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Objectives of ONBOIDS

• To determine the relative contributions of various IDs to the overall burden of IDs in Ontario
• Inform priority setting, planning, and decision-making within IDs
• Establish baseline for future evaluations of public health interventions
• Identify strengths/weaknesses of existing data on IDs in Ontario and define areas requiring improvement
Creating the Disease List

- Adapted from latest GBD list
- Syndromes (pneumonia, septicemia) vs. Agents (*Streptococcus pneumoniae*, influenza)
- Criteria for inclusion:
  - Severe (HIV) and/or common (cystitis)
  - Reportable (measles)
  - High profile (WNV)
Diseases and syndromes considered

- 10 disease groups
- 51 distinct infectious agents
- 16 syndromes

- Notable exclusions: *Helicobacter pylori*, non-tuberculous mycobacteria, norovirus, rotavirus, Epstein-Barr virus, Lyme disease, surgical site infections
Unit of Measurement: HALY

HALY: Health-Adjusted Life Year

- Used in the PHI study
- Conceptually similar to DALYs (GBD study) and QALYs (health economics)

 HALY = YLL + YERF

- YLL: Years of life lost due to premature mortality
- YERF: Year-equivalents of reduced functioning from living with disease (i.e., time spent in less than perfect health)
Data Sources for YLL

• **Ontario life expectancy table for 2001**
• **Deaths by cause, 2005-2007, disaggregated by age and sex**
  – Vital statistics data
  – Single underlying cause of death (ICD-10)
YERF: Data Sources for Incidence

- Reportable disease data
- Laboratory data
- Health care utilization data
Data Sources for YERF

- Disease incidence, 2005-2007, by age and sex
  - Reportable disease data (iPHIS)
  - Health care utilization data
    - Visits to doctors’ offices (OHIP)
    - Visits to emergency departments (NACRS)
    - Hospitalizations and same day surgery (CIHI-DAD and SDS)
  - Cancer registry data (OCR)
  - Mathematical models
  - Epidemiologic studies (i.e., literature)
- Distribution of disease by health state (literature)
- Health state duration (literature and expert opinion)
- Severity weights (SW subcommittee)
Significant issue for enteric illnesses
Majowicz et al.: For each case of enteric illness reported in province of Ontario, estimated number of IGI cases in community range from 105 to 1,389

Majowicz et al., 2005
Severity weights

• Previous studies (GBD, Dutch) have developed disability weights (DWs) in various settings
• Incomplete alignment between diseases/health states included in current study and previous DWs
• Validity of combining DWs from different studies (and different settings) uncertain
• Chose to develop Ontario-specific set of severity weights using CLAMES methodology developed by Statistics Canada
CLAMES

11 attributes (scale of 1 to 4/5)

– Pain/discomfort
– Physical functioning
– Emotional state
– Fatigue
– Memory and thinking
– Social relationships
– Anxiety
– Speech
– Hearing
– Vision
– Use of hands and fingers
CLAMES

- Combination of health professionals and lay panels assessed a set of hypothetical health states
- Algorithm produces severity weight
- Focus on functional limitations
# ONBOIDS (HALYs) vs. GBD (DALYs)

<table>
<thead>
<tr>
<th></th>
<th>ONBOIDS HALY</th>
<th>GBD DALY</th>
</tr>
</thead>
</table>
| Life expectancy table | Ontario  
|                   | F: 82.0 yrs  
|                   | M: 77.4 yrs  | GBD standard  
|                   | F: 82.5 yrs  
|                   | M: 80.0 yrs  |
| Age-weighting    | Uniform age weights  
|                   | (i.e., no age-weighting) | Differential age weights  
|                   |                        | (more weight for working age adults) |
| Discounting      | No discounting  | Discount rate of 3%                  |
| Health state valuation | Severity weights  
|                   | (CLAMES)  | Disability weights  
|                   |                        | (previous studies)              |
HALYs for Top 20 pathogens

- Hepatitis C virus
- Streptococcus pneumoniae
- Human papillomavirus
- Hepatitis B virus
- Escherichia coli
- HIV/AIDS
- Staphylococcus aureus
- Influenza
- Clostridium difficile
- Rhinovirus
- Respiratory syncytial virus
- Parainfluenza virus
- Group B streptococcus
- Group A streptococcus
- Haemophilus influenzae
- Tuberculosis
- Legionella
- Chlamydia
- Adenovirus
- Gonorrhea
DALYs for Top 20 pathogens
Ranking using HALYs vs. DALYs

$R_s = 0.88$

P-value < 0.001
ONBOIDS (HALYs) vs. GBD (DALYs)

• Proportion attributable to premature mortality differs (82% using HALYs vs. 48% using DALYs)
  – YLL reduced for DALYs due to age-weighting and discounting
  – YLD increased for DALYs due to higher values for disability weights (compared to severity weights)

• Overall ranking of pathogens mostly consistent

• No established gold standard since differences are value judgments
HALYs for Top 20 by sex

**Male / Female HALY Ratio**

- **Hepatitis C virus**: 1.9
- **Streptococcus pneumoniae**: 0.9
- **Human papillomavirus**: 0.2
- **Hepatitis B virus**: 2.2
- **Escherichia coli**: 0.6
- **Human immunodeficiency virus**: 4.5
- **Staphylococcus aureus**: 0.9
- **Influenza**: 0.8
- **Clostridium difficile**: 0.6
- **Rhinovirus**: 0.8
- **Respiratory syncytial virus**: 0.8
- **Parainfluenza virus**: 0.8
- **Group B streptococcus**: 1.4
- **Group A streptococcus**: 0.8
- **Haemophilus influenzae**: 0.9
- **Tuberculosis**: 1.4
- **Legionella**: 0.9
- **Chlamydia**: 0.8
- **Adenovirus**: 0.1
- **Gonorrhea**: 0.1
HALYs for selected syndromes

- Pneumonia: 19,000 YLL, 93%
- Septicaemia: 10,000 YLL, 98%
- Urinary tract infections: 5,000 YLL, 94%
- Acute bronchitis: 2,000 YLL, 5%
- Endocarditis: 1,000 YLL, 99%
- Upper respiratory infections: 20,000 YLL, 7%
- Bacterial meningitis: 10,000 YLL, 47%
- Cellulitis: 0 YLL, 54%
- Encephalitis: 5,000 YLL, 94%
- Otitis media: 0 YLL, 0%
- Osteomyelitis: 0 YLL, 90%
- Necrotizing fascitis: 0 YLL, 99%
- Pharyngitis: 0 YLL, 3%
- Septic arthritis: 0 YLL, 92%
- Conjunctivitis: 0 YLL, 0%
- Bronchiolitis: 0 YLL, 0%
Top 10 by different measures

<table>
<thead>
<tr>
<th>#</th>
<th>HALYs</th>
<th>Number of Deaths</th>
<th>Number of Cases</th>
</tr>
</thead>
<tbody>
<tr>
<td>1</td>
<td>Hepatitis C</td>
<td><em>E. coli</em></td>
<td>Rhinovirus</td>
</tr>
<tr>
<td>2</td>
<td><em>S. pneumoniae</em></td>
<td><em>S. pneumoniae</em></td>
<td>Influenza</td>
</tr>
<tr>
<td>3</td>
<td><em>E. coli</em></td>
<td>Hepatitis C</td>
<td><em>S. pneumoniae</em></td>
</tr>
<tr>
<td>4</td>
<td>HPV</td>
<td>Hepatitis B</td>
<td>Coronavirus</td>
</tr>
<tr>
<td>5</td>
<td>Hepatitis B</td>
<td><em>C. difficile</em></td>
<td><em>E. coli</em></td>
</tr>
<tr>
<td>6</td>
<td>HIV</td>
<td><em>S. aureus</em></td>
<td>RSV</td>
</tr>
<tr>
<td>7</td>
<td><em>S. aureus</em></td>
<td>HPV</td>
<td>Parainfluenza</td>
</tr>
<tr>
<td>8</td>
<td>Influenza</td>
<td>Influenza</td>
<td>Adenovirus</td>
</tr>
<tr>
<td>9</td>
<td><em>C. difficile</em></td>
<td>HIV</td>
<td><em>S. aureus</em></td>
</tr>
<tr>
<td>10</td>
<td>Rhinovirus</td>
<td>RSV</td>
<td>Group A strep</td>
</tr>
</tbody>
</table>
Questions?

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