How do we decide where to focus surveillance?

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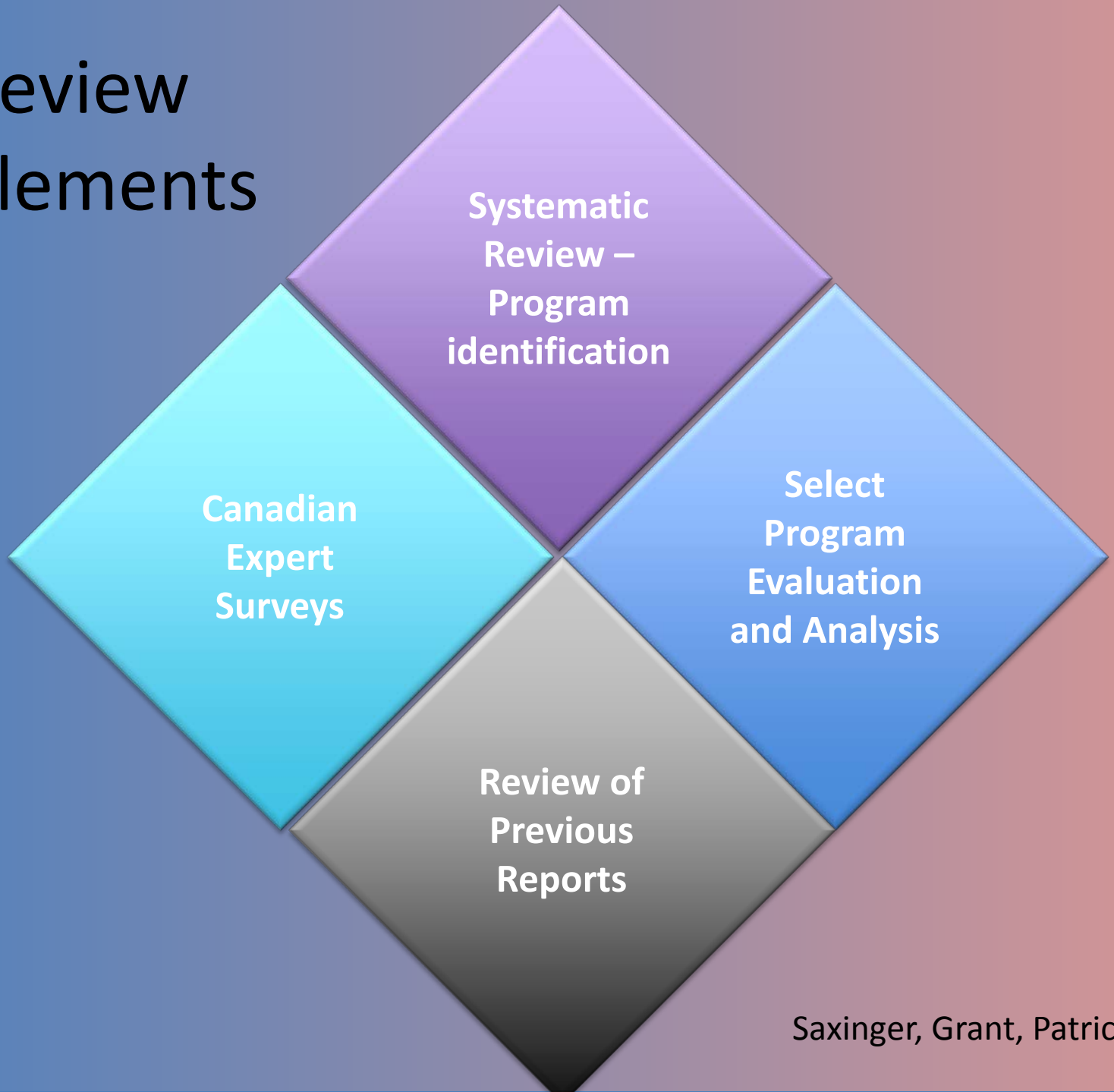
Surveillance

- Information for Action
- Ongoing
- Closes the loop by providing reports to those responsible for action

The most comprehensive systems (e.g. EARS-Net) combine the following:

- Population-based human AMU use metrics from communities and hospitals
- AMU metrics by commodity from animal agriculture
- AMR trends from a list of indicator organisms from community and hospital settings
- Trends in rates of key nosocomial infections
- AMR trends from sampling within agriculture and retail food settings
- Reference microbiology capabilities to characterize new strains
- Most systems are weak on burden of illness

Review Elements



Saxinger, Grant, Patrick et al.

In Canada

- AMU surveillance is improving thanks to CIPARS/IMS collaboration.
- Data on population based antibiotic use (over time, by province and by drug class) are becoming available.
- Similar data from the hospital sector has been largely missing, though efforts by CIPARS and CNISP may help to fill this gap over the next year.
- There are comparatively few data available on AMU in agriculture or companion animal practice.

AMR In Hospitals

- AMR surveillance from hospitals benefits from CNISP output. The focus has been on illness or colonization event surveillance for a discrete list of strains (e.g. MRSA, VRE, *C. difficile*, ESBLs).
- There are ongoing discussions about the potential for broader isolate-based surveillance that would track trends in resistance for a large list of organisms.

Community

- There is fairly large gap in representative, population-based data on trends in resistance in community based infections. The data exist at laboratory level and there is much potential in the analysis of aggregated laboratory data.
- AMR surveillance in agriculture and companion animal practice has limited coverage. Exceptions include focused surveillance on a few enteric organisms.

		CNISP	CIPARS
Populations of Interest	hospitalized patients		
	community patients		
	children		
	Elderly		
	aboriginal populations		
Funding Source(s)		*PHAC*	*PHAC*
Organisms of Interest	C. difficile		
	E. coli		
	E. faecium		
	H. influenzae		
	K. pneumoniae/oxytoca		
	N. gonorrhea		
	P. aeruginosa		
	S. aureus		
	S. pneumoniae		
	S. pyogenes		
	Salmonella		
	MRSA		
	VRE		
	CRE		
	ESBL		
	other organisms		

If we just look at Human AMR data collected under a Public Health mandate, we can see that national Canadian programs, which are robust and well functioning systems for their designated function, do not address evolving antimicrobial resistance

Our Lead Recommendations

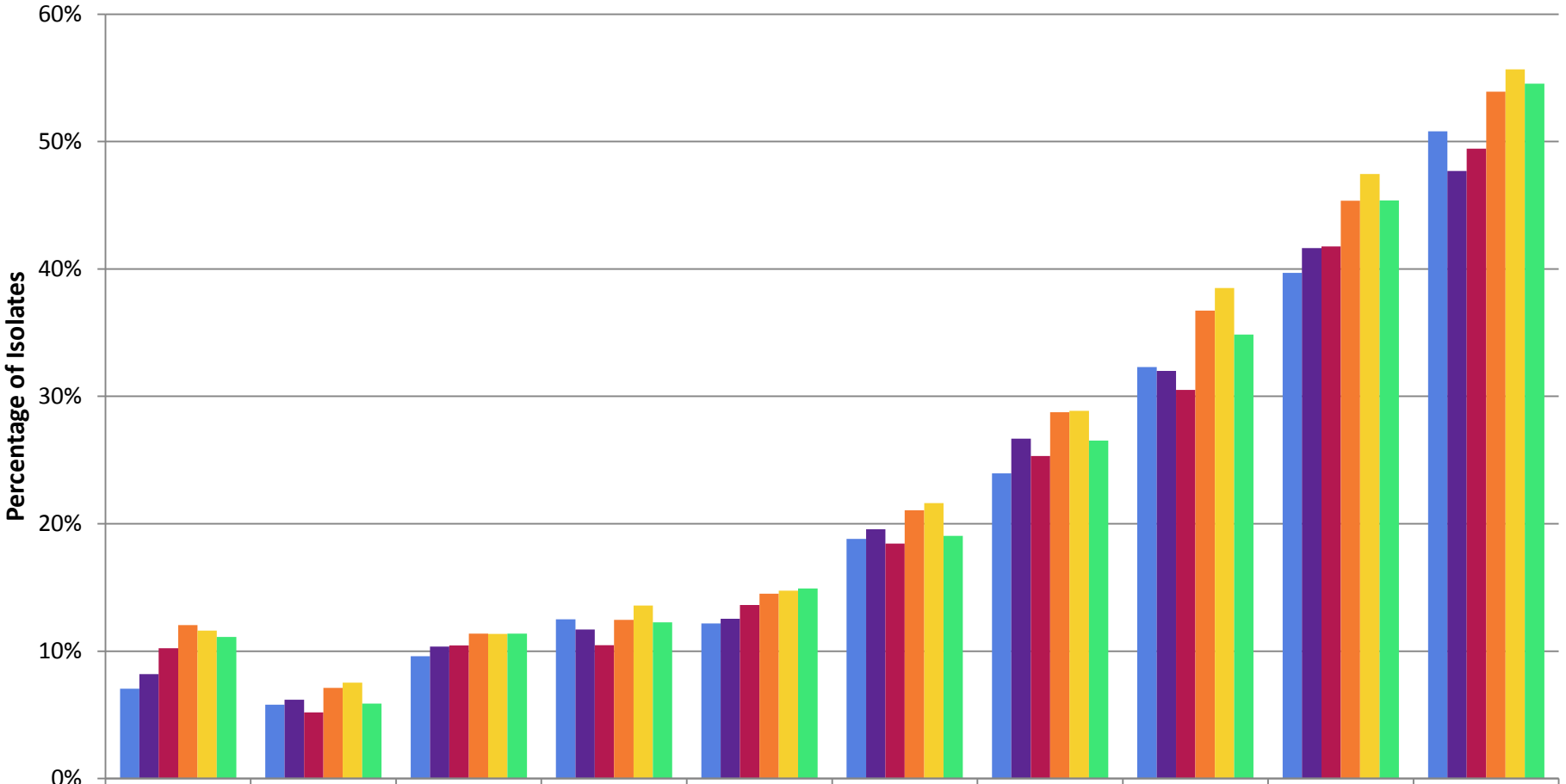
- A nationally coordinated program of surveillance.
  - (PHAC cannot do this alone but can provide conceptual oversight, surveillance standardization and work toward a comprehensive national annual report).
- Secure funding for our strongest assets (CNISP/CIPARS,NML)
- Work with individual lab networks toward a system of susceptibility data warehousing or reporting that allows for much broader inference about the burden of illness at population level.

Recommendations (Cont)

- Work at hospital, health authority, provincial and national levels toward better hospital utilization data directly linked to stewardship programs
- Integrate annual reports of findings in the human and agricultural sectors.
- Close the loop by funding research through CIHR and funding public and professional education programs to support more logical use of antibiotics.

Epidemiological Analysis in Resistance "Person, Place, Time"

- The antibiogram is just a start.
- "Person" – by age group, by gender
- "Place" – by Province, Regional Health Authority
- "Time" – Consistent tracking of trends over time (years but monthly data have huge additional value)
- By species, by specimen type, by syndrome
- Correlations – link use and resistance data



	<10	10-19	20-29	30-39	40-49	50-59	60-69	70-79	80-89	90+
2007	7.1%	5.8%	9.6%	12.5%	12.2%	18.8%	24.0%	32.3%	39.7%	50.8%
2008	8.2%	6.2%	10.4%	11.7%	12.5%	19.6%	26.7%	32.0%	41.6%	47.7%
2009	10.2%	5.2%	10.4%	10.5%	13.6%	18.4%	25.3%	30.5%	41.8%	49.4%
2010	12.0%	7.1%	11.4%	12.5%	14.5%	21.1%	28.8%	36.7%	45.4%	53.9%
2011	11.6%	7.5%	11.4%	13.6%	14.7%	21.6%	28.9%	38.5%	47.4%	55.7%
2012	11.1%	5.9%	11.4%	12.3%	14.9%	19.1%	26.5%	34.9%	45.4%	54.5%

Age Groups (years)

Figure 9 - Proportion of *Escherichia coli* urinary isolates non-susceptible to ciprofloxacin by age of patient (2007-2012)
Source: BC Biomedical Laboratories

Utilization
Rates – Not Numbers

NUMERATOR

- Prescriptions
- Defined Daily Doses
- Days of Therapy

DENOMINATOR

- Population for community
- Patient bed days / admissions for hospital

- Standardized rates (age, acuity mix etc)

Person, Place and Time Apply Here Too

Patient Outcomes

- Hospitals:
  - Facility/ward specific rates of infection with CDI, ESBL, MRSA etc
  - ARO specific mortality
  - 30 day readmission rates with infection
- Community:
  - Patient visits for discrete infections at population level (UTI, abscess)
  - DOT or discrete prescriptions per infection episode

Process In Stewardship

- Time to appropriate therapy
- Adverse reactions
- Excessive or inadequate therapy
- Day 3 Bundle “Niwa et al”
- Costs

Niwa T., Shinoda Y., Suzuki A., Ohmori T., Yasuda M. *Outcome measurement of extensive implementation of antimicrobial stewardship in patients receiving intravenous antibiotics in a Japanese university hospital.* International Journal of Clinical Practice, 2012. **66**(10): p. 999-1008.

Agriculture, Veterinary Medicine

- Just as important
- Large barriers to measurement

Summary - We Need

- Population-based human AMU use metrics from communities and hospitals
- AMU metrics by commodity from animal agriculture
- AMR trends from a list of indicator organisms from community and hospital settings
- Trends in rates of key nosocomial infections
- AMR trends from sampling within agriculture and retail food settings
- Reference microbiology capabilities to characterize new strains
- Relevant metrics for burden of illness