Preventing Influenza and Pneumonia in the Elderly by Vaccinating Children:

A State-level Analysis

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Public Health Significance

- Influenza mortality and morbidity
  - 6,000 annual deaths from influenza
  - 36,000 annual deaths from influenza-related diseases
  - Over 2 million annual hospitalizations
    - Mostly due to influenza-induced pneumonia
- Economic impacts
  - Direct and indirect costs of pandemic as high as $170 billion

Simonsen L., et al. *Arch Int Med* 165: 265-272.
Thompson W.W., et al. *JAMA* 292: 1333-1340.
Thompson W.W., et al. *JAMA* 289: 179-186.
Meltzer M.I., et al. *Emerg Inf Dis* 5:659-671.

Influenza in the Older Population

- Age-specific mortality 100x higher in 65+ than in infants <1 year
- Rapidly growing older population
- Vaccine efficacy lower in elderly than in children
- Growing body of evidence suggests that children spread influenza to adults and elderly

Thompson, W.W., et al. *JAMA* 289: 179-186.
Viboud C, et al. *British J Gen Pract* 54: 684-689.
Hurwitz ES, et al. *JAMA* 284: 1677-1682.
Lewis EN, et al. *Pediatrics* 120:467-472.
Navas E, et al. *Vaccine* 25:3323-3239.

Link between Children and Elderly?

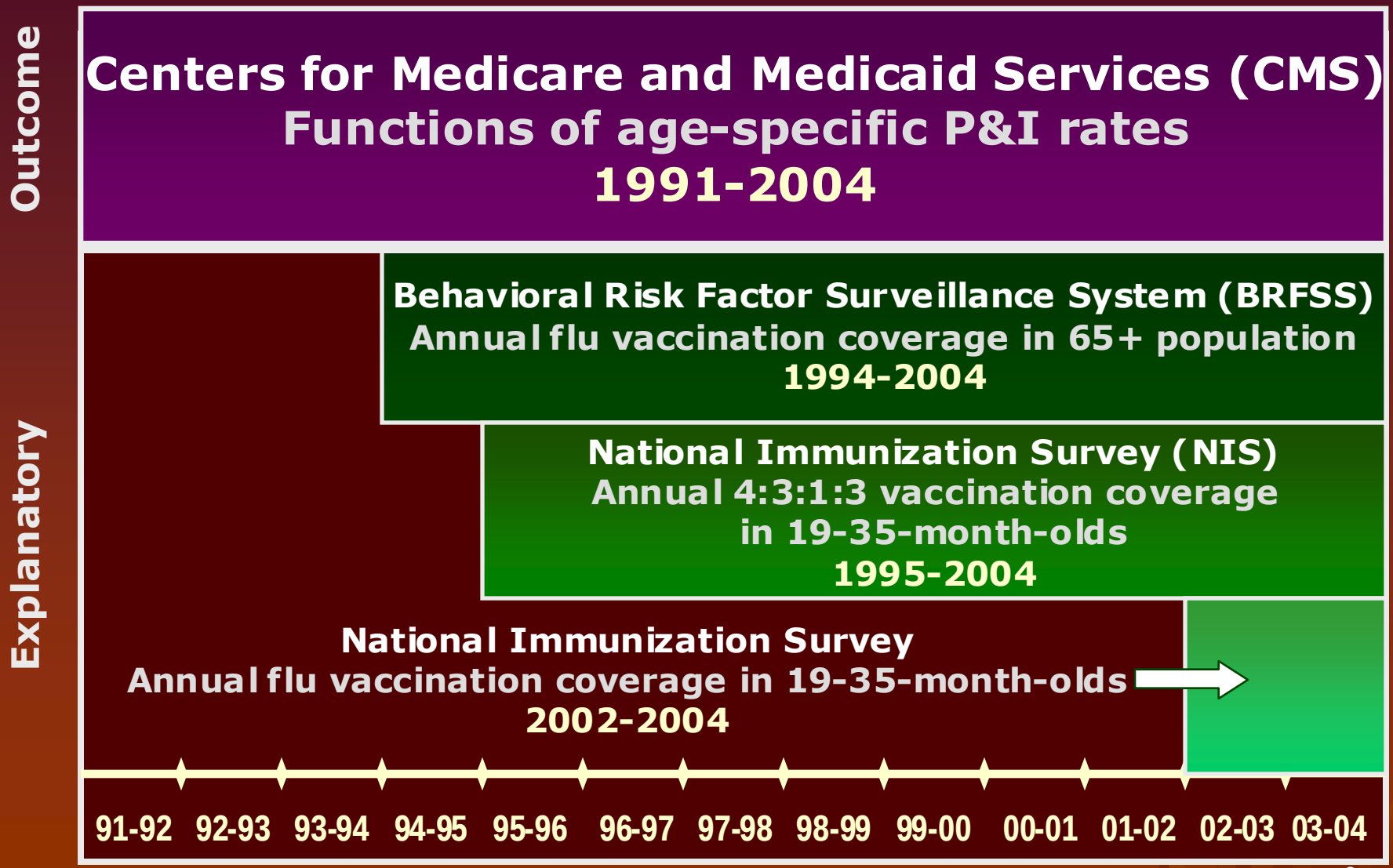
Given an insufficient supply of vaccine for universal immunization against influenza:

Would vaccinating children against influenza and other diseases reduce influenza and pneumonia in the elderly?

Methods

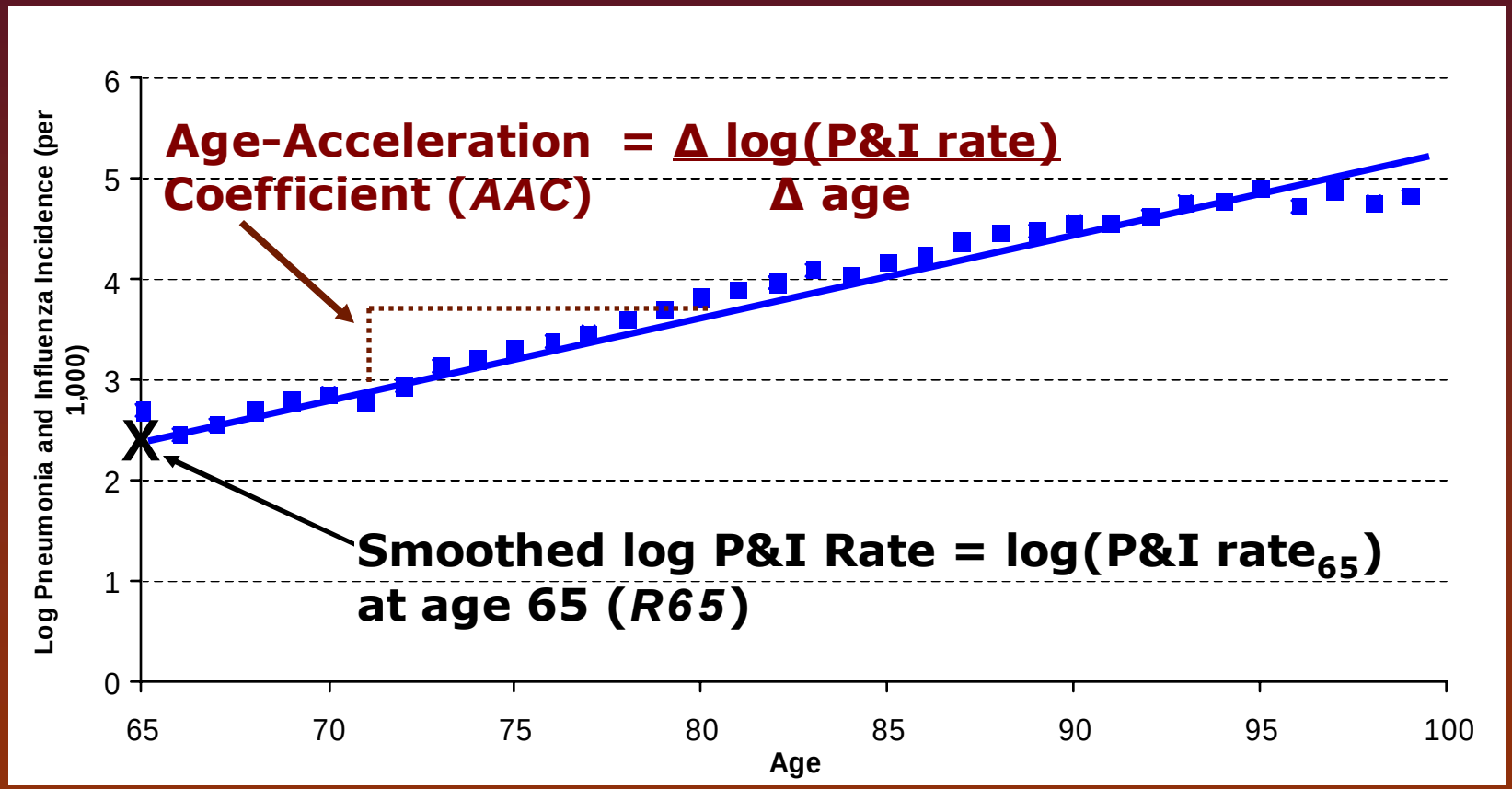
- Influenza season defined as July-June
- Unit of observation: state
- Spatial and temporal bivariate correlations between two outcomes &
  - Elderly influenza vaccination coverage
  - Child influenza and 4:3:1:3 vaccination coverage

Data Sources



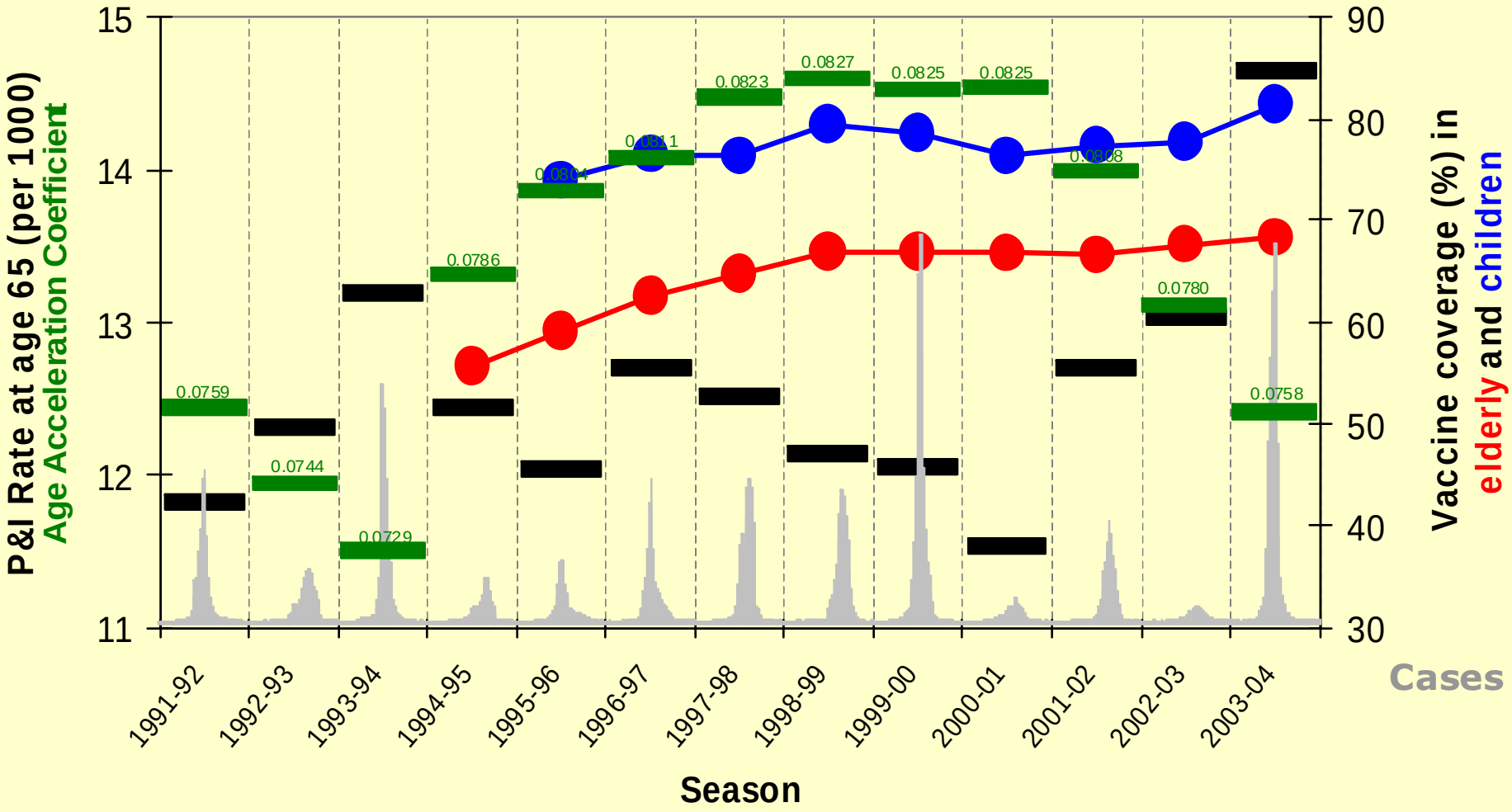
Outcome Measures

$\log(\text{P\&I rate}_{ij}) = \beta_{0i} + \beta_{1i}*(\text{age}_j - 65) + e_i$
where i = state, j = age



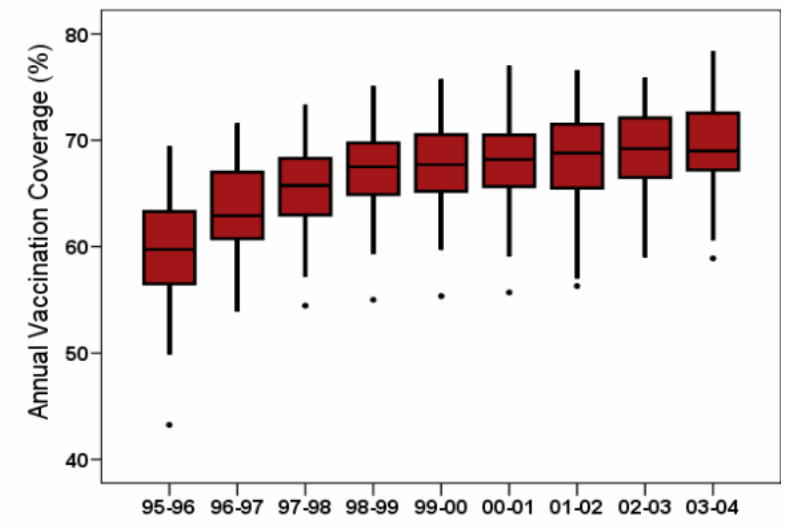
Cohen SA, Naumova EN. *Lec Notes Comp Sci* 4506:47-58.

National Trends in P&I and Vaccination

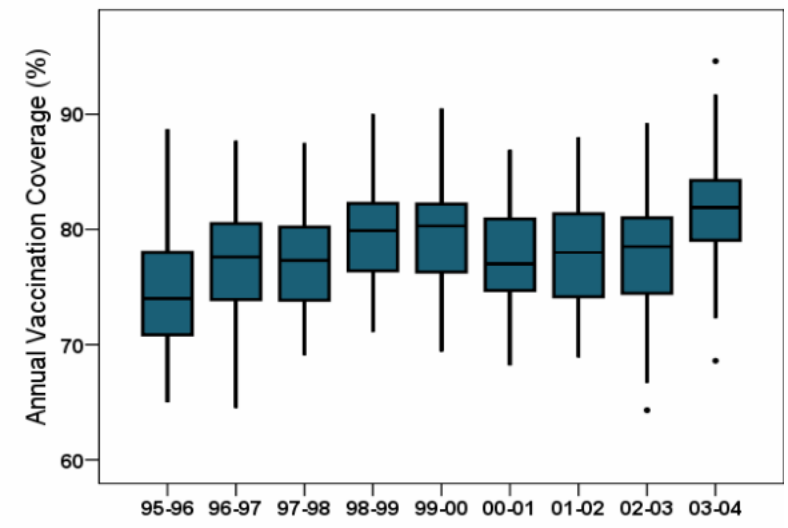


State Trends in P&I and Vaccination

Elderly Influenza Vaccination



Child 4:3:1:3 Vaccination



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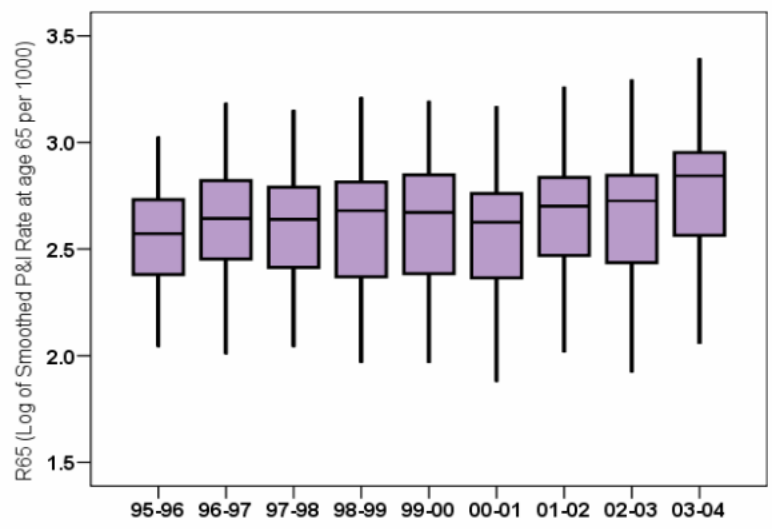

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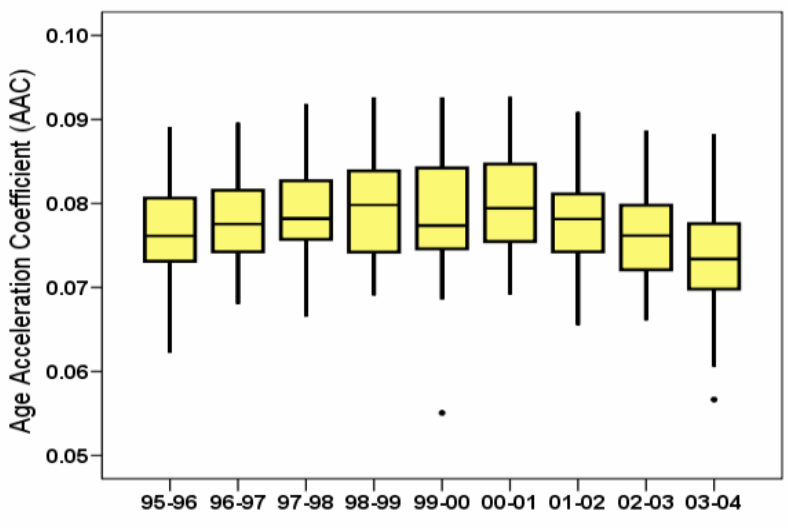
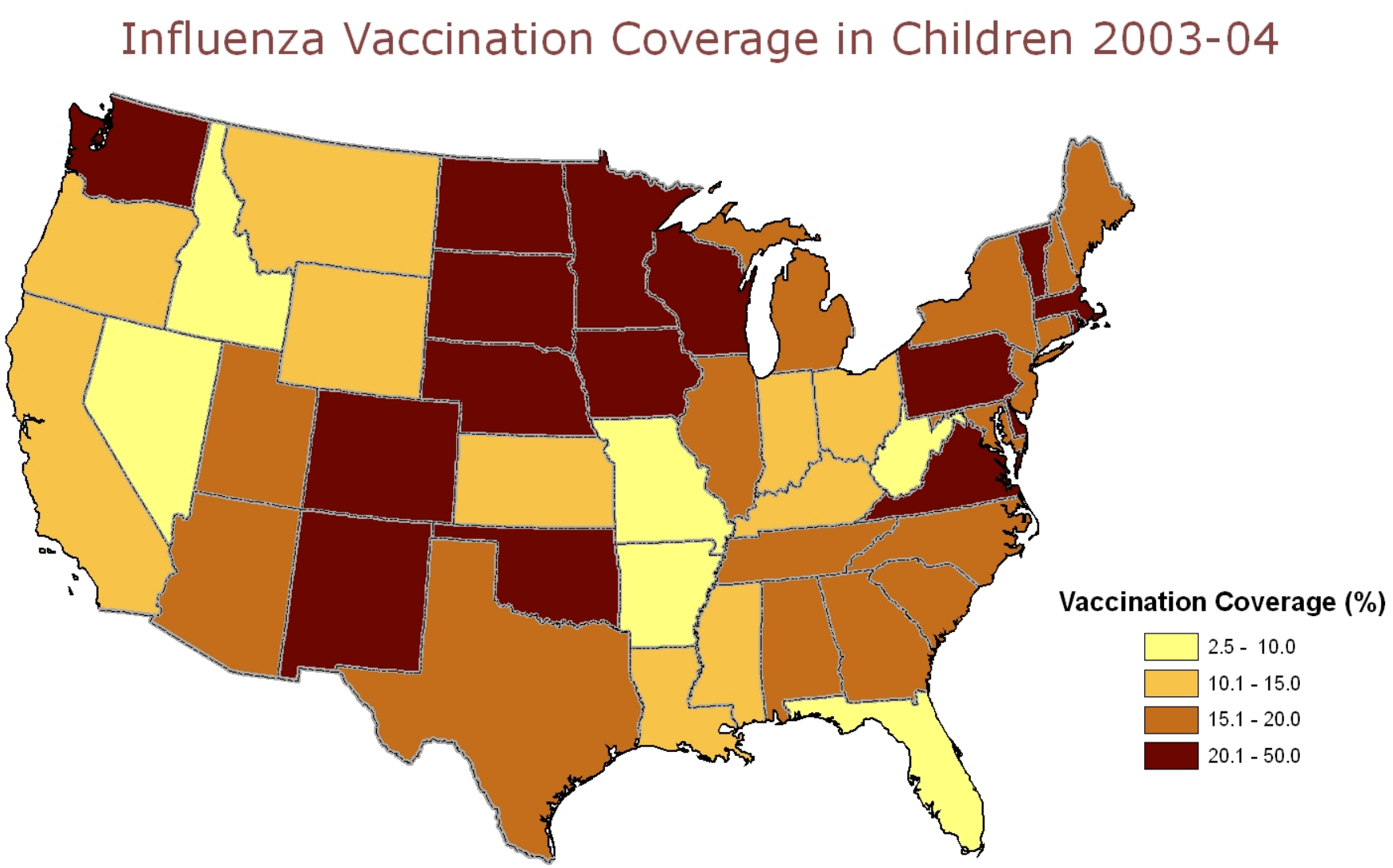
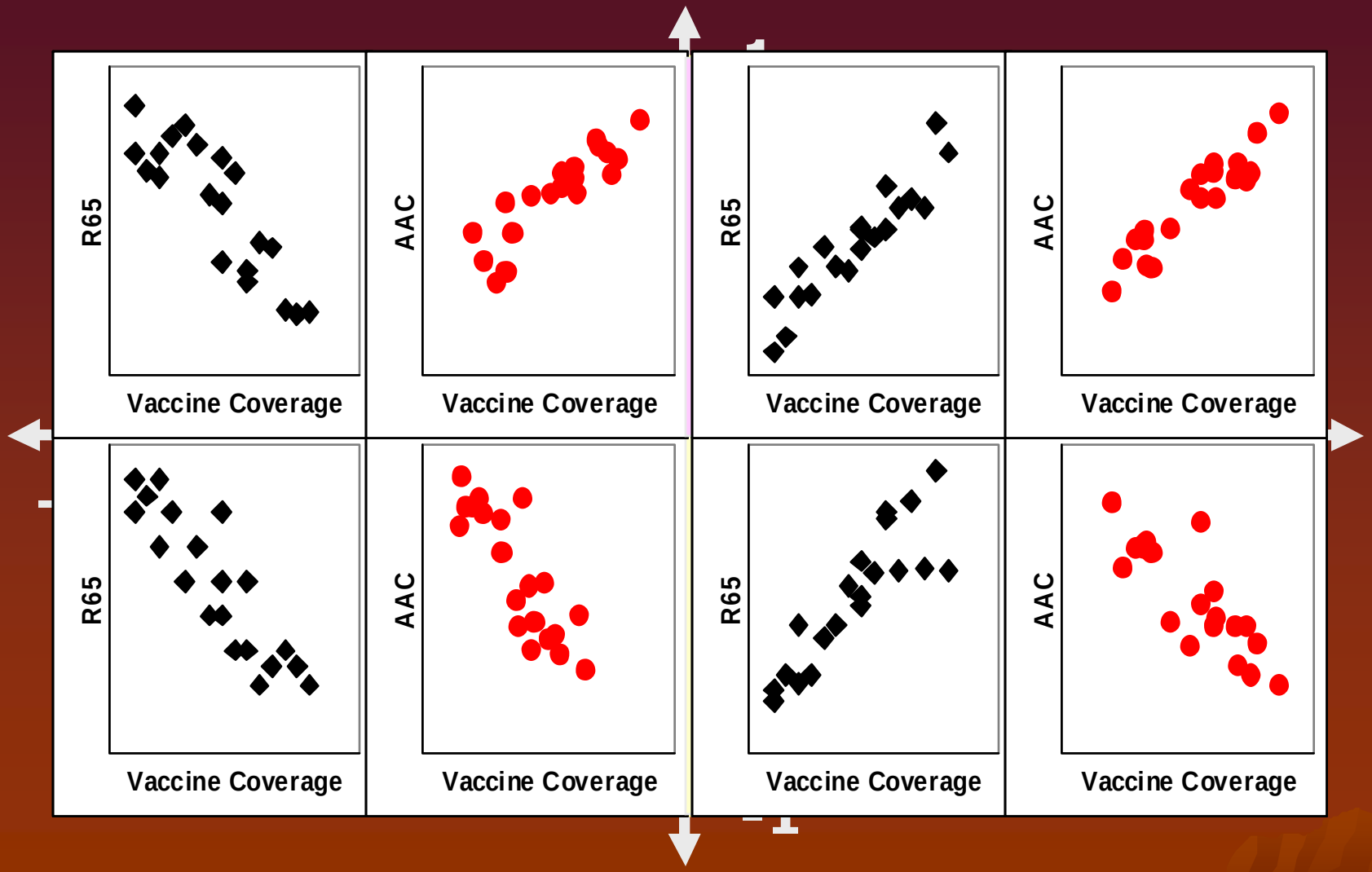


US Vaccination Coverage

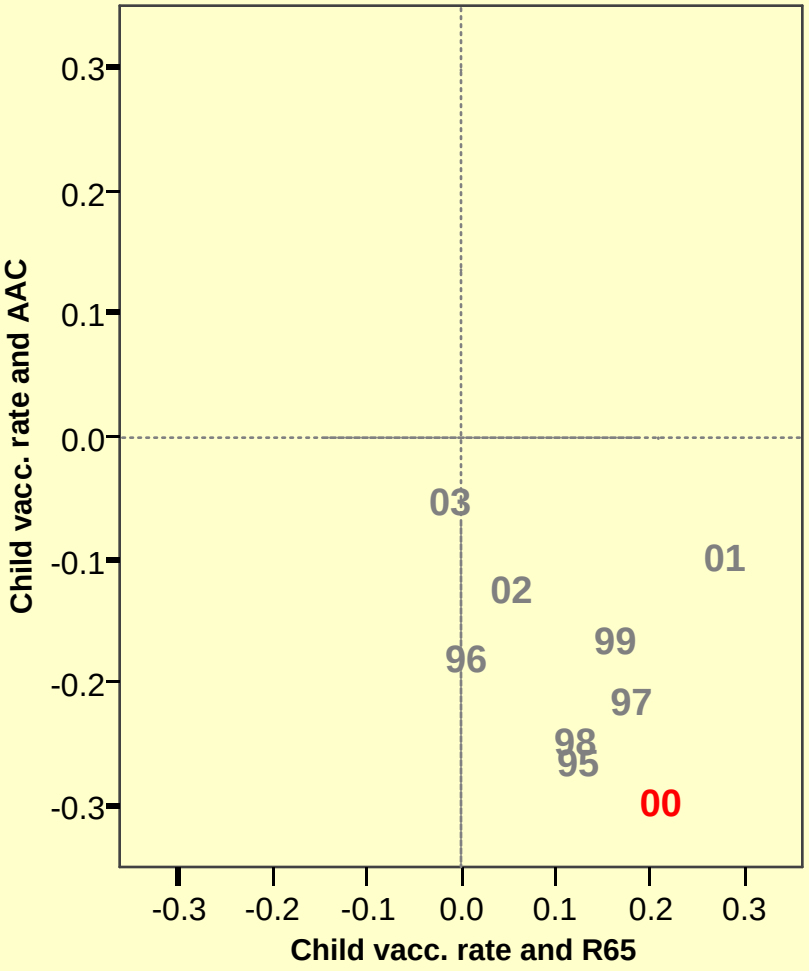


Correlation Graphs:
Vaccine coverage and outcomes

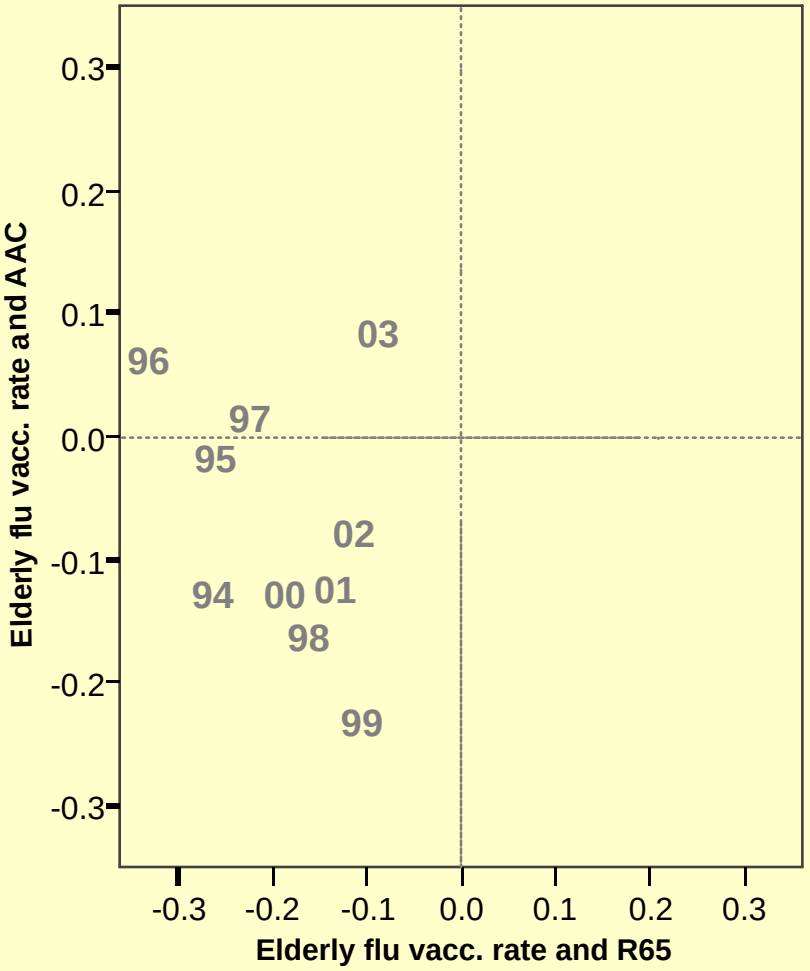


Correlations by Season

Child Vaccination

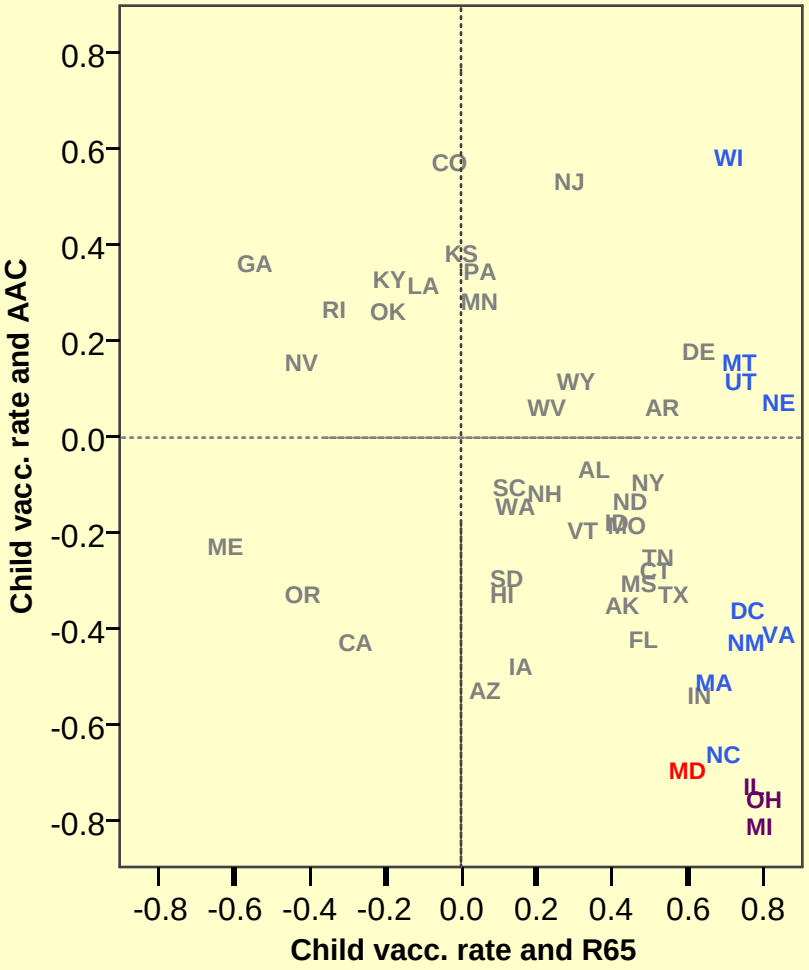


Elderly Flu Vaccination

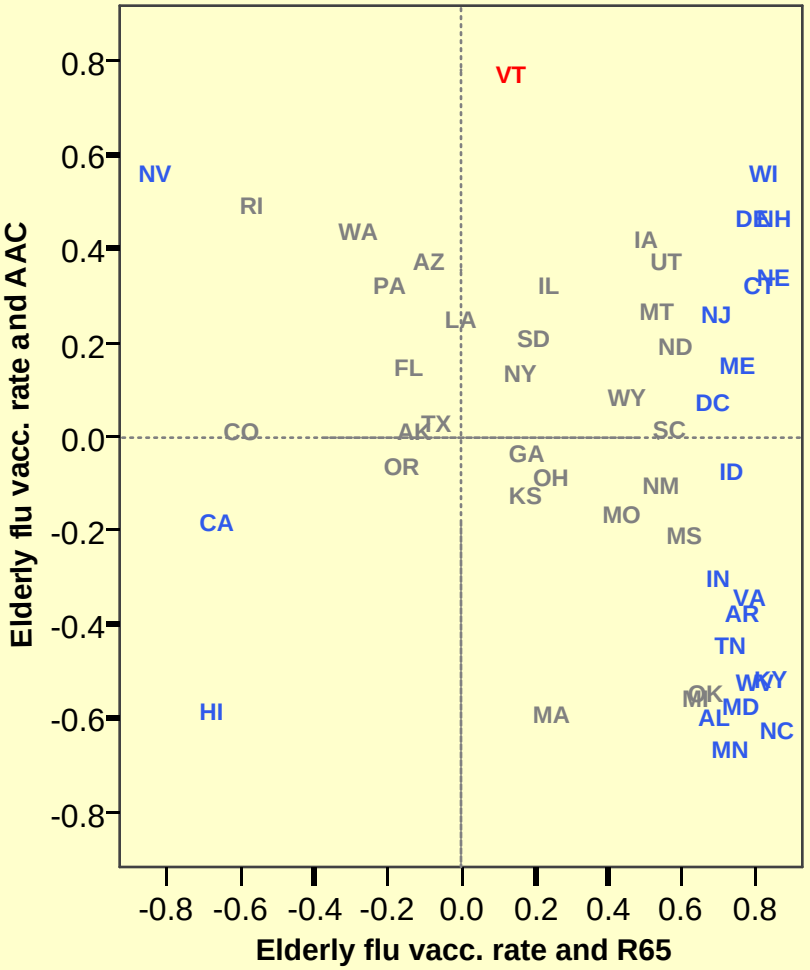


Correlations by State

Child Vaccination



Elderly Flu Vaccination



Discussion

- Suggestive, but not conclusive evidence that general vaccination coverage in children negatively associated with age-acceleration of P&I
- Influenza vaccination coverage in the elderly may reduce overall level of P&I in elderly
- More research is needed

Future Research

- Longitudinal models assessing relationship between vaccination coverage and P&I in elderly with covariates
- Modeling relationships on several geographical levels
- Incorporation of matching of vaccine strain to circulating strain
- Extending analysis through 2006-07 season
  - Using influenza vaccination data for children
  - Pneumonia vaccination coverage and outcomes in the elderly

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Thank you!