Comparing States' Immunization Coverages of Preschool Children

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Background and Summary

- States are often ranked by point estimates of their immunization coverage
- This does not account for sampling uncertainty in state ranks
- The sampling uncertainty in state ranks is large, and should not be ignored

The National Immunization Survey (NIS)

- The NIS provides estimates of immunization coverage in 19-35 month old children at a national and state level
- Estimates are not true coverage
  - National level estimates typically have standard errors of < 0.5%
  - State level estimates typically have much larger standard errors, ~2-3%

Ranking of States

- States are often ranked by NIS point estimate of coverage
- Media and state officials often take ranks very seriously
- Reports of ranks do not account for sampling uncertainty

Ranking of States, continued

- We calculated 90% confidence limits for states ranks of 4:3:1:3 (4+ doses of diphtheria and tetanus toxoids and pertussis vaccine, 3+ doses of polio vaccine, 1+ doses of measles containing vaccine, 3+ doses of haemophilus influenzae type b vaccine) coverage for 2001.

Methods

- We use the parametric bootstrap methods to construct confidence limits for ranks.
- Details appear in: Gerzoff and Williamson, Who's Number One? Public Health Reports 2001;116(2):1-12.
- We consider the District of Columbia as a state, so there are 51 states in our analysis

90% Confidence Limits for States' Ranks

- A hand-out gives the confidence limits for all states
- A few examples:
  - North Carolina; rank 2; 90% confidence limits for rank: 1-17
  - Virginia; rank 26; 90% confidence limits for rank: 9-44
  - Illinois; rank 33; 90% confidence limits for rank: 23-46
  - Hawaii; rank 48; 90% confidence limits for rank: 25-51

If We Can’t Rank, Can We Identify Quartiles?

- We can (perhaps) do a better job of identifying states by quartiles than we can of ranking states
- But …

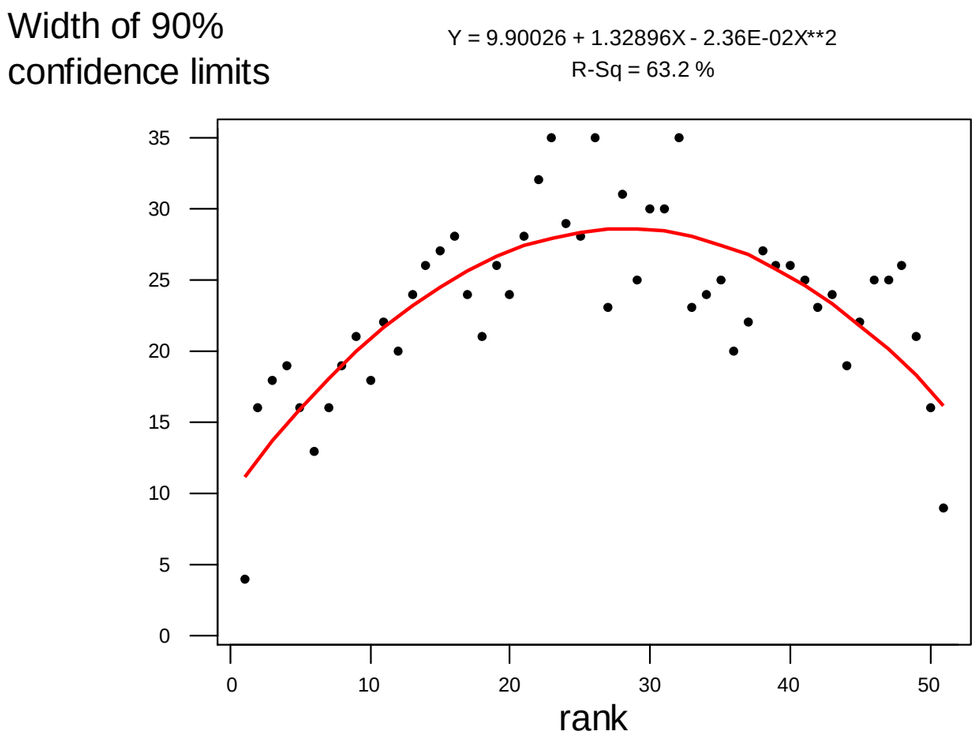
… We Can't Reliably Identify Quartiles

- Example one: 90% confidence limits for rank of Virginia: 9-44
  - Virginia could be in the first, second, third, or fourth quartile
- Example two: Connecticut, ranked 3, has 90 % confidence limits of 1-19
  - Connecticut could be in the first or second quartile

Uncertainty is Not Uniform

- States with ranks near the top or bottom are less uncertain than states ‘in the middle’ (next slide)
- Width of confidence limits is ‘upper confidence limit minus lower confidence limit’

Width of Confidence Limits vs. Ranks



How Might We Rank States?

- Practically speaking, we can't – many states' immunization coverages are so close that current methods of measuring coverage can't distinguish them
  - Example: the point estimate of North Dakota and Wisconsin's coverages differed by less than one tenth of one percent, with standard errors of about 2 percent

How Might We Rank States?, continued

- Fully functioning immunization registries *might* someday let us rank states
  - Might someday come close to a ‘census of immunizations’
  - That is years away

Conclusion

- We have very limited ability to rank the states with the highest and lowest immunization coverages
- We have much less ability to rank states ‘in the middle’
  - If a state’s rank is, say,15 in one year and 35 in the next, it means absolutely nothing (although it will probably not be so perceived)

Conclusion, continued

- We need to educate the media and government officials concerning how little ranks mean