REVISED ESTIMATE OF FOOD-BORNE ILLNESS IN CANADA

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PROTECTING CANADIANS FROM ILLNESS

Public Health Agency of Canada
Agence de la santé publique du Canada

Canada

Outline

- Purpose and Background
- Methods:
  - » Specified Pathogens
  - » Unspecified Agents
- Results
- Discussion

Purpose

- To estimate the annual number of cases of food-borne illness in Canada for specified pathogens and unspecified agents
- To identify gaps and potential future research areas

- F/P/T food safety and public health partners, as well as industry and academia, rely on estimates of food-borne illness to inform their activities, including:
  - » Set food safety priorities;
  - » Create public health policies;
  - » Inform research, cost estimates and disease attribution;
  - » Contribute to education and advocacy campaigns; and
  - » Develop risk assessments

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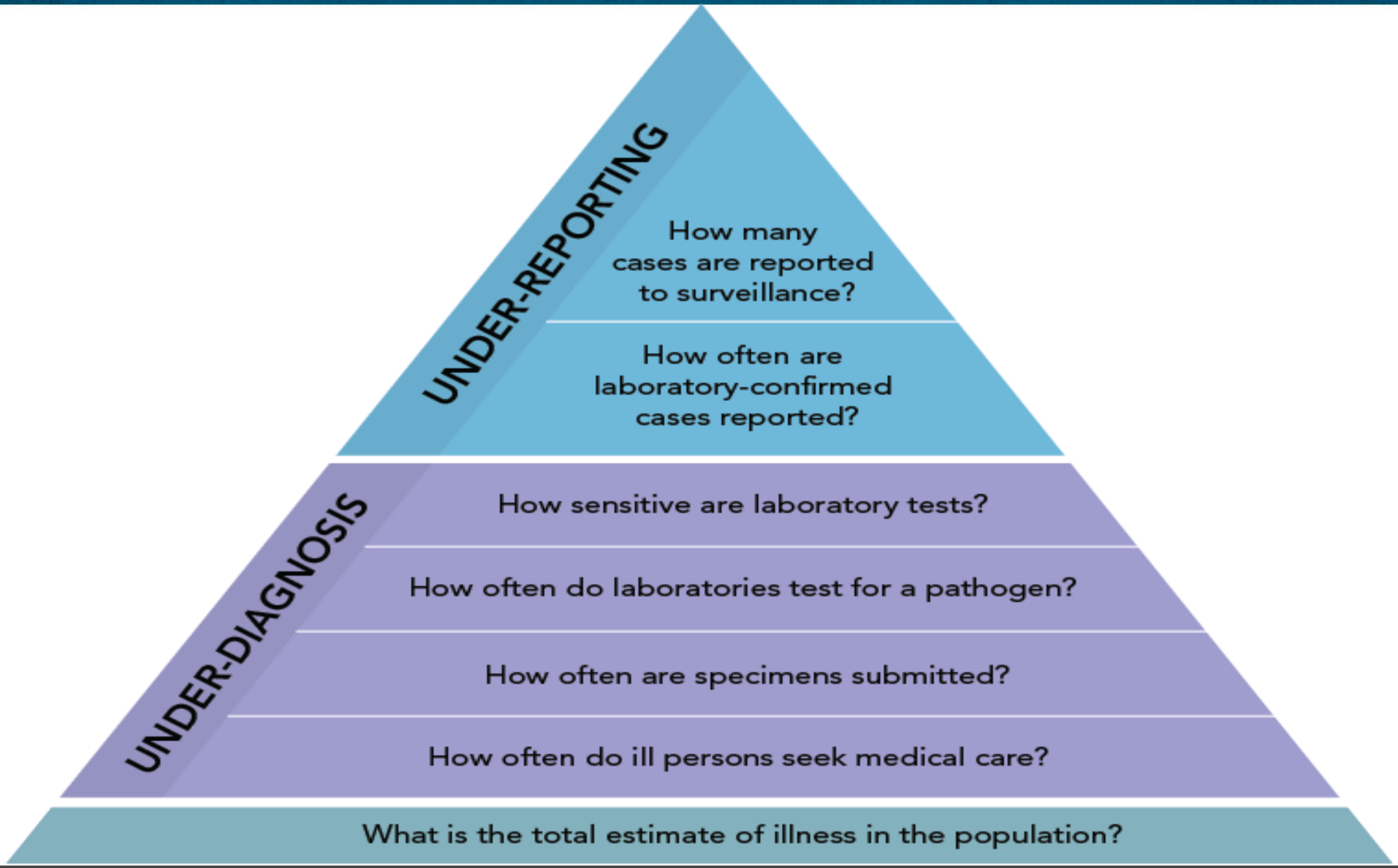


Background

- 1999 – US CDC publishes estimate of 76 million food-borne illnesses annually (Mead et al)

- 2008 – Public Health Agency of Canada publishes estimate of 11 million food-borne illnesses annually, based in part on results and methods used for US estimate (Thomas et al)

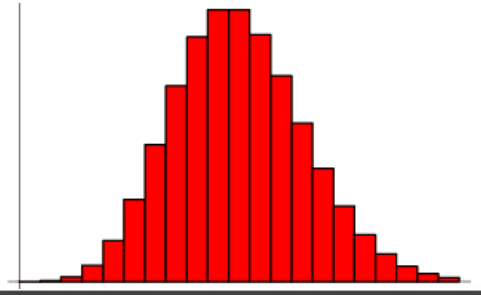
- 2011 – US CDC publishes revised estimate of 48 million food-borne illnesses annually (Scallan et al)
  - » More advanced methodology and improved data sources, resulting in a more accurate estimate

Methods

- Estimates established for 30 pathogens and unspecified agents
- 2000-2010 data:
  - Canadian surveillance systems
  - International literature
  - 2006 Canadian census population
- Accounted for under-ascertainment (i.e. under-reporting and under-diagnosis)

Methods

- Probability (PERT) Distribution to describe range of plausible values for model inputs (low, modal, high value)
- Modeled uncertainty for each estimate, resulting in credible intervals for each number
  - » Inherent variability of estimates and uncertainty due to lack of knowledge
- Values are generated using monte carlo simulations in @Risk – 100,000 iterations



Methods

- Data sources

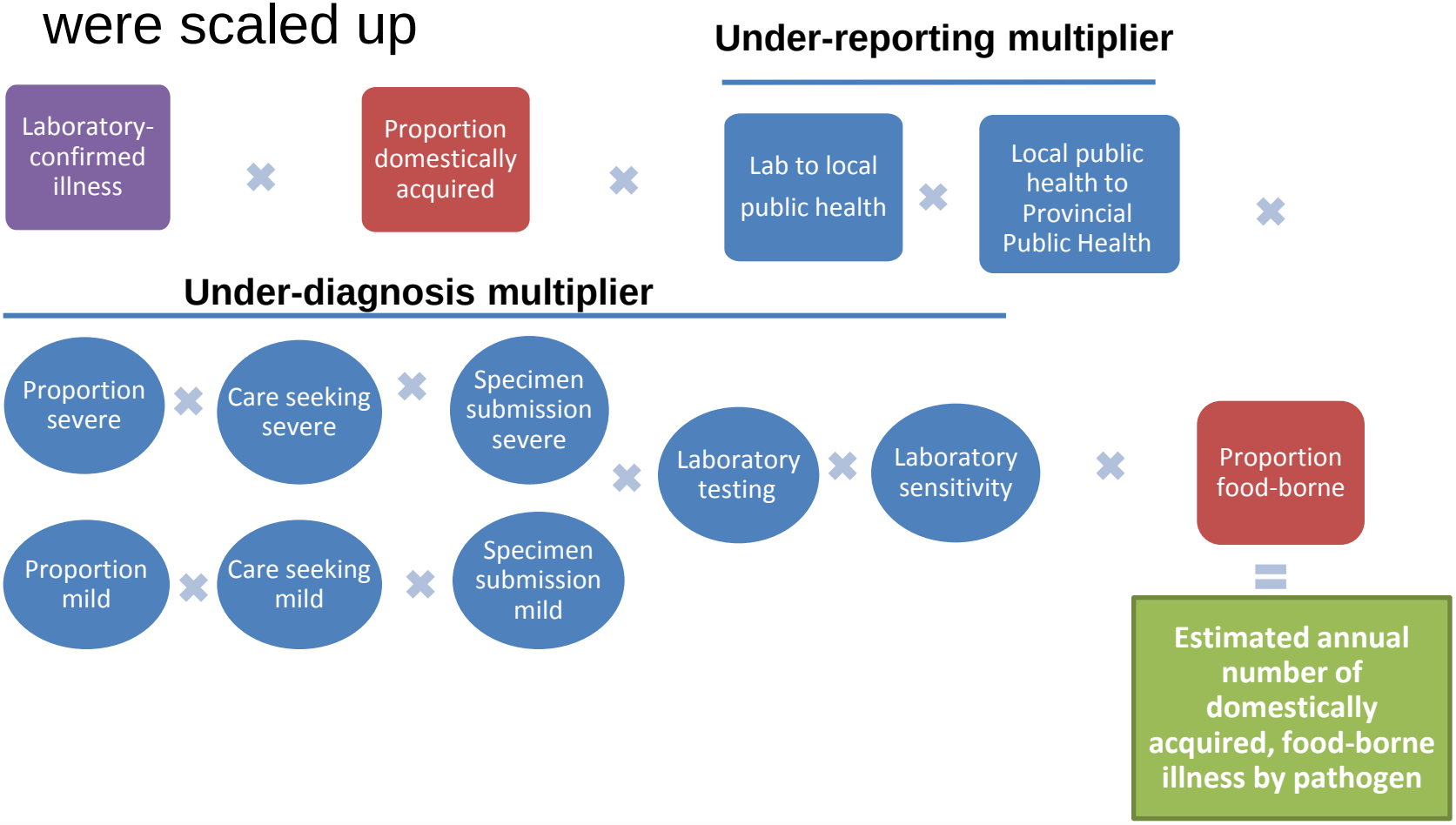
Pathogen case counts	Under-diagnosis / Under-reporting	Proportion travel related	Proportion food-borne
• Canadian Notifiable Disease Surveillance system (CNDSS) • National Enteric Pathogen Surveillance system (NESP) • Provincial Reportable Disease Surveillance system	• NSAGI population surveys • C-EnterNet Surveillance • Consultation with NML, HC and CPHLN • Literature review	• C-EnterNet Surveillance • BCCDC provincial data • Enhanced Listeriosis surveillance	• Expert elicitation • Literature review

Methods

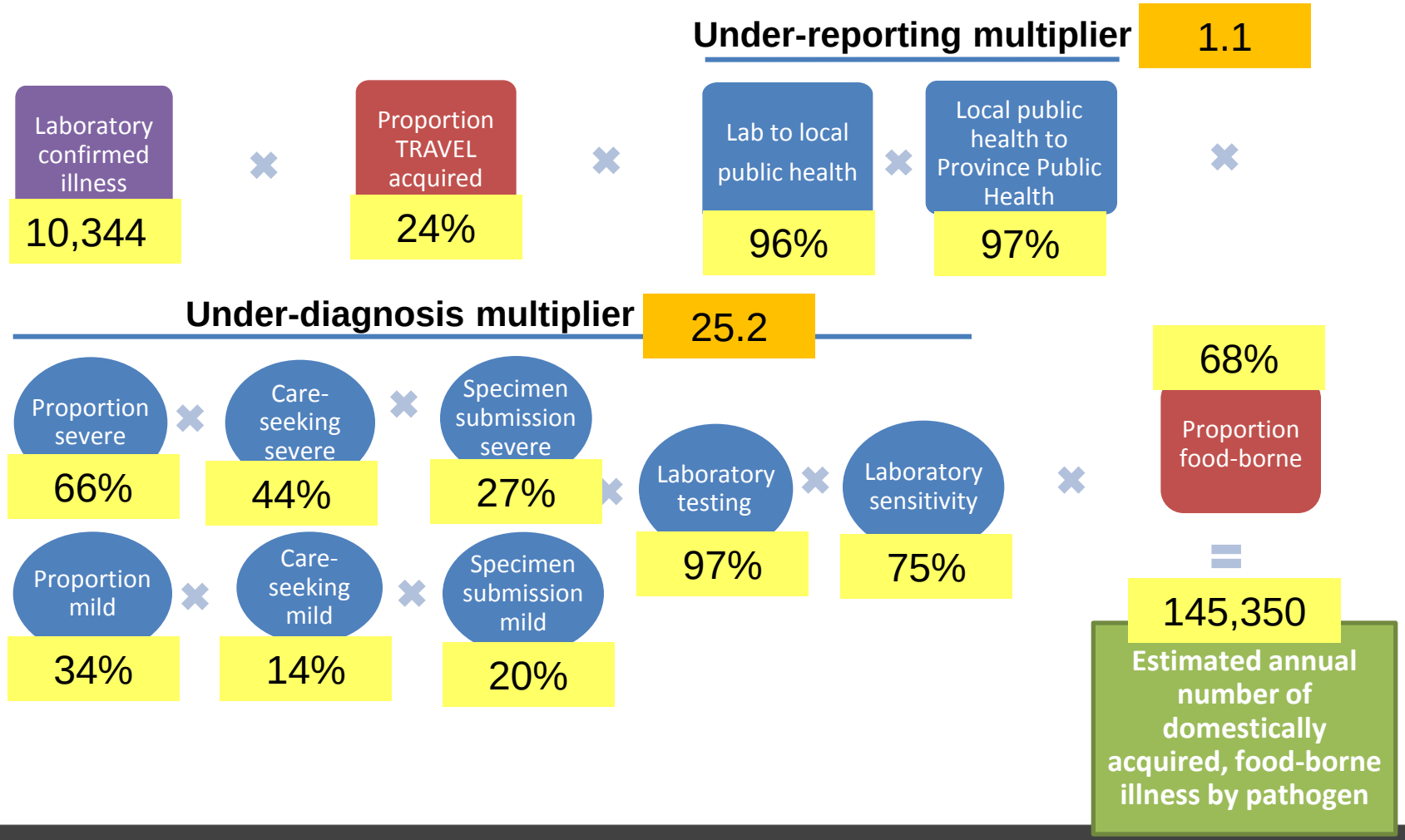
1. Pathogens for which laboratory-confirmed illnesses were scaled up		2. Pathogens for which Canadian population scaled down	3. Other methods
National reportable disease data	**Provincial reportable disease data**		
Brucella spp.	***Trichinella* spp.**	**Adenovirus**	***E. coli*, other diarrheagenic**
***Campylobacter* spp.**	***Listeria monocytogenes***	**Astrovirus**	**ETEC**
Clostridium botulinum	***Vibrio parahaemolyticus***	**Norovirus**	**VTEC non-O157**
***Cryptosporidium* spp.**	***Yersinia enterocolitica***	**Rotavirus**	***Bacillus cereus***
Cyclospora cayetanensis		**Sapovirus**	***Staphylococcus aureus***
VTEC O157		***Toxoplasma gondii***	
***Giardia* sp.**		***Clostridium perfringens***	
Hepatitis A			
***Salmonella* spp., nontyphoidal**			
***Salmonella* Typhi**			
***Shigella* spp.**			
Vibrio cholerae			
***Vibrio* spp., other**			
Vibrio vulnificus			

Methods: 30 Pathogens

1. Pathogens for which laboratory-confirmed illnesses were scaled up

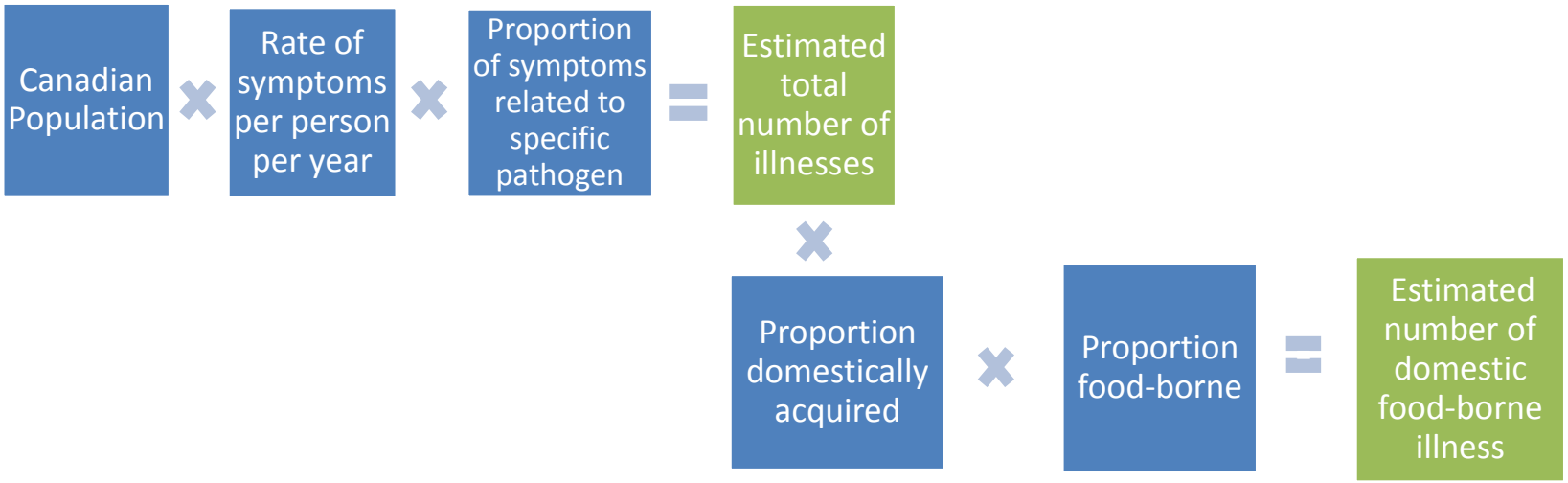


Example – *Campylobacter*

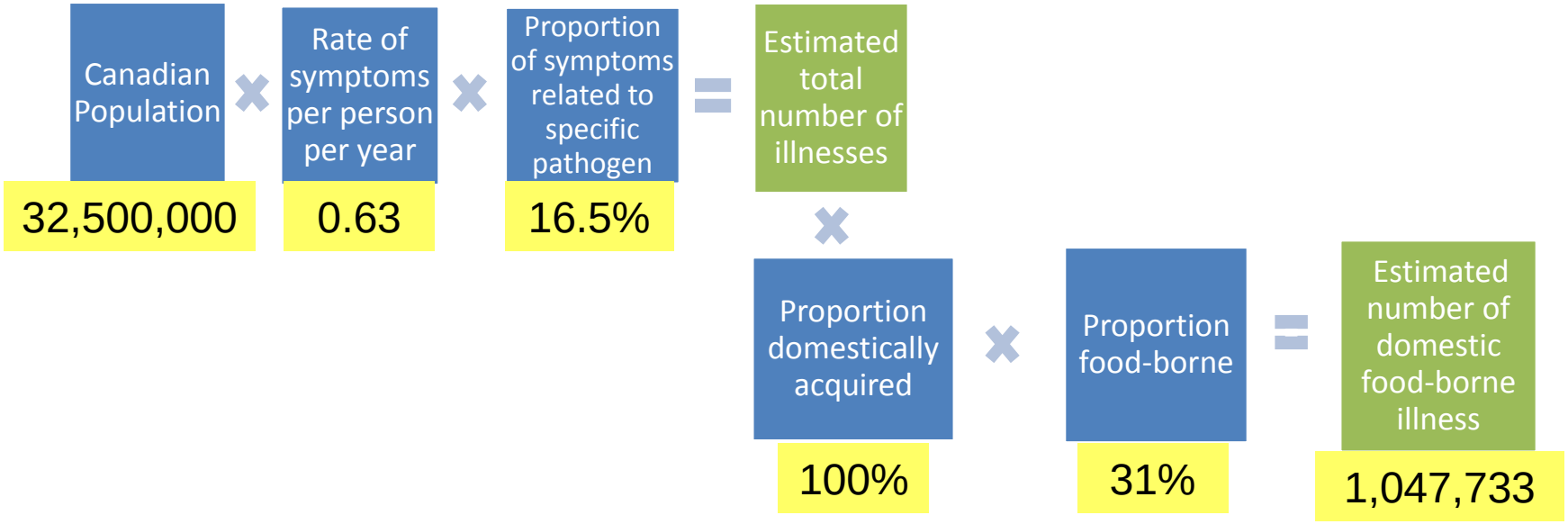


Methods

2. Pathogens for which Canadian population was scaled down



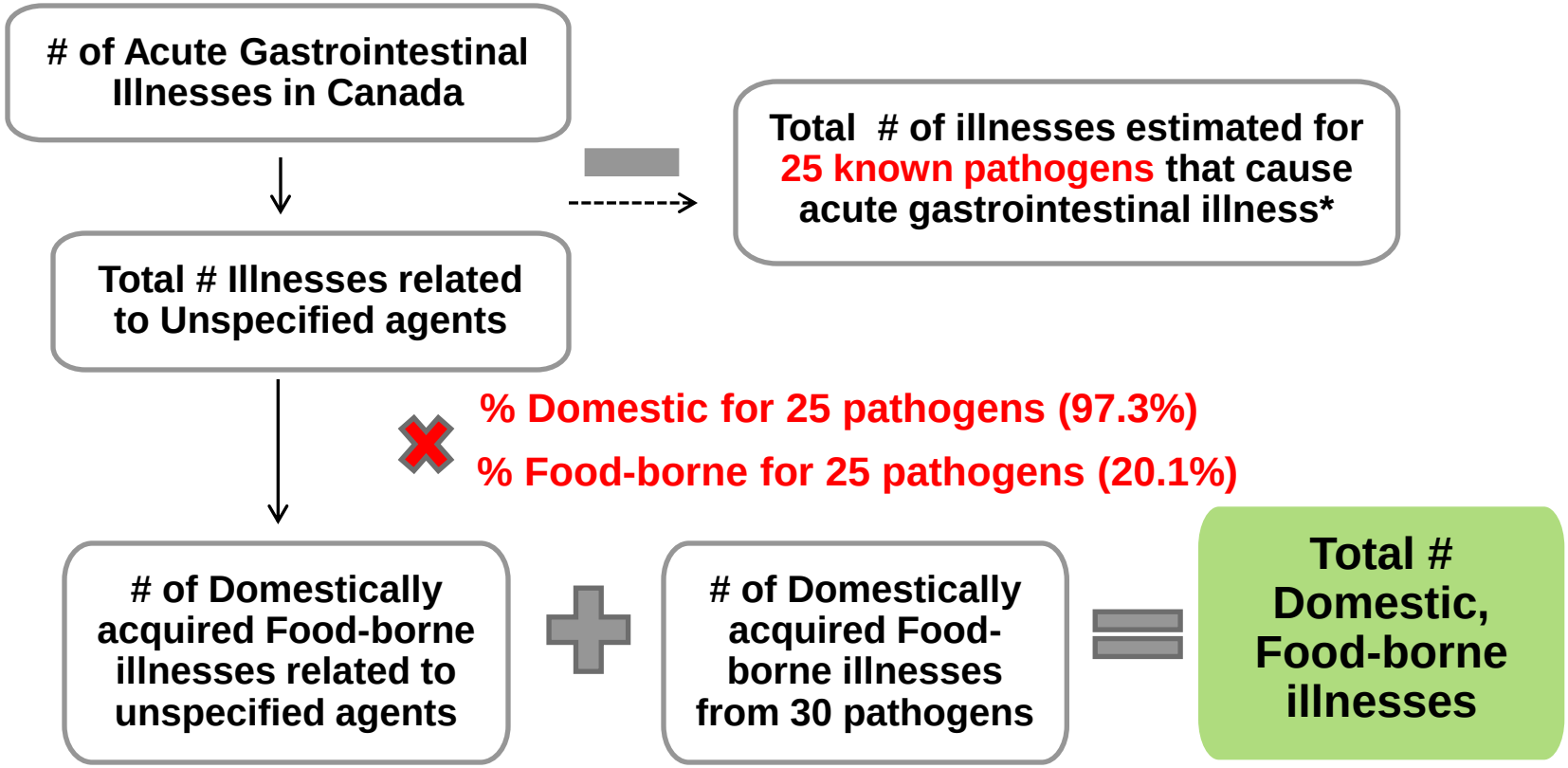
Example - Norovirus



Methods: Unspecified agents

- Unspecified:
  - » Known agents with insufficient data for estimating agent-specific episodes of illness;
    - E.g. *Aeromonas* spp., *Edwardsiella* spp., and *Plesiomonas* spp. mushroom and marine biotoxins, metals, and other inorganic toxins
  - » Known agents not yet recognized as causing food-borne illness;
    - E.g. *Clostridium difficile* in retail meats
  - » Microbes, chemicals, or other substances known to be in food but for which pathogenicity is unproven;
  - » Agents not yet described

Methods: Unspecified agents



* Non AGI pathogens: *Brucella*, *C. botulinum*, Hepatitis A, *L. monocytogenes*, *Toxoplasma gondii*

Results

- 4.0 million domestically acquired food-borne illnesses annually (90% CrI: 3.1 – 5.0 million)
  - » Specified pathogens: 1.6 million (90% CrI: 1.2 – 2.0 million)
  - » Unspecified agents: 2.4 million (90% CrI: 1.8 – 3.0 million)

- Approximately 1 in 8 Canadians experiences domestically acquired food-borne illness each year

Results for 30 Specific Pathogens

Total domestic food-borne illness in Canada:								
Pathogens (1-10)	Count	% of Total	Pathogens (11-20)	Count	% of Total	Pathogens (21-30)	Count	% of Total
Norovirus	1,047,733	64.25	Toxoplasma gondii	9,132	0.56	Shigella spp.	1,202	0.07
Clostridium perfringens	176,963	10.85	Giardia sp.	7,776	0.48	Vibrio, other spp.	1,112	0.07
Campylobacter spp.	145,350	8.91	Rotavirus	4,252	0.26	Salmonella Typhi	287	0.02
Salmonella spp., non-typhoidal	87,510	5.37	ETEC	3,848	0.24	Hepatitis A	271	0.02
Bacillus cereus	36,269	2.22	Adenovirus	3,739	0.23	Listeria monocytogenes	178	0.01
Yersinia enterocolitica	25,915	1.59	E. coli, other diarrheogenic	2,565	0.16	Trichinella spp.	63	0.00
Staphylococcus aureus	25,110	1.54	Cyclospora cayetanensis	2,450	0.15	Brucella spp.	22	0.00
VTEC non-O157	20,523	1.26	Cryptosporidium spp.	2,321	0.14	Clostridium botulinum	14	0.00
VTEC O157	12,827	0.79	Astrovirus	1,912	0.12	Vibrio vulnificus	1	0.00
Sapovirus	9,491	0.58	Vibrio parahaemolyticus	1,798	0.11	Vibrio cholerae, toxigenic	0	0.00

Discussion

- US methods generally followed, but with some improvements:
  - Definition of severe included bloody diarrhea or duration > 7 days in Canada vs. bloody diarrhea alone in the US;
  - Estimates for rotavirus, astrovirus and sapovirus were made for the full population in Canada vs. only children < 5 years in the US; and
  - Pathogens were excluded (i.e. *Strep* Group A and *Mycobacterium bovis*) and included (i.e. adenovirus) to be more specific to food-borne disease in Canada
- Changes from 2008 Canadian estimate include:
  - Estimating the burden for specific pathogens;
  - Using a specific case definition of acute gastrointestinal illness; and
  - Removing travel-related illness

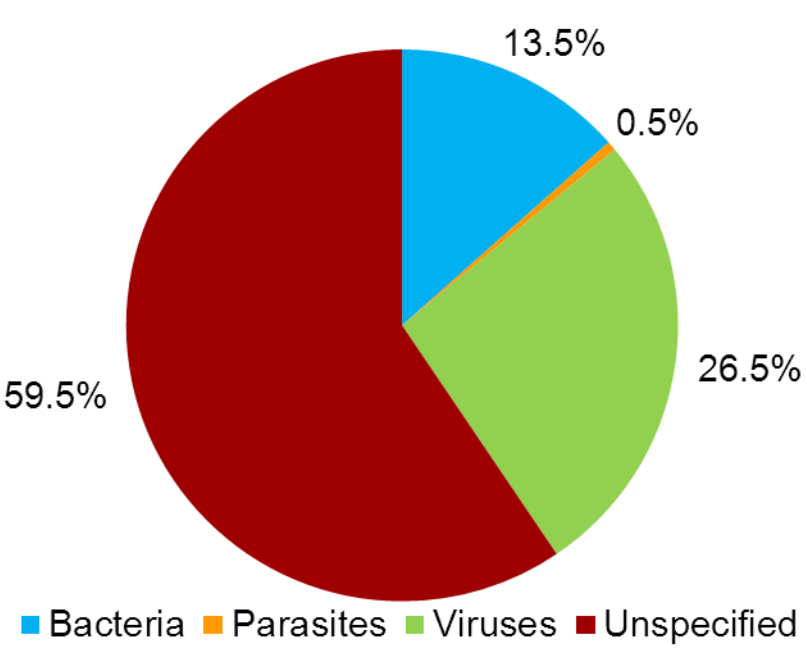
Discussion - Comparison with the US

- Order of top 5 pathogens
- Viruses account for higher proportion of total in Canada compared to US
- Illness due to unspecified agents lower per 100,000 in Canada compared to US

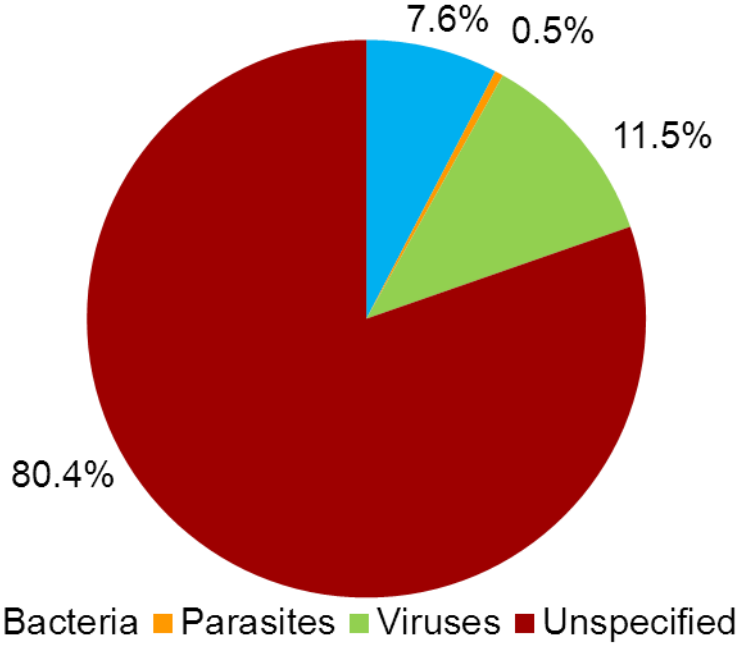
Top 5 Pathogens	
Total Domestic Food-borne illness in Canada	**Total Domestic Food-borne Illness in the US**
Norovirus	Norovirus
Clostridium perfringens	*Salmonella* spp., non-typhoidal
Campylobacter spp	*Clostridium perfringens*
Salmonella spp., non-typhoidal	*Campylobacter* spp.
Bacillus Cereus	*Staphylococcus aureus*

Discussion - Comparison with the US

Canada Total Estimates
1.6 million known
2.4 million unspecified
1 in 8 Canadians



US Total Estimates
9.4 million known
38.4 million unspecified
1 in 6 Americans



Discussion - International Comparisons

- US, Australia, the Netherlands, New Zealand, France, UK and Greece have completed national estimates
  - » Varying methodology therefore cannot make direct comparisons
- Norovirus – high in US, Australia, the Netherlands, New Zealand and France
- *Campylobacter* and *Salmonella* - high in US, Australia, New Zealand, France, UK and Greece
- *Bacillus cereus*, *Clostridium perfringens* and *Staphylococcus aureus* - top 10 in all countries

Thank you

Questions?

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