Epi stats case study

CIC Study Group
September 20, 2022
Measles in Texarkana

On November 3, 1970, the CDC received the weekly surveillance data from the Texas State Health Department. The telegram reported 319 cases of measles in the state during the previous week.

In contrast, Texas had reported an average of 26 cases per week during the previous four weeks.

*Is this an outbreak? Why or why not?*
Follow up

CDC learned that **295 cases (of 319) of measles had been diagnosed in the city of Texarkana**, including 25 in children reported to have been previously immunized.

At the time, Texarkana was a city of roughly 50,000. Though the city straddles the Texas-Arkansas state line, it is a single town economically and socially. Persons of all ages on both sides of town have frequent contact.

The two sides of Texarkana, however, do have separate public school systems and separate public health departments.
Between June 1970 and January 1971, 633 cases of measles were reported in Texarkana.

Is this incidence or prevalence?

What observations can be made from the curve?
Case Distribution

The majority of cases occurred in children 1 to 9 years of age and were not evenly distributed across the city.

<table>
<thead>
<tr>
<th>Age Group</th>
<th># Cases</th>
<th>Population</th>
<th>Attack Rate?</th>
</tr>
</thead>
<tbody>
<tr>
<td><strong>Texas</strong> (Bowie Co)</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>1-4</td>
<td>242</td>
<td>4933</td>
<td>4.9%</td>
</tr>
<tr>
<td>5-9</td>
<td>251</td>
<td>6252</td>
<td>4.0%</td>
</tr>
<tr>
<td><strong>Arkansas</strong> (Miller Co)</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>1-4</td>
<td>19</td>
<td>2617</td>
<td>0.7%</td>
</tr>
<tr>
<td>5-9</td>
<td>6</td>
<td>3345</td>
<td>0.2%</td>
</tr>
</tbody>
</table>

First estimate, then calculate, the **attack rate** for each population. What is the value of the attack rate (aka incidence proportion)?
What might be behind the uneven distribution of cases?

What tools do you have to investigate?
>99% of kids (age 1-9) in Texarkana, AR (Miller Co.) were vaccinated for measles

~57% of kids in Texarkana, TX (Bowie Co.) were vaccinated for measles
### Determining Vaccine Efficacy (Effectiveness)

<table>
<thead>
<tr>
<th>Measles Status</th>
<th>Vaccinated</th>
<th>Unvaccinated</th>
<th>Totals</th>
</tr>
</thead>
<tbody>
<tr>
<td>Measles +</td>
<td>27</td>
<td>466</td>
<td>493</td>
</tr>
<tr>
<td>Measles -</td>
<td>6,348</td>
<td>4,344</td>
<td>10,692</td>
</tr>
<tr>
<td>Totals</td>
<td>6,375</td>
<td>4,810</td>
<td>11,185</td>
</tr>
</tbody>
</table>

| Rate (per 1000) | 4.2         | 96.9         | —      |

*Calculate, the rate (per 1,000) for each population*
Evaluating Vaccine Efficacy (Relative risk reduction)

\[ VE = \frac{96.9 - 4.2 \times 100}{96.9} \]

= 95.7%

A 95.7% reduction from the number of cases you would expect if they were not vaccinated
Take Home Points

- Data are just numbers until you tell a story
  - The story is yours to tell
  - Keep the story simple
- Use the tools you have
- Examine all sides of the story
- Consider alternatives
- Avoid the p-value trap
- Label your units (& axes)
- Don’t be afraid of statistics!
Reject, or fail to reject. There is no accept.
References