Applying JVA to Other Public Health Challenges

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Presentation Outline

- Regression modeling basics for count data
- Social Vulnerability Index (SVI) – An alternative approach
  - Compare and contrast regression modeling versus SVI
- Applications to other public health challenges
- Steps for qualifying challenges
- Frequency of repeating JVA

Regression models for count data

- Van Handel et. al (2016) identified US communities especially vulnerable for rapid spread of IDU-associated HIV
  - 15 county-level predictor measures (e.g. OD deaths, Rx sales, etc.)
  - HCV infection outcome, as a proxy for IDU
- A multilevel Poisson model was run to generate vulnerability scores for each county in the US, based off regression coefficients
- Counties that fell into the upper 95th percentile were flagged as most vulnerable for rapid IDU spread

Regression models for count data

- Poisson regression are useful for estimating count or rate outcome data

$$\ln\big(E(y)\big) = b_0 + b_i x_i + \ln(p)$$

- Where:
  - E(y) is the expected/mean outcome (count)
  - ln() is the link function for the outcome
  - x_i are the predictor variable(s)
  - b_0, b_i are the model coefficients
  - ln(p) is the population offset

$$\ln\big(E(y)\big) - \ln(p) = b_0 + b_i x_i$$

$$\ln\left(\frac{E(y)}{p}\right) = b_0 + b_i x_i$$

$\frac{E(y)}{p}$ is the estimated person-rate

Social Vulnerability Index (SVI)

- When county-level data are unavailable, the SVI is a useful alternative

- This method can be used at the state or national level and calculates four sub-domains, from 15 census variables, and an overall vulnerability index
  - SES
  - Household composition/disability
  - Minority status/language
  - Housing/transport

Social Vulnerability Index (SVI)

- The SVI is principally based on percentile rankings of the 15 census tract variables (either at the state or national level)
- Subdomains are calculated by summing the percentile rankings of the respective census tract variables it comprises
- Overall SVI scores are calculated by summing the four subdomain scores
  - A more granular approach flags any of the 15 census tract variables >90th percentile

Regression versus SVI

Poisson Regression	SVI
Pros	***Pros***
Identify strength, direction, and significance of predictors	Readily available data
County- and year-specific inferences	Easy to calculate and understand
Model predictors to specific outcomes (i.e., more flexibility)	Inter- and intra-state inferences
Cons	***Cons***
Analytically more complex	Limited to census tract areas
More intensive data collection	Cannot distinguish outcomes
Data/regression assumptions	Data only updated every 10 years

Each of these analytical methods are useful and valid for predicting IDU and opioid vulnerability; however, they can be applied in many other public health scenarios

What Other Public Health Challenges?

- Emerging issues where there isn't a sufficient amount of surveillance data
- Public health response is needed
- Geographic component is strong (jurisdictional analyses)
- Social determinants are at play
  - Risks for these challenges are multifactorial
  - Relationships to social determinants can be causal or confounding
  - More difficult to get good data on issues with stigmas attached

Possible Challenges to Consider

- Vaccine refusal
- Non-foodborne hepatitis A
- Herpes and other sexually transmitted infections
- Others
- What have you considered? Let's discuss…

Next Steps in Qualifying Challenges

- Define/describe public health challenges
- Identify stakeholders to engage
- Identify indicators plausibly associated with outcome
- Identify data sources available
- Prioritize indicators
- Choose methodological approach

How Often to Repeat the JVA?

- Depends on how quickly the indicators will change in the community
- Consideration of predicted rates as a measure of impact of public health actions

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