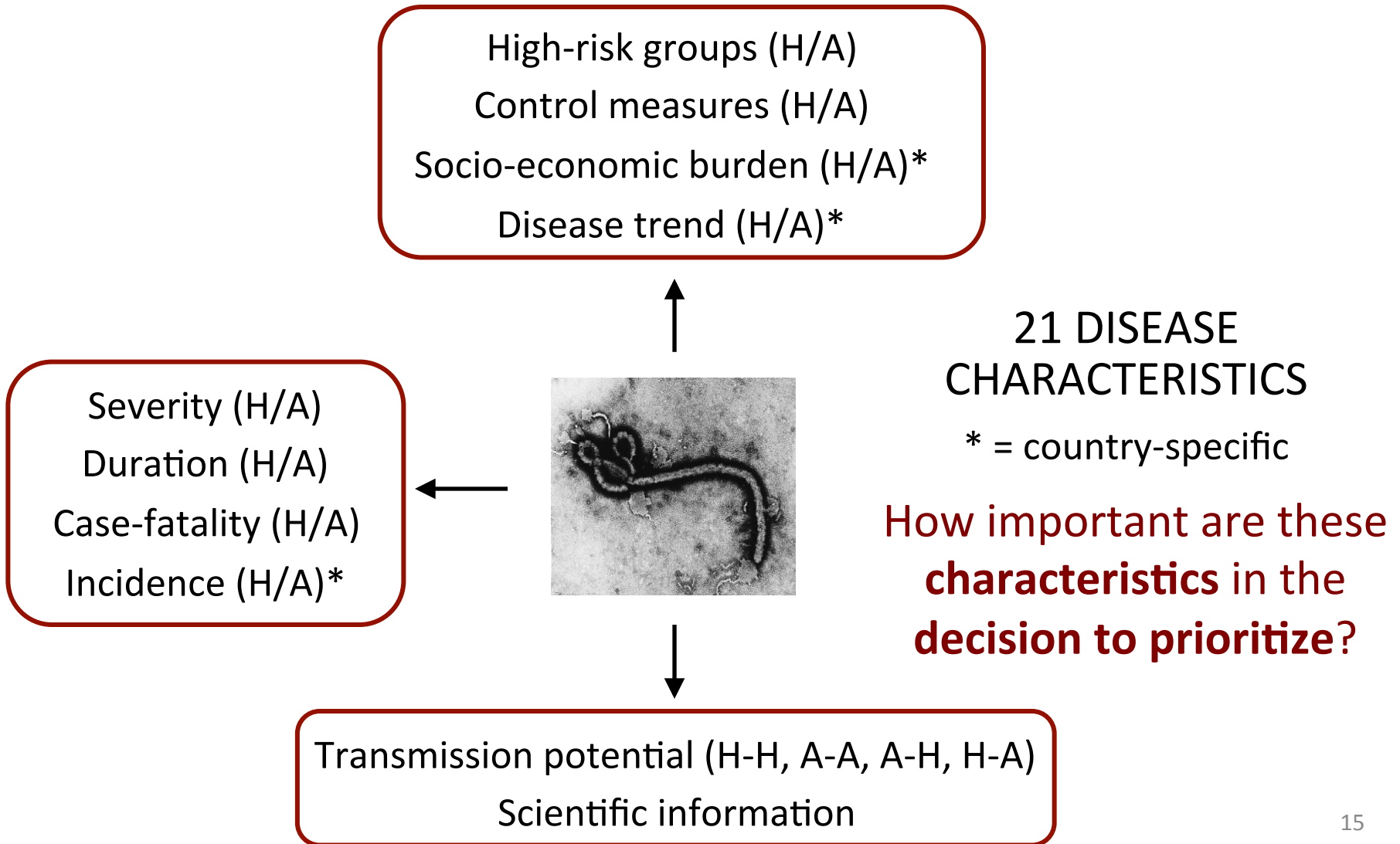


- Same concept, different product (different set of characteristics)
- Decision to purchase becomes the decision to prioritize

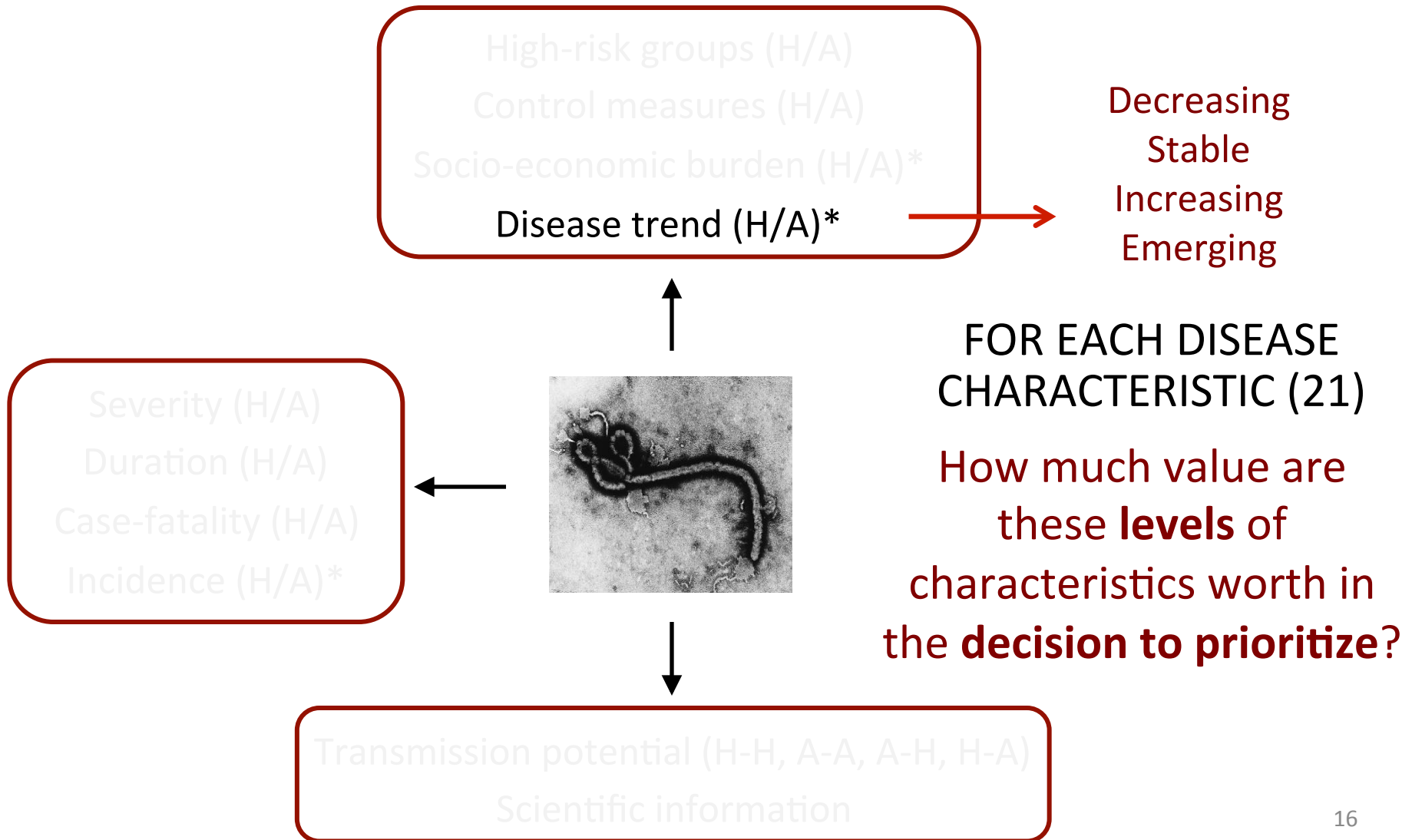
Using CA to prioritize zoonoses



Using CA to prioritize zoonoses

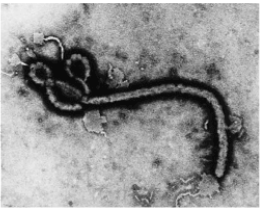


Using CA to prioritize zoonoses



Zoonoses choice-task set

Zoonoses #1



Case-fatality: **70%**

Duration: **days**

Symptoms: **severe**

Incidence: **0 cases**

Disease trend: **stable**

Zoonoses #2



Case-fatality: **100%**

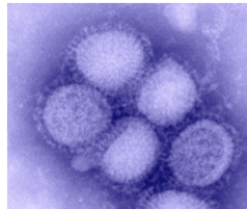
Duration: **weeks**

Symptoms: **severe**

Incidence: **5 cases**

Disease trend: **stable**

Zoonoses #3



Case-fatality: **1%**

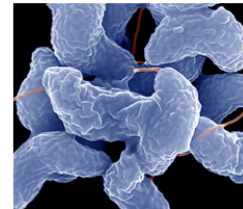
Duration: **weeks**

Symptoms: **mild**

Incidence: **45,000 cases**

Disease trend: **emerging**

Zoonoses #4



Case-fatality: **1%**

Duration: **weeks**

Symptoms: **mild**

Incidence: **30,000 cases**

Disease trend: **declining**

Zoonoses #5



Case-fatality: **10%**

Duration: **weeks**



Symptoms: **moderate**

Incidence: **0 cases**

Disease trend: **stable**

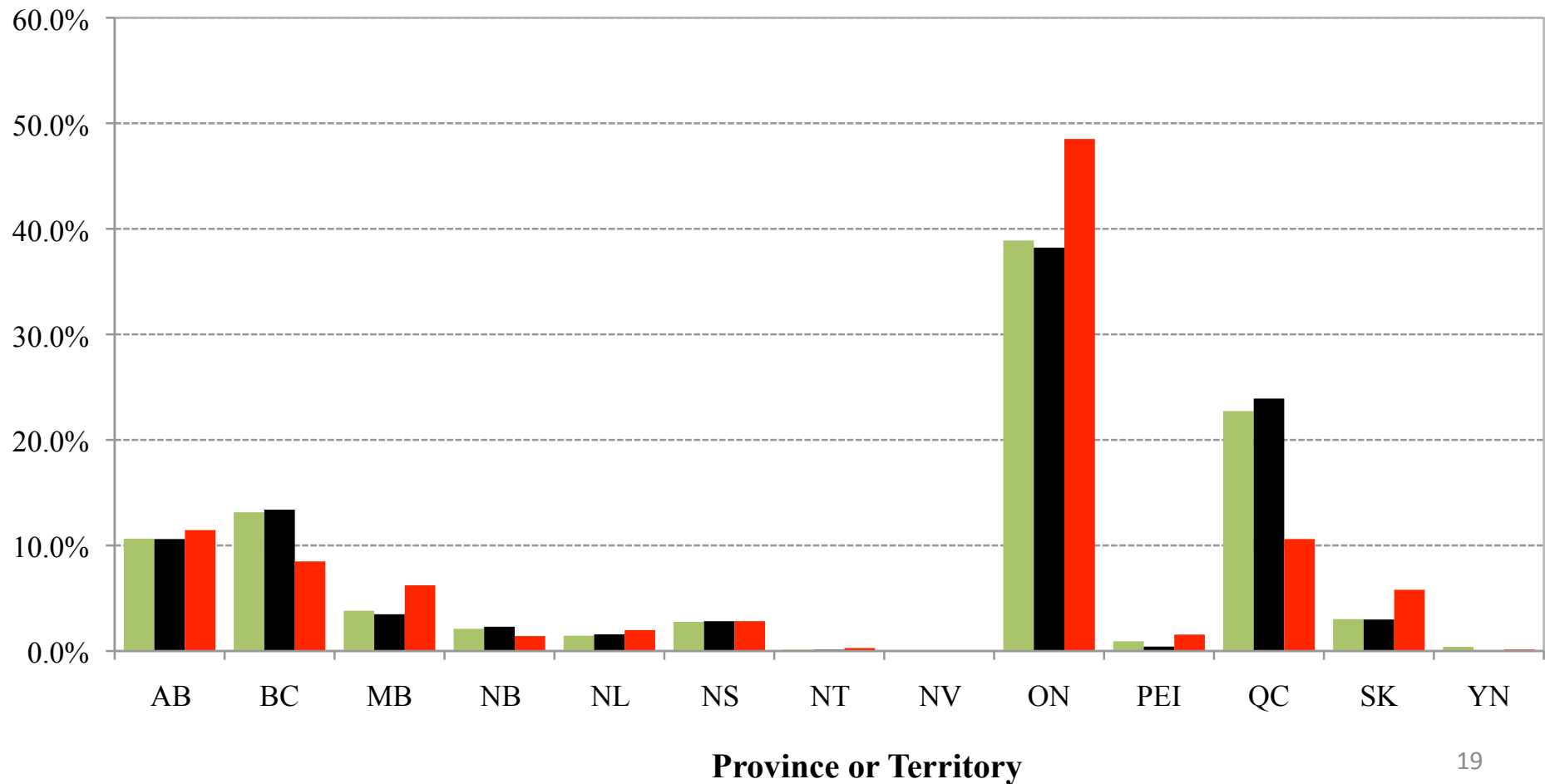
Choose one zoonoses to prioritize

Study overview

- 62 zoonoses, 21 disease characteristics (3 to 4 levels each)
- 5 characteristics per combination, 5 combinations per task
- 14 choice tasks per survey, 300 survey versions
- 1,468  761 public/707 professionals
- 1,542  778 public/764 professionals
- Hierarchical Bayes multinomial logit models

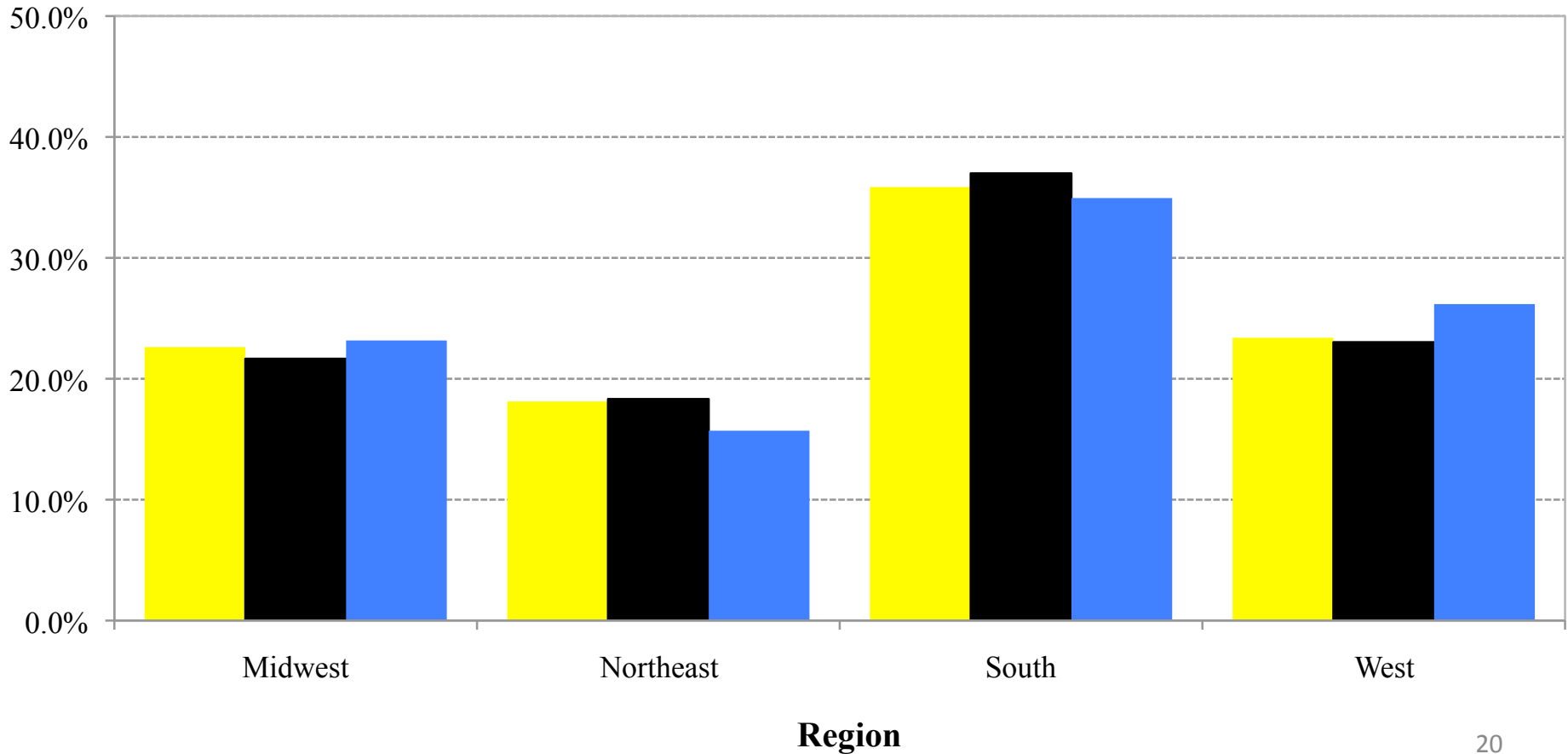
Geography (🇨🇦 761/707)

Canadian Public 2011 Canadian population Canadian Professionals



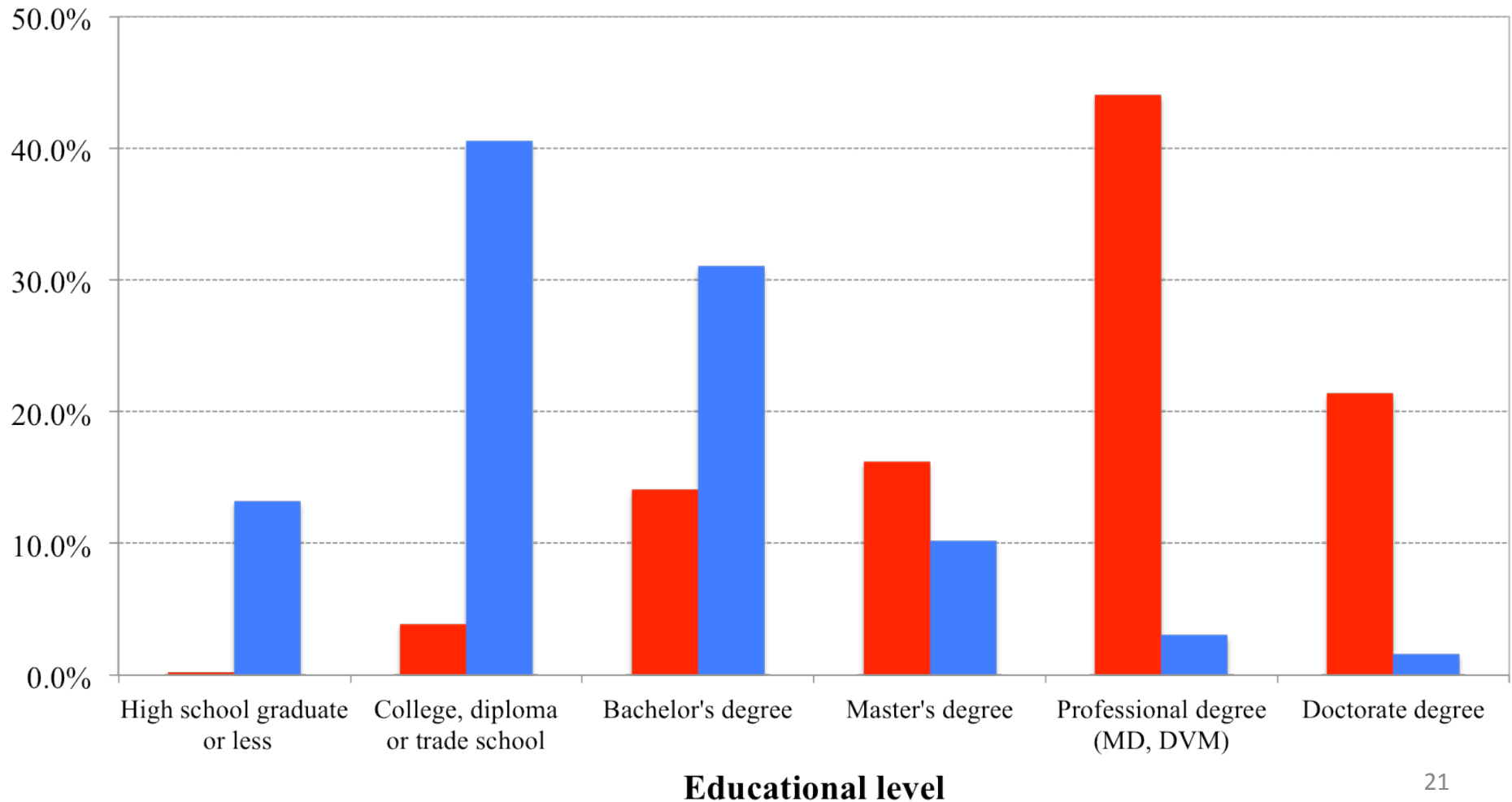
Geography (🇺🇸 778/764)

■ US Public ■ 2010 US population ■ US Professionals

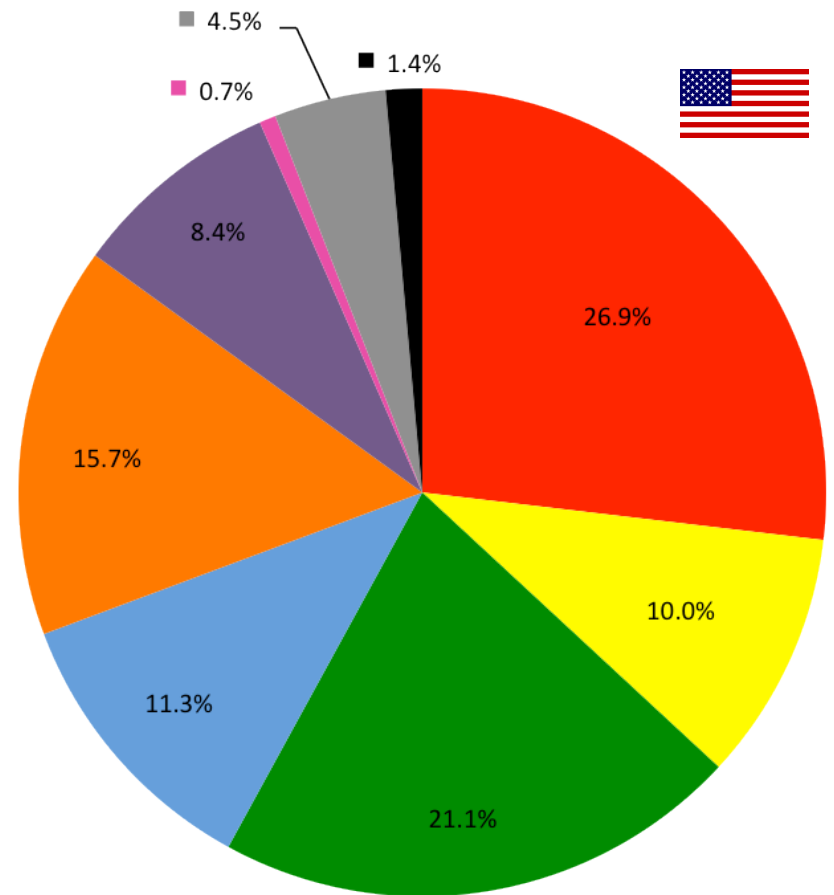
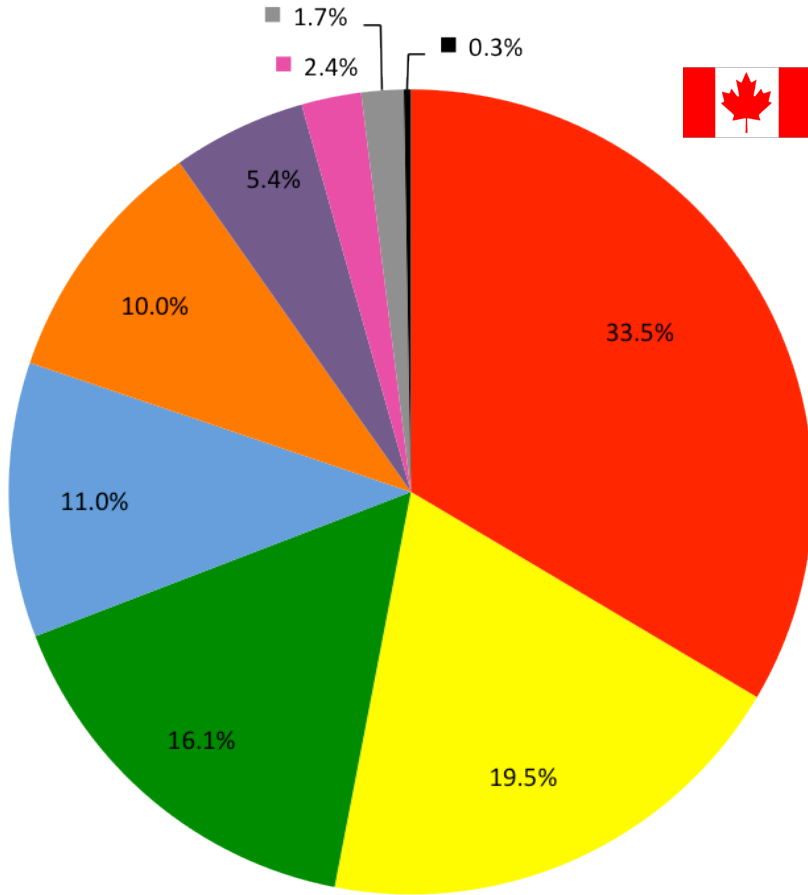


Public vs. Professionals (education)

■ Combined professional groups (n = 1,471) ■ Combined Public groups (n=1,539)



Professional groups background



Veterinary Sciences

Other

Animal health laboratory technician

Physician or Medical Sciences

Epidemiology

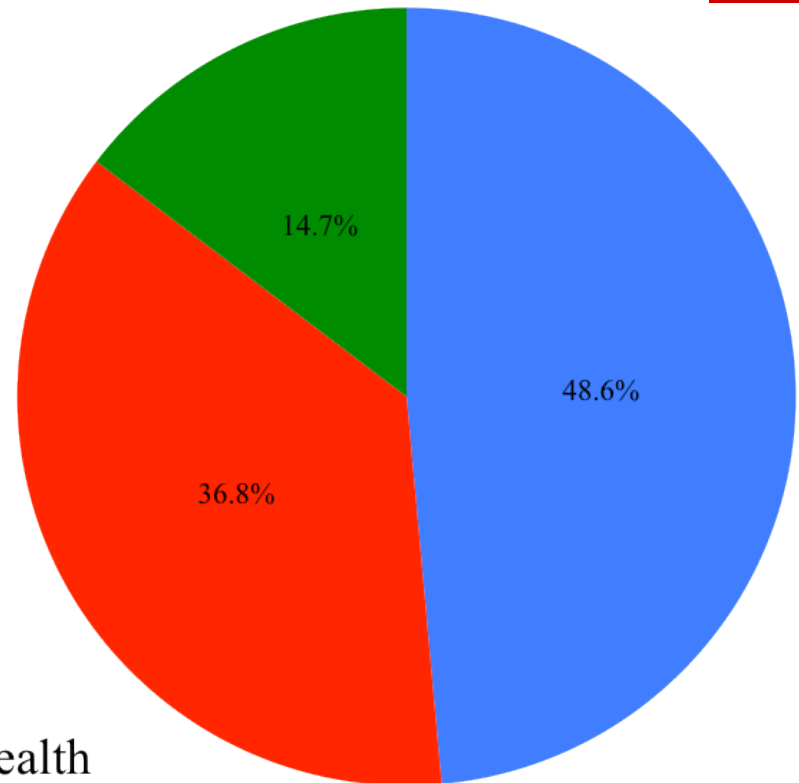
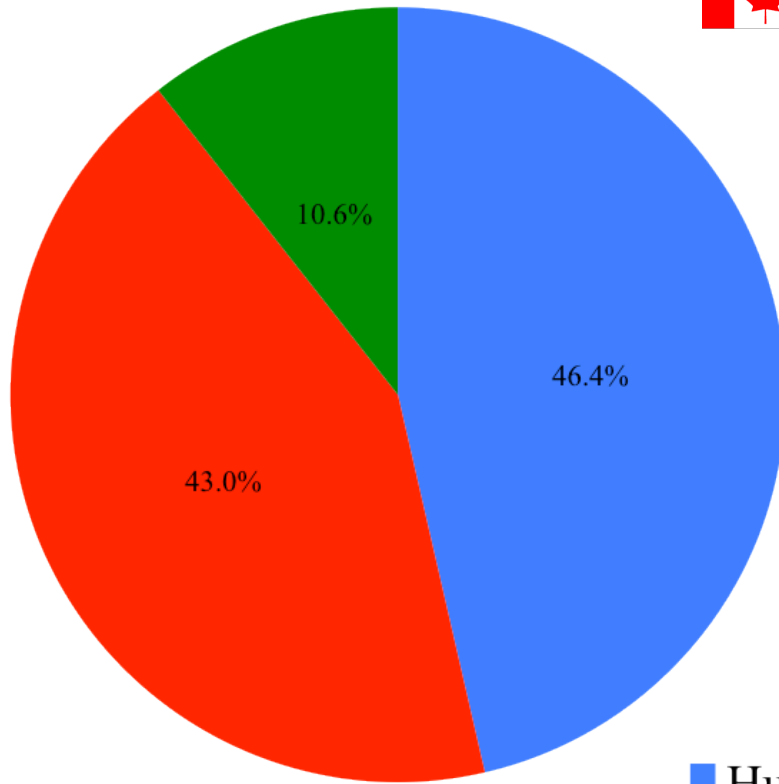
Nursing

Public Health

Infectious Disease research

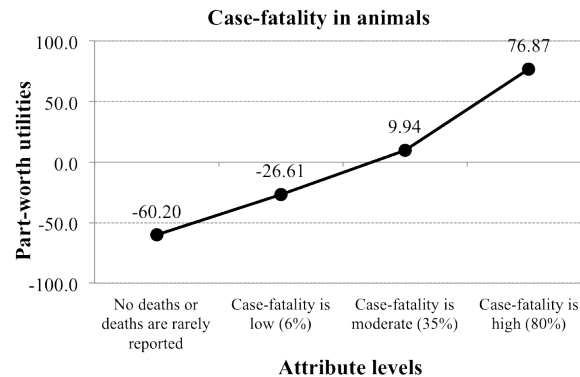
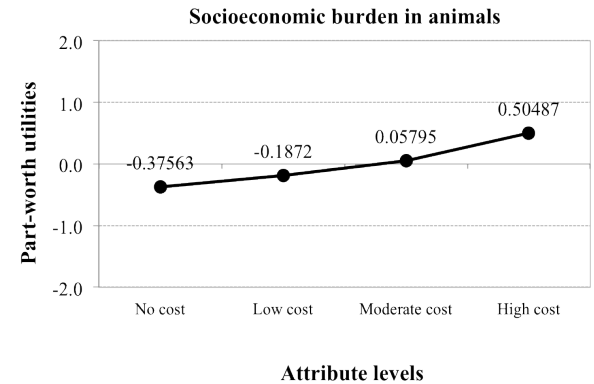
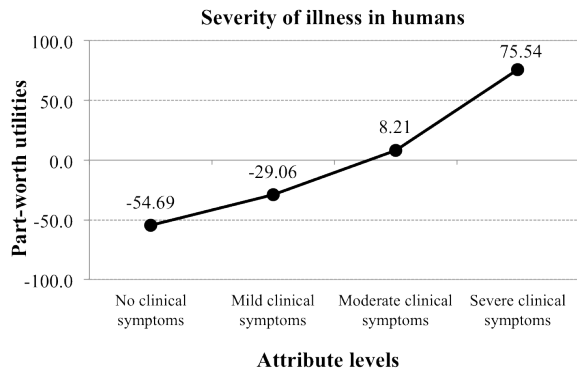
Human health laboratory technician

Professional groups (HH/AH)



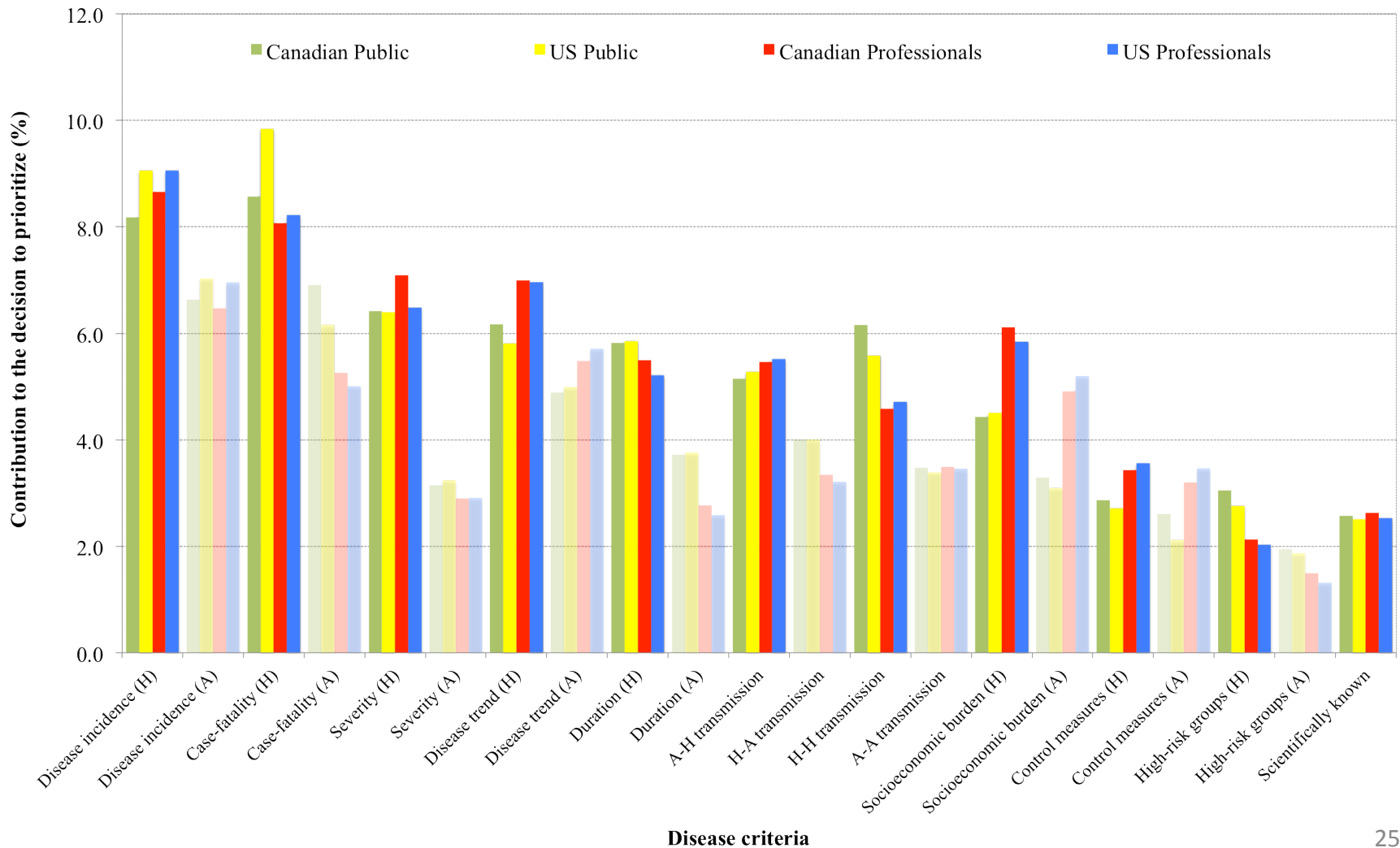
- Human health
- Animal health
- Both

Results: CA-derived scores

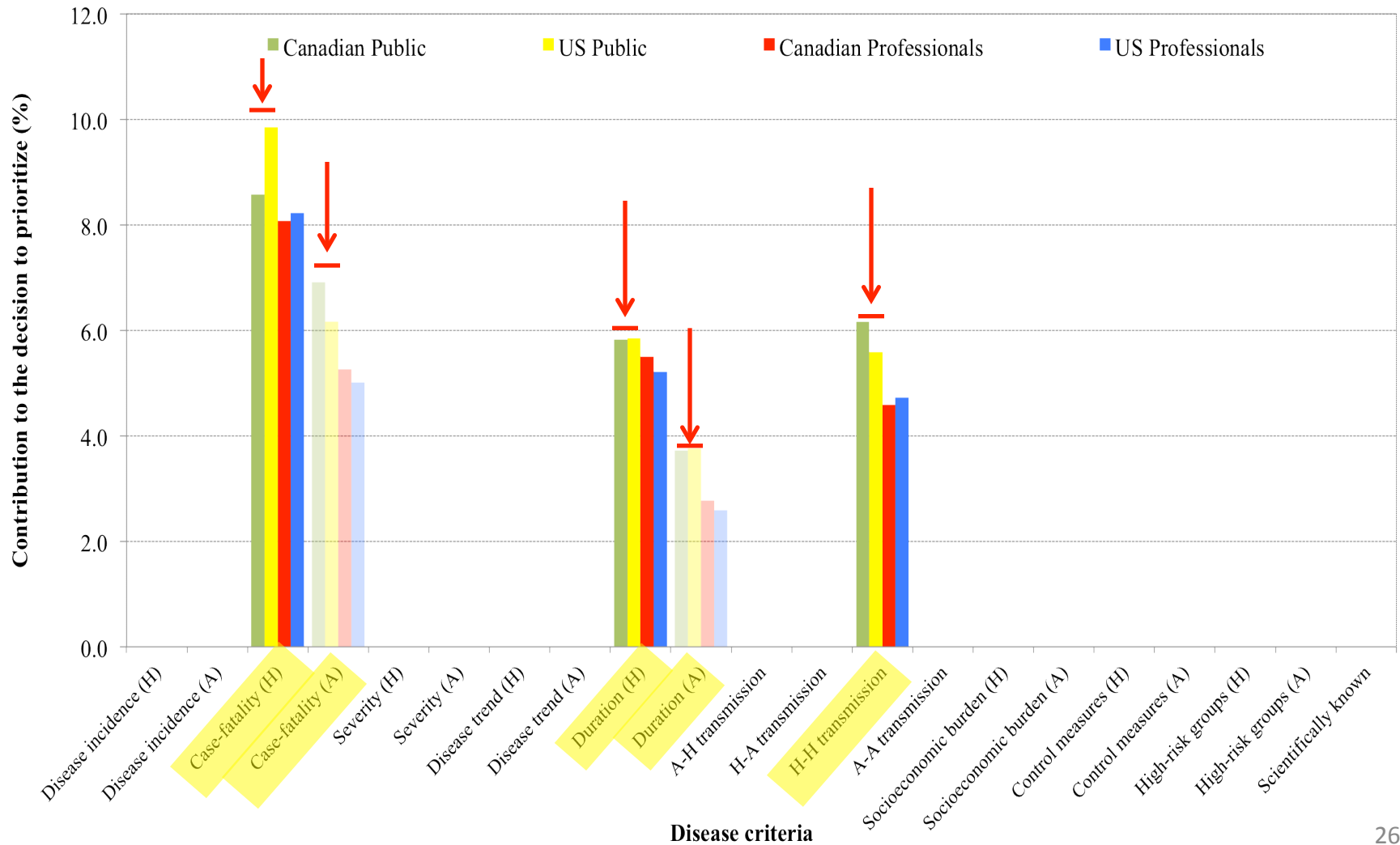


21 disease characteristics (3 to 4 levels each)

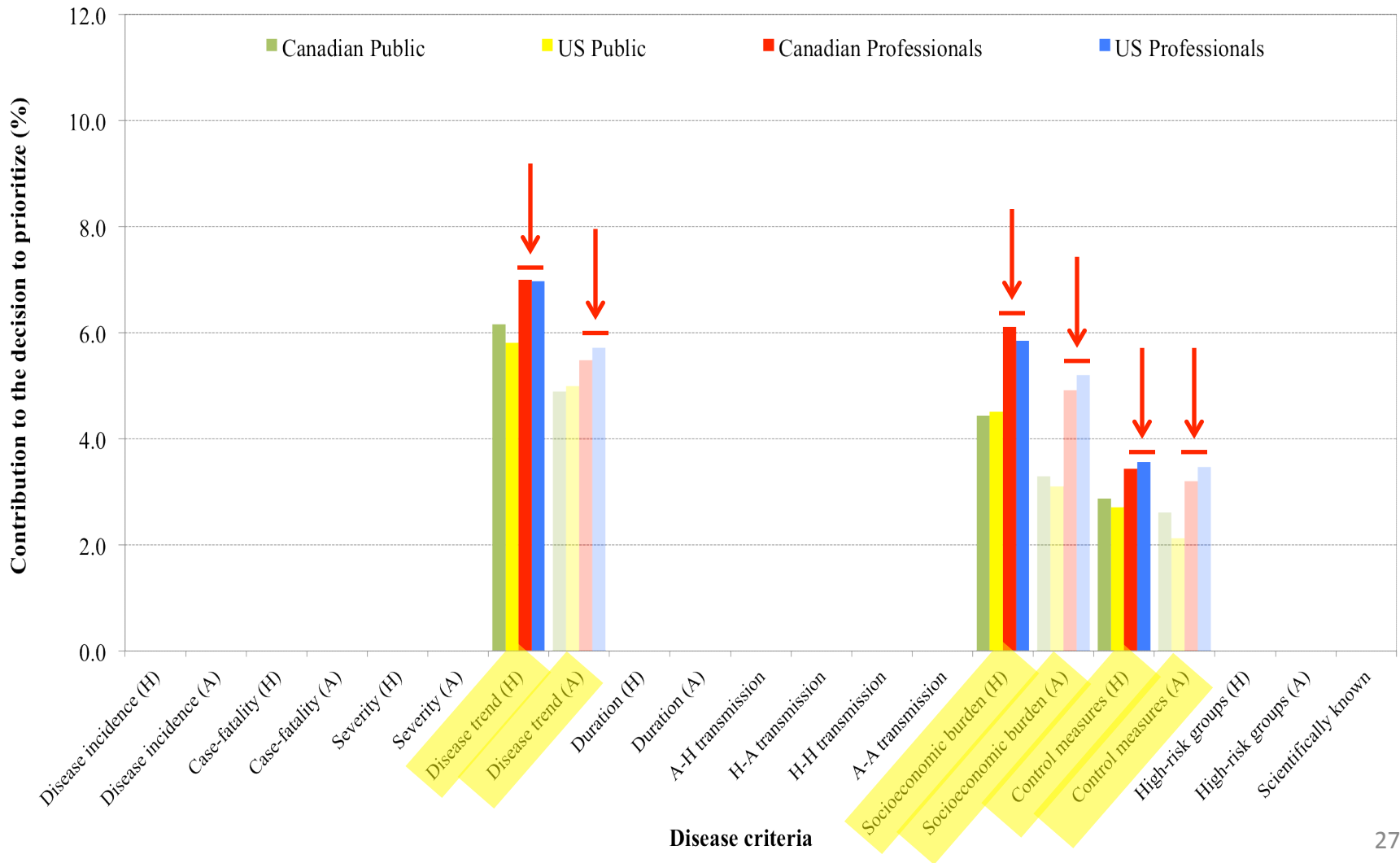
Disease criteria importance



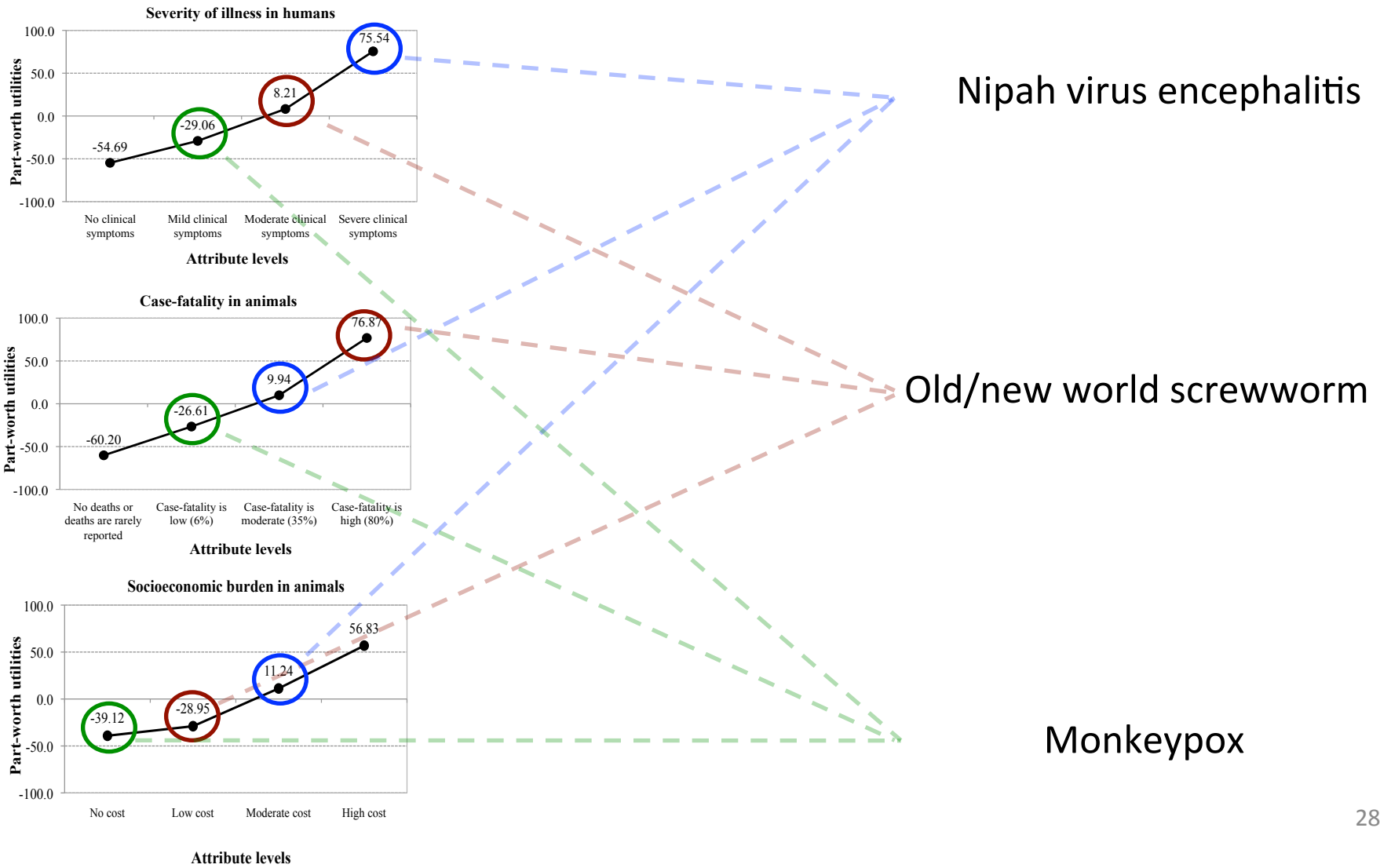
More important to the public groups



More important to the professional groups



Assigning CA-derived scores to zoonoses



Zoonoses priority list

Public

- Nipah
- Rabies
- Ebola
- Marburg
- H1N1 Influenza
- Variant CJD/BSE
- Listeriosis
- Hendra virus
- H5N1 Influenza
- Salmonellosis

Professionals

- Rabies
- Nipah
- H1N1 Influenza
- Variant CJD/BSE
- Listeriosis
- Ebola
- Marburg
- H5N1 Influenza
- Botulism
- Cryptosporidiosis

Zoonoses priority list



Public

- Variant CJD/BSE
- Rabies
- Nipah
- Ebola
- Marburg
- H1N1 Influenza
- Listeriosis
- Tularemia
- Anaplasmosis
- Hantavirus

Professionals

- Variant CJD/BSE
- Rabies
- H1N1 Influenza
- Nipah
- Listeriosis
- Babesiosis
- Ebola
- Anaplasmosis
- Marburg
- Tularemia

Publications are available online


- <http://ovc.uoguelph.ca/cphaz/resources>

OVC » CPHAZ » CPHAZ Resources & Links

CPHAZ Resources & Links

Our members have published some useful educational documents. Please click on the title of the documents below to download the PDF files or to visit their website.

Websites and Videos



The work from the national study has been published and can be downloaded here:

- [A Stakeholder-informed Approach to the Identification of Criteria for the Prioritization of Zoonoses in Canada](#)
- [A Quantitative and Novel Approach to the Prioritization of Zoonotic Diseases in North America: A Public Perspective](#)
- [A Quantitative Approach to the Prioritization of Zoonotic Diseases in North America: A Health Professionals' Perspective](#)
- [Prioritizing Zoonotic Diseases: Differences in Perspectives Between Human and Animal Health Professionals in North America](#)

REVIEW

Best practices in ranking communicable disease threats: a literature review, 2015

EC O'Brien¹, R Taft¹, K Geary², M Ciotti³, JE Suk³

1. Bazian Ltd (an Economist Intelligence Unit business), London, United Kingdom
2. International SOS, London, United Kingdom
3. European Centre for Disease Prevention and Control, Stockholm, Sweden

Correspondence: Jonathan Suk (jonathan.suk@ecdc.europa.eu)

Citation style for this article:

O'Brien EC, Taft R, Geary K, Ciotti M, Suk JE. Best practices in ranking communicable disease threats: a literature review, 2015. Euro Surveill. 2016;21(17):pii=30212. DOI: <http://dx.doi.org/10.2807/1560-7917.ES.2016.21.17.30212>

Study	Methodology	Overall score	Individual domain scores			Reviewer comments
			Validity	Content validity	Reliability	
Ng et al. [28-30]	Questionnaire	Green	Green	Green	Green	Implementation issues were not specifically discussed, but practical considerations were discussed which would assist implementation. Most of the key communicable disease facets were met. Internal consistency was not measured. The Delphi method reduces the effect of inter-rater variation because of discussion.

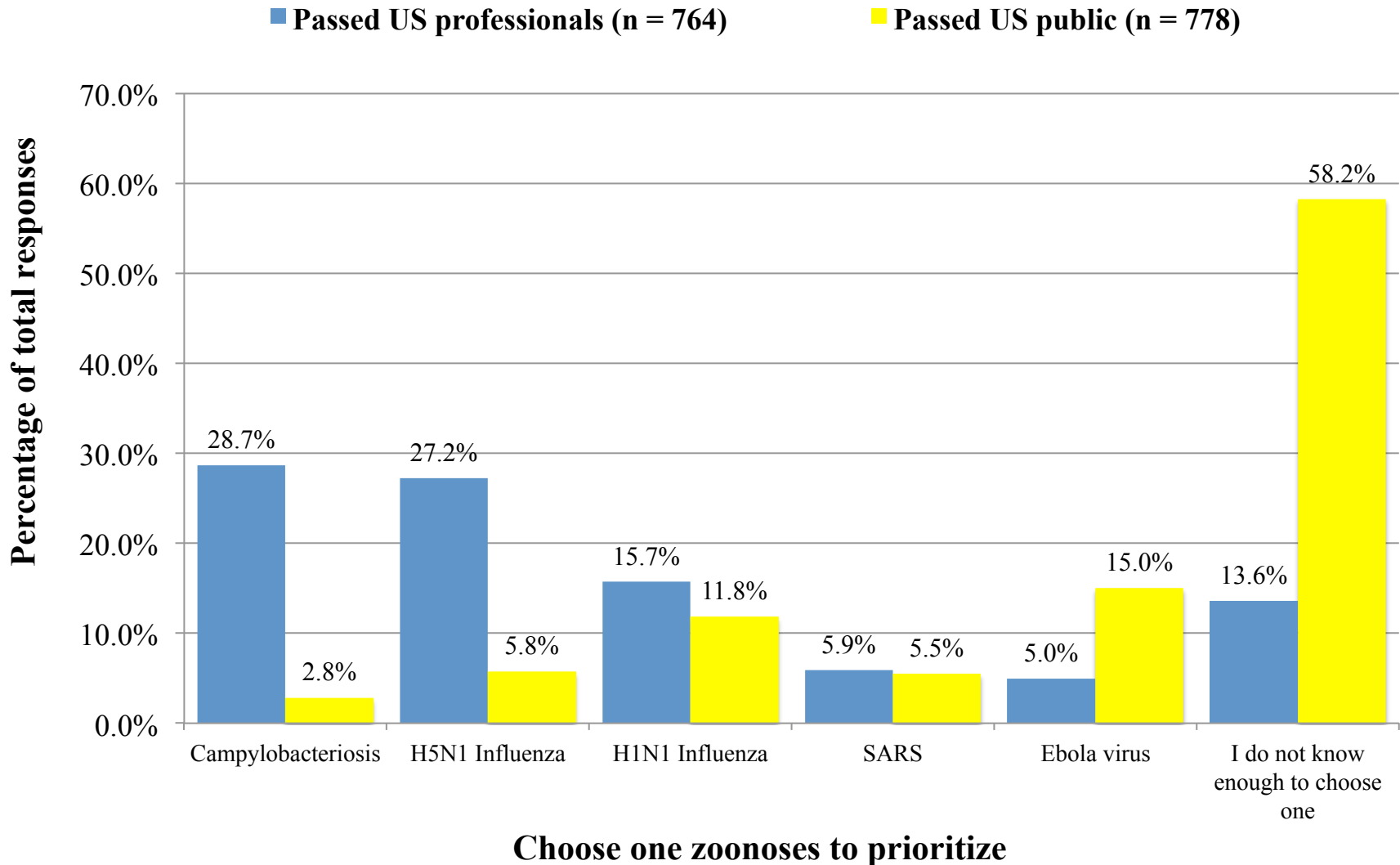
Quick poll (5 min)

Comparison to 2010/11 results

US (n=764)

Professional disciplines	
<i>Epidemiology</i>	16.0%
<i>Public Health</i>	20.9%
<i>Physician or Medical Sciences</i>	10.1%
<i>Infectious Disease Research</i>	8.9%
<i>Human Disease Laboratory Technician</i>	1.8%
<i>Veterinarians and Veterinary Sciences</i>	29.2%
<i>Animal Health Laboratory Technician</i>	0.8%
<i>Nursing</i>	4.7%
<i>Other Profession¹</i>	6.9%
<i>Unknown²</i>	0.7%
Animal health/Human health	
<i>Human health</i>	48.5%
<i>Animal Health</i>	36.8%
<i>Both</i>	14.7%
<i>Neither</i>	0.0%
Years in Employment	
<i>Less than 1 year</i>	3.4%
<i>>1 year to 3 years</i>	9.3%
<i>>3 years to 5 years</i>	9.8%
<i>>5 years to 10 years</i>	14.3%
<i>>10 years</i>	62.8%
<i>Unknown</i>	0.4%

Comparison to 2010/11 results



Motivation behind the tool

- Knowledge translation tool
- Prioritization is a provincial responsibility
- Large subset of data from the national study was from Ontario – 2.5 years of research to utilize
- Research gap in Ontario; no formal framework to prioritize zoonoses
- Stakeholder interest in science-based research driven decision-making
- Recognition that there is no one-size-fits-all solution for prioritizing zoonoses (MCDA)

Disease prioritization tool

- Excel-based tool combining MCDA with CA: individuals indicated their strength of preferences for disease characteristics (MCDA), these weights were then combined with Ontario-specific CA-derived scores (extracted from national study)
- The tool can generate multiple outputs by presenting alternative lists of recommended diseases reflecting individuals' preferences
- The tool provides a shared platform for disease prioritization amongst different stakeholders as well as a general framework for disease prioritization

Tool is available freely online

- <http://ovc.uoguelph.ca/cphaz/resources>

OVC » CPHAZ » CPHAZ Resources & Links

CPHAZ Resources & Links

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Websites and Videos



Zoonotic Disease Prioritization Tool

Drs. Victoria Ng and Jan Sargeant were awarded funding from the OMAFRA Emergency Management Program in 2011-2012 to develop a functional tool for the prioritization of zoonotic diseases in Ontario. The data extracted for the tool was based on a larger national study conducted by Dr. Ng during her time as a Postdoctoral Research Fellow at the Centre for Public Health and Zoonoses. The prioritization tools were developed in Excel and can be used by anyone with access to this software. Instructions on how to use the tool are provided in the tab 'MCDA Tool' of the Excel spreadsheet that can be downloaded [here](#) (the files are zipped for easy downloading). The tool is an example of a scientific framework for disease prioritization involving stakeholder engagement across multiple disciplines.

The work from the national study has been published and can be downloaded [here](#):

<http://news.uoguelph.ca/2016/02/improving-disease-response-goal-of-new-u-of-g-tool/>

Improving Disease Response Goal of New U of G Tool

Monday, February 1, 2016 – News Release

A new decision-making tool created at the University of Guelph could aid in the complicated task of prioritizing responses to zoonotic diseases and outbreaks.

Many diseases can jump from animals to humans, says Jan Sargeant, director of Guelph's [Centre for Public Health and Zoonoses](#), and a professor in the Department of Population Medicine at U of G's Ontario Veterinary College.

Zoonotic diseases account for more than 60 per cent of all communicable diseases, and 75 per cent of emerging infectious diseases, in humans.

Some, such as rabies, are rare but always fatal. Others, such as salmonella, are relatively common but generally don't cause serious or long-term illness, said Sargeant.



Demonstration of the tool (10 min)

OMAFRA prioritization tool UPDATED.xlsm

Search in Sheet

Home Layout Tables Charts SmartArt Formulas Data Review Developer

Font: Arial 12, Bold, Italic, Underline, Paragraph, Alignment, Number, Format, Cells, Themes

F10 Select a baseline model

Agri-Food and Rural Link
A program of the OMAFRA-U of G Partnership
Mobilizing Agri-Food and Rural Research Knowledge

This MCDA tool was created by Victoria Ng and was supported by the OMAFRA-University of Guelph Emergency Management Research Program (Research Project #: U of G 2011-1089).
For any questions regarding the work, please contact Victoria Ng at vng03@uoguelph.ca or cphaz@uoguelph.ca
Last updated: July 16, 2014

STEP 1 (optional): Rank each disease criterion either within each disease criteria category or across all 21 disease criteria.

Note: ranks do not affect the final disease score; this step helps with assigning weights according to importance.

STEP 2: Assign a weight to each criterion according to importance. A weight of 1 represents the baseline model. A weight from 0.01 to 0.99 decreases the weight of the baseline model. A weight of 1.01 to 2.00 increases the weight of the baseline model.

STEP 3: Select a group as a baseline model to a individual weights on (click on cell F10 to bring up drop-down menu button on the right-hand side)

The baseline model weights are presented in colour individual weights (Step 2) applied to the baseline weights are presented as adjusted weights in colour

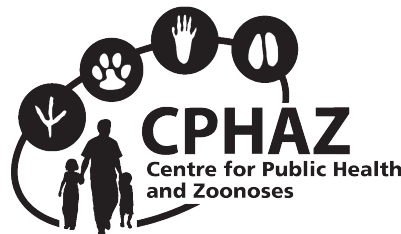
HUMAN-RELATED DISEASE CRITERIA			RANK	WEIGHT	BASELINE WEIGHT	ADJUSTED WEIGHT
1. SEVERITY OF THE ILLNESS IN HUMANS				1.00	#VALUE!	#VALUE!
2. DURATION OF ILLNESS IN HUMANS				1.00	#VALUE!	#VALUE!
3. CASE-FATALITY IN HUMANS				1.00	#VALUE!	#VALUE!
4. INCIDENCE OF THE DISEASE IN THE ONTARIO POPULATION IN THE LAST FIVE YEARS				1.00	#VALUE!	#VALUE!
5. HIGH-RISK GROUPS IN HUMANS				1.00	#VALUE!	#VALUE!
6. EFFICACY OF CONTROL MEASURES IN HUMANS				1.00	#VALUE!	#VALUE!
7. ECONOMIC BURDEN OF THE DISEASE IN HUMANS IN ONTARIO				1.00	#VALUE!	#VALUE!
8. DISEASE TREND IN THE ONTARIO POPULATION IN THE LAST FIVE YEARS				1.00	#VALUE!	#VALUE!

ANIMAL-RELATED DISEASE CRITERIA			RANK	WEIGHT	BASELINE WEIGHT	ADJUSTED WEIGHT
9. SEVERITY OF THE ILLNESS IN ANIMALS				1.00	#VALUE!	#VALUE!
10. DURATION OF ILLNESS IN ANIMALS				1.00	#VALUE!	#VALUE!
11. CASE-FATALITY IN ANIMALS				1.00	#VALUE!	#VALUE!
12. INCIDENCE OF THE DISEASE IN THE ONTARIO ANIMAL POPULATION IN THE LAST FIVE YEARS				1.00	#VALUE!	#VALUE!
13. HIGH-RISK GROUPS IN ANIMALS				1.00	#VALUE!	#VALUE!

Normal View Ready Sum=0

Acknowledgements

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