



# **Recent Advances in Association Analysis for Multivariate Failure Time Data**

## **Discussion**

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# Why Multivariate Failure-time Analysis?

- ◆ Modern biomedical research proliferates with multivariate failure-time data
  - Familial, Community
  - Outcomes research
    - Falls history
    - Comorbid disease onset
    - Multiple sleep latency assessment
- ◆ Modern: data, computing advances

# Does doing things multivariately matter?

- ◆ 1: Primary interest = marginal distributions
  - If data are analyzed globally: Yes (for inference)
    - Wei, Lin, & Weissfeld (1989), and much subsequent work
  - If within-cluster comparisons not of interest: Efficiency?
    - My impression: considerably less work
  
- ◆ 2: Primary interest = associations
  - Yes (self evident)
  - Import: Yes (heritability, provider effects, etiology)
  - Sleep example: Circadian rhythm

# Session - Overview

- ◆ Much prior work on association analysis
  - Tradition 1: The Modelers
    - Global: *Kendall (1955); Clayton (1978); Oakes (1982)*
    - Frailties: *Vaupel (1979); Hougaard (1986); Oakes (1989)*
    - Copulas: *Sklar (1959); Genest (1986); Shih (1995); Shih (2006); Oakes (2006)*
    - Benefits: Parsimony; interpretation; efficiency
    - Drawbacks: Assumptions; inflexibility of description

# Session - Overview

- Tradition 2: The Nonparametric Describers
  - S(t) estimation: *Dabrowska (1988); Prentice (2004)*
  - Plug-in: *Prentice (1992); Hsu (1996), Wang (2000), Fan (2000)*
  - Copula-related process: *Oakes (1989), Genest (1993), Fine (2000)*
  - GEE: *Heagerty (1996); Yan/Fine (2006)*
  - Benefits: Flexibility of description
  - Drawbacks: Complex implementation, interpretation
- Amalgamation: *Oakes/Wang (2006); Yan/Fine (2006)*



# Session – Overview

## A primary message



- ◆ Getting to flexible, yet practicable, association models has been hard...
- ◆ ... The talks we've seen advance toward this goal

# Session – Oakes / Wang

## An insight whose exploitation is due

- ◆ Accommodating censoring in estimating the BPIT —and Kendall-based association, has proven **hard**
- ◆ Truly exciting: end-of-paper tidbit
  - Fully nonparametric estimator of Archimedean-defining inverse Laplace transform; interpretable descriptor
- ◆ Two questions
  - Do we need another estimator of AC parameters?
  - How practicable?

# Session – Yan / Fine

## A very “complete”-feeling methodology

- ◆ I wonder why this general approach hasn't been more widely pursued
- ◆ Shared with David: Truly flexible, interpretable association estimation accommodating censoring
- ◆ Two questions
  - Complexities re estimation at each  $t$  (or,  $(s,t)$ )?
  - How practicable?





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# Session – Shih / Lu

## Elegant Modeling for Complex Data

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- ◆ There remains a place for parametric modeling
- ◆ Moon mission: Synthesis of analytic methods and modules to accomplish a challenging whole
- ◆ Two questions
  - Necessity / price of modular strategy?
  - How practicable?

# Benediction

- ◆ Advancements in this area have required high-level expertise
- ◆ **Have they had the impact they should have?**
  - > My suspicion: No.
- ◆ (Brief) General reactions?
- ◆ There is impact to be made. I either hope I'm wrong, or higher impact will be achieved.