Outline

- Background
- Study question
- Study design
- Hypotheses
- Results
- Implications
- Future directions
Health Outcomes

Mortality (length of life) 50%
Morbidity (quality of life) 50%

Health Factors

Health behaviors (30%)
- Tobacco use
- Diet & exercise
- Alcohol use
- Unsafe sex

Social and economic factors (40%)
- Access to care
- Quality of care
- Education
- Employment
- Income
- Family & social support
- Community safety

Physical environment (10%)
- Environmental quality
- Built environment

Programs and Policies

County Health Rankings model ©2010 UWPHI
URIs & Antibiotics

- Use/Misuse of antibiotics has been evaluated a multitude of times*
- The problems of misuse are apparent
  - Drug resistant organisms
  - Potential side effects/toxicities with no clinical benefit
  - Rising health care costs (> $27 million per year**) 
- Is there a way that we can look at this issue from a different and novel viewpoint?

* MMWR 2011
**State of Health Care Quality, 2007
Quality Measure

- National Committee for Quality Assurance (NCQA)
  - Developed the Health Effectiveness Data and Information Set (HEDIS)

- **Appropriate treatment of children with URI**
  - Percentage of children who were given diagnosis of URI and were not dispensed antibiotic prescription

\[ 1 - \left( \frac{\text{Number of children receiving antibiotics with URI}}{\text{Eligible pop}} \right) \]
Limitations

- Data are not stratified
  - Are some groups at higher or lower risk of being given antibiotic inappropriately?

- Only considers 2 diagnostic codes

- Tells no information about diagnostic trends
  - Are children being diagnosed with other diagnoses inappropriately so that antibiotic can be given?
## Review of Literature

### Risk Factors For Receipt of Antibiotics for URI in Children

<table>
<thead>
<tr>
<th>Factor</th>
<th>Reference(s)</th>
</tr>
</thead>
<tbody>
<tr>
<td>Non-Pediatrician Providers</td>
<td>Nash, 2002</td>
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<tr>
<td>Age 5 – 11</td>
<td>Nash, 2002</td>
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<tr>
<td>Emergency Department</td>
<td>Nadeem Ahmed, 2010</td>
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<tr>
<td>Diagnosis of Bronchitis</td>
<td>Linder 2003, Nash 2002</td>
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<tr>
<td>Provider Perceives Expectation of Antibiotics</td>
<td>Mangione-Smith, 2004</td>
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<tr>
<td>Family of Low SES</td>
<td>Mangione-Smith, 2006</td>
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<td>More Experienced Physicians</td>
<td>Stone 2000, Mincey 2001</td>
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Golden Opportunity

- No prior studies had employed electronic medical records
- No prior study had tried to evaluate community characteristics as risk factors for inappropriate antibiotics
Study Question

- Is there a population of children that is at increased risk of inappropriate use of antibiotics when diagnosed with a URI?

- **HEDIS protocol**
  - Stratified across certain demographic variables
UW MED - PHINEX

University of Wisconsin Medical Record – Public Health Information Exchange

PI – Theresa Guilbert, MD
UW MED - PHINEX

- Large clinical data exchange
  - UW Dept Family Medicine (DFM) clinics
  - Wisconsin State Division of Public Health (DPH)

- Linking of data to public databases on geographical, environmental, socioeconomic, and demographic profiles

- Identification of health disparities
EMR Data Extract Specifications

- Patients at UW Family Medicine Clinics (25)
- 2007-2009 - Updates through 2012
- All conditions / Diagnoses except HIV/AIDs
- De-Identified / HIPAA Privacy Rule
- Census Block Group (CBG) Geographic Information System
  - 600-1,500 persons in area
### Multi-Level Modeling and Data Mining of Disease Risk, Disparity, and Health Outcome Quality

<table>
<thead>
<tr>
<th>Outcomes =</th>
<th>Patient Factors +</th>
<th>Clinician Factors +</th>
<th>Clinic Factors +</th>
<th>Community Factors</th>
</tr>
</thead>
<tbody>
<tr>
<td>Asthma</td>
<td>Age, Gender, Race/ethnicity, Co-morbidities, Medications</td>
<td>Age, Gender, Certifications, Graduation date, Years of practice</td>
<td>Location, Capabilities Processes</td>
<td>Census Block Group: Poverty, Education level, Built environment: Traffic, Recreation / parks, Safety / crime, Psycho-demographics, Restaurant mix, Fast food sales, Fresh fruit &amp; vegetable sales / consumption</td>
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<tr>
<td>Diabetes</td>
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<td>CVD / CHF</td>
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<tr>
<td>Immunizations</td>
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<tr>
<td>Obesity</td>
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<td>Hypertension</td>
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<td>Smoking</td>
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<td>Alcohol</td>
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<td>A1c level</td>
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<td>LDL</td>
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<td>HDL</td>
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<td>BP</td>
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<tr>
<td>Hospitalizations</td>
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<tr>
<td>Health Care - Process factors (e.g. time to repeat follow-up)</td>
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<tr>
<td>Electronic Health Record &amp; Hospitalization Data</td>
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<tr>
<td>Census / ESRI BA Data</td>
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</tbody>
</table>
Study Population

- All children 3 mos – 18 yo in PHINEX Database (>40,000 subjects)
  - ≤ 4 yo
  - 5 – 11 yo
  - 12 – 18 yo
Hypotheses

- 2 main reasons for inappropriate prescription of antibiotics for children with URI
  - Perceived expectations from family
  - Provider did not want to “miss” the diagnosis
Hypotheses

<table>
<thead>
<tr>
<th>Variable</th>
<th>Characteristic Associated With Administration of Antibiotics</th>
</tr>
</thead>
<tbody>
<tr>
<td>Age</td>
<td>Younger Age</td>
</tr>
<tr>
<td>Gender</td>
<td>Female</td>
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<tr>
<td>Race/Ethnicity</td>
<td>Caucasian</td>
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<tr>
<td>Insurance Status</td>
<td>Private</td>
</tr>
<tr>
<td>Comorbidities (Neoplasm, Asthma)</td>
<td>Present</td>
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<tr>
<td>Urbanicity of Patient’s Home</td>
<td>Suburban</td>
</tr>
<tr>
<td>Level of Community Education</td>
<td>High</td>
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<tr>
<td>Level of Community Economic Hardship Index</td>
<td>Low</td>
</tr>
</tbody>
</table>
Results

.pending IRB approval

Pieces are in place
Implications

- Confirm findings in previous studies
- Identify new community risk factors
- Quality improvement component
  - How are UW DFM clinics doing?
- Are these risk factors associated with other disease processes?
- How can the effect of these risk factors be mitigated?
  - At the patient level
  - At the population level
Future Directions

- Are certain groups of children at increased risk of being diagnosed with certain infections?
  - Ear infections vs. acute nasopharyngitis
- What happens to HEDIS measurement when wider scope of URI diagnostic codes are used?
Acknowledgments

Capstone Committee

- Ana Martinez-Donate, PhD (Chair)
  - Assistant Professor, Department of Population Health Sciences
- Larry Hanrahan, PhD, MS
  - Director of Public Health Informatics, Chief Epidemiologist
- Jon Temte, MD, PhD
  - Professor, Department of Family Medicine
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- Kristin Gallager, MS


Mangione-Smith R, Elliott MN, Stivers T, McDonald LL, Heritage J. Ruling out the need for antibiotics: are we sending the right message? *Archives of pediatrics & adolescent medicine.* Sep 2006;160(9):945-952.
