Analysis of the Annual Influenza Vaccination Event Hosted by the Riley County Health Department

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Kansas State University | MPH Candidate
Outline

I. Background
II. Learning Objectives
III. Activities Performed
IV. Analysis Objectives
V. Influenza Overview
VI. Cost-Benefit Analysis
VII. Outreach Analysis
VIII. Conclusion
IX. Limitations
October 2017-April 2018

Field Experience Site:
- Riley County Health Department

Preceptor:
- Andrew Adams, MPH

Major Professor:
- Paige Adams, DVM, PhD

Graduate Committee:
- Robert Larson, DVM, PhD
- Ellyn Mulcahy, PhD, MPH
Riley County Health Department
“Healthy People in a Healthy Community”

• Location: 2030 Tecumseh Rd, Manhattan, KS 66502

• Services: Child Care Licensing, Immunizations, Maternal and Child Health, Reproductive Health Services, and Women Infants and Childhood (WIC) Nutrition
Okt-FLU-ber Fest

• Since 2012, RCHD has hosted “Okt-FLU-ber Fest”: an annual event in October where the public can receive an influenza vaccination

• 435 vaccinations were administered at Okt-FLU-ber Fest 2017

• Purpose: to provide a large quantity of flu vaccines to the community.
  • Comparatively, the most vaccinations administered at one of the health department’s standard mobile flu clinics in the 2017-2018 season was 129.

• Important target population: school-aged children (5-18 years old)
Learning Objectives

I. Determine the economic impact of influenza and the benefit of flu vaccination programs.
II. Gain an understanding of the responsibilities and operations of a county health department.
III. Learn how a health organization analyzes its impact on the health of a community and determines how to improve in the future to increase overall health and public outreach.
Activities Performed

I. Construct an analysis of Okt-FLU-ber Fest

II. Experience and learn about the different programs of RCHD.
   
   • Attended “Epidemiology Team” meetings, all-staff meetings, emergency preparedness meetings, and accreditation meetings.
   
   • One-on-one meetings with personnel from different programs to learn about the purpose of the department and the responsibilities of their respective position.
   
   • Learned about different public health programs and databases, such as EpiTrax and GIS mapping.
Analysis Objectives

- The cost-benefit analysis was used to evaluate the potential economic benefit of Okt-FLU-ber Fest on an individual, county, and societal level.
- GIS mapping was used to analyze the overall outreach of RCHD and to be able to provide a visual representation of the coverage of flu vaccinations at the event.
- GIS mapping was used to analyze the median household income, poverty level, and vehicle access, to ensure areas of greater health inequities were provided vaccine coverage.
- Determine ages of the individuals vaccinated.
Influenza

- *Orthomyxoviridae* family
- Enveloped, -ssRNA virus \(^{[14]}\)
- Types A, B, C
- Type A is the most common of the three virus types and typically causes the most severe symptoms and pandemics \(^{[12]}\)
- Endemic or seasonal influenza is caused by types A and B \(^{[8]}\)
- “Flu Season”: November-March
Influenza

• Influenza is easily spread through aerosol, droplet and fomite transmission [8]

• During an average endemic influenza season in the United States, approximately 200,000 hospitalizations and 36,000 deaths occur [12]

• Influenza is responsible for approximately 44 million days of work lost each year in the United States [2]
  • This immense loss of productivity can have negative effects on the economy.
Influenza

• Influenza affects individuals of all ages; prevalence is highest in school-aged individuals. Disease severity tends to be greatest in infants, the elderly, and the immunocompromised [9]

• The most effective protection against influenza A and B is the inactivated flu vaccine [14]

• The purpose of the influenza vaccine is not to fully prevent influenza epidemics, but to prevent the serious consequences, such as severe disease, hospitalization, and death [9]

• The vaccine provides protection against serious outcomes among the elderly and children [9]

• A new vaccine must be produced each year because the virus undergoes antigenic drift [14]
Different subtypes of Influenza A

Antigenic shift (Genetic shuffling)

New Influenza A subtype

Antigenic drift (Random mutation)

Different Influenza A strains

http://www.influenzacentre.org/aboutinfluenza.htm
Influenza

2017-2018 vaccine strains [5]

- A/Michigan/45/2015 (H1N1)pdm09-like virus
- A/Hong Kong/4801/2014 (H3N2)-like virus
- B/Brisbane/60/2008-like (B/Victoria lineage) virus
- B/Phuket/3073/2013-like (B/Yamagata lineage) virus
Okt-FLU-ber Fest 2017 Analysis
Total Vaccinations: 435
Riley County Residents: 342
Manhattan Residents: 339
Ages of Attendees

- <5 yrs: 24%
- 5-18: 40%
- 19-64: 35%
- >64: 1%
## Cost to be Vaccinated

<table>
<thead>
<tr>
<th>Vaccine Type</th>
<th># Administered</th>
<th>Price per Dose</th>
<th>Total Cost</th>
</tr>
</thead>
<tbody>
<tr>
<td>Private PF 6-35 m</td>
<td>30</td>
<td>$38</td>
<td>$1,140</td>
</tr>
<tr>
<td>Private PF &gt;36 m</td>
<td>274</td>
<td>$38</td>
<td>$10,412</td>
</tr>
<tr>
<td>Public PF 6-35 m</td>
<td>22</td>
<td>$18</td>
<td>$369</td>
</tr>
<tr>
<td>Public PF &gt;36 m</td>
<td>86</td>
<td>$18</td>
<td>$1,548</td>
</tr>
<tr>
<td>317 PF &gt;36 m</td>
<td>18</td>
<td>$0</td>
<td>$0</td>
</tr>
<tr>
<td>High Dose</td>
<td>5</td>
<td>$63</td>
<td>$315</td>
</tr>
<tr>
<td>Total</td>
<td>435</td>
<td></td>
<td>$13,784</td>
</tr>
</tbody>
</table>
## Cost to Provide Vaccines

<table>
<thead>
<tr>
<th>Vaccine Type</th>
<th># Administered</th>
<th>Price per Dose</th>
<th>Total Cost</th>
</tr>
</thead>
<tbody>
<tr>
<td>Private PF 6-35 m</td>
<td>30</td>
<td>$16.53</td>
<td>$495.90</td>
</tr>
<tr>
<td>Private PF &gt;36 m</td>
<td>274</td>
<td>$16.53</td>
<td>$4,529.22</td>
</tr>
<tr>
<td>Public PF 6-35 m</td>
<td>22</td>
<td>$0</td>
<td>$0</td>
</tr>
<tr>
<td>Public PF &gt;36 m</td>
<td>86</td>
<td>$0</td>
<td>$0</td>
</tr>
<tr>
<td>317 PF &gt;36 m</td>
<td>18</td>
<td>$0</td>
<td>$0</td>
</tr>
<tr>
<td>High Dose</td>
<td>5</td>
<td>$42.44</td>
<td>$212.00</td>
</tr>
<tr>
<td><strong>Total</strong></td>
<td><strong>435</strong></td>
<td></td>
<td><strong>$5,237.12</strong></td>
</tr>
</tbody>
</table>
## Additional Costs to RCHD

<table>
<thead>
<tr>
<th>Supplies</th>
<th>Cost</th>
</tr>
</thead>
<tbody>
<tr>
<td>Pumpkins</td>
<td>$437</td>
</tr>
<tr>
<td>Popcorn</td>
<td>$34</td>
</tr>
<tr>
<td>Advertisement</td>
<td>$50</td>
</tr>
<tr>
<td>Snacks</td>
<td>$30</td>
</tr>
<tr>
<td>Face Painting</td>
<td>$40</td>
</tr>
<tr>
<td>Band-Aids</td>
<td>$28.90</td>
</tr>
<tr>
<td>Alcohol Wipes</td>
<td>$19.47</td>
</tr>
<tr>
<td>Nitrile Gloves</td>
<td>$87.55</td>
</tr>
<tr>
<td>Syringe + Needle</td>
<td>$44.15</td>
</tr>
<tr>
<td><strong>Total</strong></td>
<td><strong>$771.07</strong></td>
</tr>
</tbody>
</table>

### Cost of Labor

<p>| | |</p>
<table>
<thead>
<tr>
<th></th>
<th></th>
</tr>
</thead>
<tbody>
<tr>
<td><strong>Staff</strong></td>
<td>35</td>
</tr>
<tr>
<td><strong>Hours</strong></td>
<td>5</td>
</tr>
<tr>
<td><strong>Hourly Wage</strong></td>
<td>$25.31</td>
</tr>
<tr>
<td><strong>Cost of Labor</strong></td>
<td><strong>$4,429.25</strong></td>
</tr>
</tbody>
</table>
## Revenue

<table>
<thead>
<tr>
<th>Total Cost to Consumer</th>
<th>Total Cost to RCHD</th>
<th>Revenue</th>
</tr>
</thead>
<tbody>
<tr>
<td>$13,784</td>
<td>$10,438.44</td>
<td>$3,345.56</td>
</tr>
</tbody>
</table>
# Direct Costs of Influenza

<table>
<thead>
<tr>
<th>Medical Service</th>
<th>Avg. Cost (w/ insurance)</th>
<th>Avg. Cost (no insurance)</th>
</tr>
</thead>
<tbody>
<tr>
<td><strong>Medical Care (Outpatient)</strong></td>
<td>$29 [10]</td>
<td>$96 [10]</td>
</tr>
<tr>
<td><strong>Influenza Virus Test</strong></td>
<td>$12 [10]</td>
<td>$41 [10]</td>
</tr>
<tr>
<td><strong>Tamiflu® Prescription</strong></td>
<td>$32.36</td>
<td>$107.89</td>
</tr>
<tr>
<td><strong>Total Outpatient Cost</strong></td>
<td>$73.36</td>
<td>$244.89</td>
</tr>
</tbody>
</table>
The influenza Hospitalization Surveillance Network (FluSurv-NET) conducts population-based surveillance for laboratory-confirmed influenza-associated hospitalizations in children (persons younger than 19 years) and adults. The current network covers over 70 counties in the 10 Emerging Infections Program (EIP) states (CA, CO, CT, GA, MD, MN, NM, NY, OR, and TN) and three additional states (MI, OH, and UT). The network represents approximately 9% of US population (~27 million people). Cases are identified by reviewing hospital, laboratory, and admission databases and infection control logs for patients hospitalized during the influenza season with a documented positive influenza test (i.e., viral culture, direct/indirect fluorescent antibody assay (DFA/IFA), rapid influenza diagnostic test (RIDT), or molecular assays including reverse transcription-polymerase chain reaction (RT-PCR)). Data gathered are used to estimate age-specific hospitalization rates on a weekly basis, and describe characteristics of persons hospitalized with associated influenza illness. Laboratory-confirmation is dependent on clinician-ordered influenza testing. Therefore, the unadjusted rates provided are likely to be underestimated as influenza-associated hospitalizations can be missed if influenza is not suspected and tested for. FluSurv-NET hospitalization data are preliminary and subject to change as more data become available. All incidence rates are unadjusted. Please use the following citation when referencing these data: "FluView: Influenza Hospitalization Surveillance Network, Centers for Disease Control and Prevention. [WEBSITE]. Accessed on [DATE]."
### Indirect Cost of Influenza

<table>
<thead>
<tr>
<th>Avg. Hourly Salary in Riley County</th>
<th>Avg. Hours of Work Missed per Person</th>
<th>Avg. Lost Income</th>
</tr>
</thead>
<tbody>
<tr>
<td>$11.50</td>
<td>32</td>
<td>$368</td>
</tr>
</tbody>
</table>
## Avg. Cost to Attend Okt-FLU-ber Fest

<table>
<thead>
<tr>
<th></th>
<th></th>
<th></th>
<th></th>
</tr>
</thead>
<tbody>
<tr>
<td>$31.68</td>
<td>1</td>
<td>$11.50</td>
<td>$43.18</td>
</tr>
</tbody>
</table>
Averted Costs

- Cost of Outpatient Care + Lost Income: $441.36
- Cost of Attendance + Vaccination: $43.18
- Adjusted Averted Costs (per person): $398.18
Averted Costs

- Cost of Outpatient Care + Lost Income: $612.89
- Cost of Attendance + Vaccination: $43.18
- Adjusted Averted Costs (per person): $569.71
Averted Societal Costs

- 5%-20% of population affected by flu
- 36% vaccine efficacy

\[
\begin{align*}
435 \times 0.05 &= 21 \\
21 \times 0.36 &= 7 \\
7 \times 398.18 &= 2,787.26
\end{align*}
\]

\[
\begin{align*}
435 \times 0.2 &= 87 \\
87 \times 0.36 &= 31 \\
31 \times 569.71 &= 17,661.01
\end{align*}
\]
# Averted Costs to Riley County

<table>
<thead>
<tr>
<th>Averted Costs per Person</th>
<th>Vaccines Administered to Riley County Residents</th>
<th>Cost to RCHD to Host Event</th>
<th>Adjusted Averted Costs to Riley County</th>
</tr>
</thead>
<tbody>
<tr>
<td>$398.18 - $569.71</td>
<td>342</td>
<td>$10,438.44</td>
<td>$2,263.30 - $13,276.97</td>
</tr>
</tbody>
</table>
# Okt-FLU-ber Fest 2016

<table>
<thead>
<tr>
<th>2016</th>
<th></th>
</tr>
</thead>
<tbody>
<tr>
<td>Length</td>
<td>3 hours</td>
</tr>
<tr>
<td># Vaccinations Administered</td>
<td>357</td>
</tr>
<tr>
<td>RCHD Revenue</td>
<td>$2,644.02</td>
</tr>
</tbody>
</table>

~$1,390 more in potential averted societal costs in 2017 than 2016
Poverty Level

OktFLUber Fest and Poverty Level

1/26/2018, 9:44:26 AM

- Flu Clinic Patients: 17
- Poverty Status Last 12 Months:
  - ≤0.00
  - ≤8.00
  - ≤17.00
  - ≤28.00
  - ≤58.00

KANSAS STATE UNIVERSITY
Vehicle Access

OktFLUber Fest and Low Vehicle Access

1/26/2018, 9:41:22 AM

- Flu Clinic Patients 17
- Tract Low Vehicle Access
  - Census Tracts 2010
    - Medium or High Vehicle Access
    - Low Vehicle Access

RL Basemap
Conclusion

• Okt-FLU ber Fest is economically beneficial
• Successful overall in outreach to the community and reaching target population
• For future events:
  • Increase education efforts
  • Increase advertising
  • Strategic placement mobile clinics
Limitations

• Official vaccine efficacy (VE) could change
  • 2017-2018 flu season was not over when 36% VE was reported

• Influenza is not a reportable disease
<table>
<thead>
<tr>
<th>Competency</th>
<th>Description</th>
</tr>
</thead>
<tbody>
<tr>
<td>3. Analyze quantitative and qualitative data using biostatistics, informatics, computer-based programming and software, as appropriate.</td>
<td>Graphic Information Systems (GIS) was used to interpret quantitative and qualitative data regarding Okt-FLU-ber Fest attendance.</td>
</tr>
<tr>
<td>4. Interpret results of data analysis for public health research, policy or practice.</td>
<td>Data from Okt-FLU-ber Fest was collected and the results were analyzed in order for the Riley County Health Department to improve the event in the future to benefit the community.</td>
</tr>
<tr>
<td>7. Assess population needs, assets and capacities that affect communities’ health.</td>
<td>Potential health inequities in the community were assessed such as low income, poverty status, and low vehicle access. The relationship between these factors and attendance at Okt-FLU-ber Fest was evaluated.</td>
</tr>
<tr>
<td>11. Select methods to evaluate public health programs.</td>
<td>Okt-FLU-ber Fest, a public health program, was evaluated based on a cost-benefit analysis and outreach success in the community.</td>
</tr>
<tr>
<td>21. Perform effectively on interprofessional teams.</td>
<td>Internship/field experience required working with Riley County Health Department employees.</td>
</tr>
</tbody>
</table>
References


References


