

# SURVIVAL OF THE FITTEST IN THE AHEAD COHORT

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# PURPOSE

Trends in disability within an older cohort

Do cohort disability rates **rise** over time as members age and acquire new functional problems, and their existing ones worsen? or Do cohort disability rates **decline or flatten** due to high mortality for disability?

Population "frailty" versus "fitness" at advanced ages



# DATA

Nationally representative panel survey of community-dwelling older (ages 70+) Americans.

AHEAD (Asset and Health Dynamics among the Oldest Old). Later merged with HRS (Health and Retirement Study).

Target sample was persons born 1923 or earlier.

Waves in 1993, 1995, 1998, 2000, 2002, 2004, 2006, 2008, 2010, 2012.

We use 8 waves 1993–2008 (most recent death verification).

# AHEAD COHORT SAMPLES

## Interviews

1993	8,222
1995	7,023
1998	5,945
2000	4,997
2002	4,099
2004	3,353
2006	2,685
2008	2,132



# MORTALITY

% deceased

1993	0
1995	9.9
1998	22.5
2000	33.5
2002	44.9
2004	54.0
2006	62.3
2008	69.5

# DISABILITY

ADL disability: health-related difficulty or personal help to dress, bathe/shower, eat, walk across room, get in/out of bed, use toilet

IADL disability: health-related difficulty to prepare hot meal, shop for groceries, make phone calls, take medications, manage own money

Functional limitations: difficulty to walk several blocks, climb stairs, pull/push large objects, lift weights, pick up dime, drive car



# PREDICTORS

Female

Education

White

Veteran

Current married

Current smoking

Current drinking

Serious chronic conditions (5; HBP, diabetes, cancer, heart, stroke)

Other chronic conditions (9)

# MODELS

Outcomes: predicted means of ADLs (IADLs, functional limitations) for AHEAD cohort across 15 years, as members age from 70+ to 85+

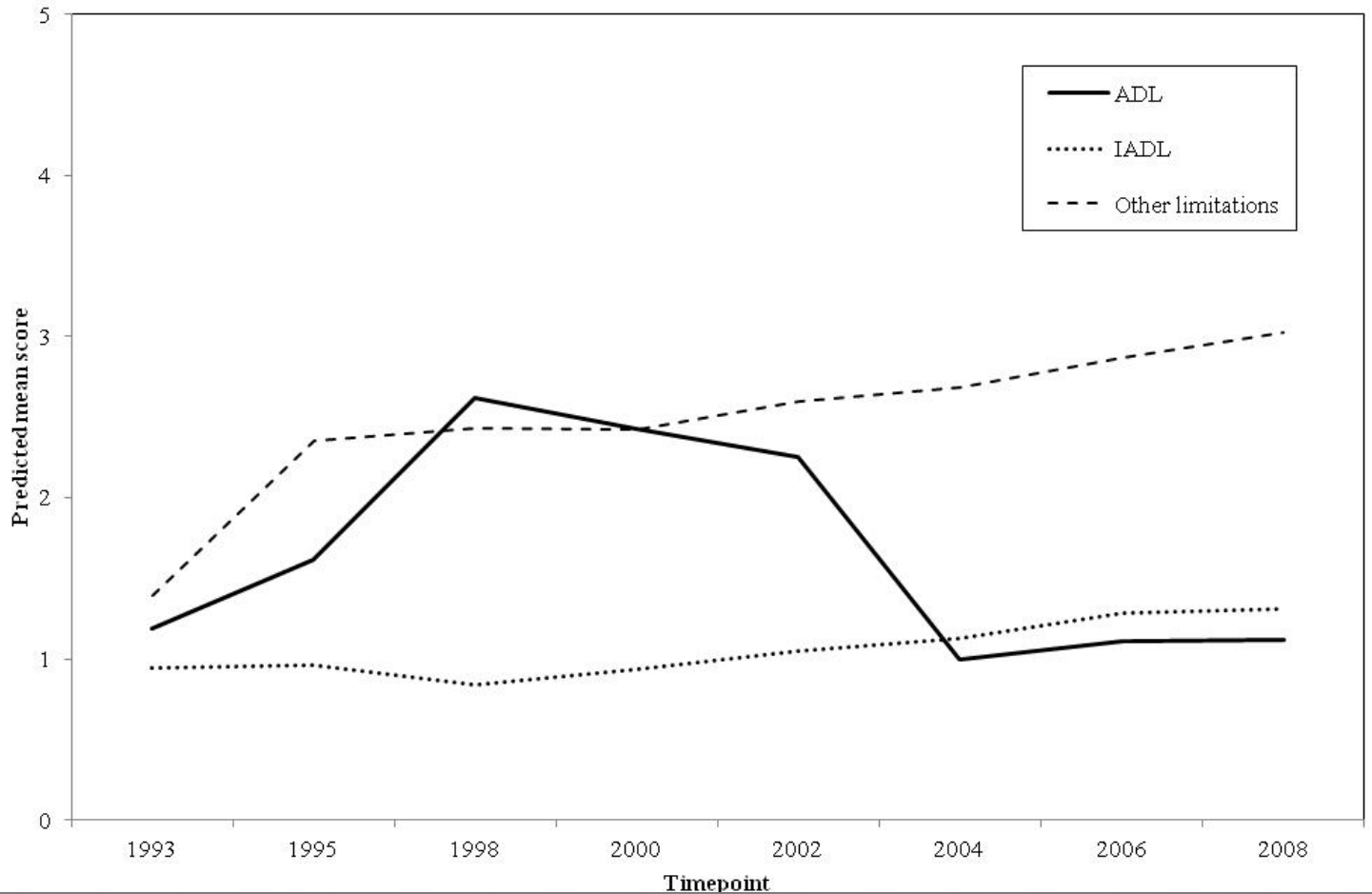
Two-stage: first stage predicts 0 vs 1+, and second stage predicts specific number 1 or above

Method: two-stage nonparametric mixed modeling that adjusts explicitly for mortality selection, and handles case and item missing data by shrinkage procedures

Weights for complex sample design



# COHORT TRENDS



# RESULTS

ADLs rise, then fall, and flatten at lower than initial level

IADLs are near-steady over time

Functional limitations rise, then continue gentle slope up

In sum: The patterns signal “survival of the fittest”.  
Long-term survivors have some resistance to having  
and acquiring functional problems.

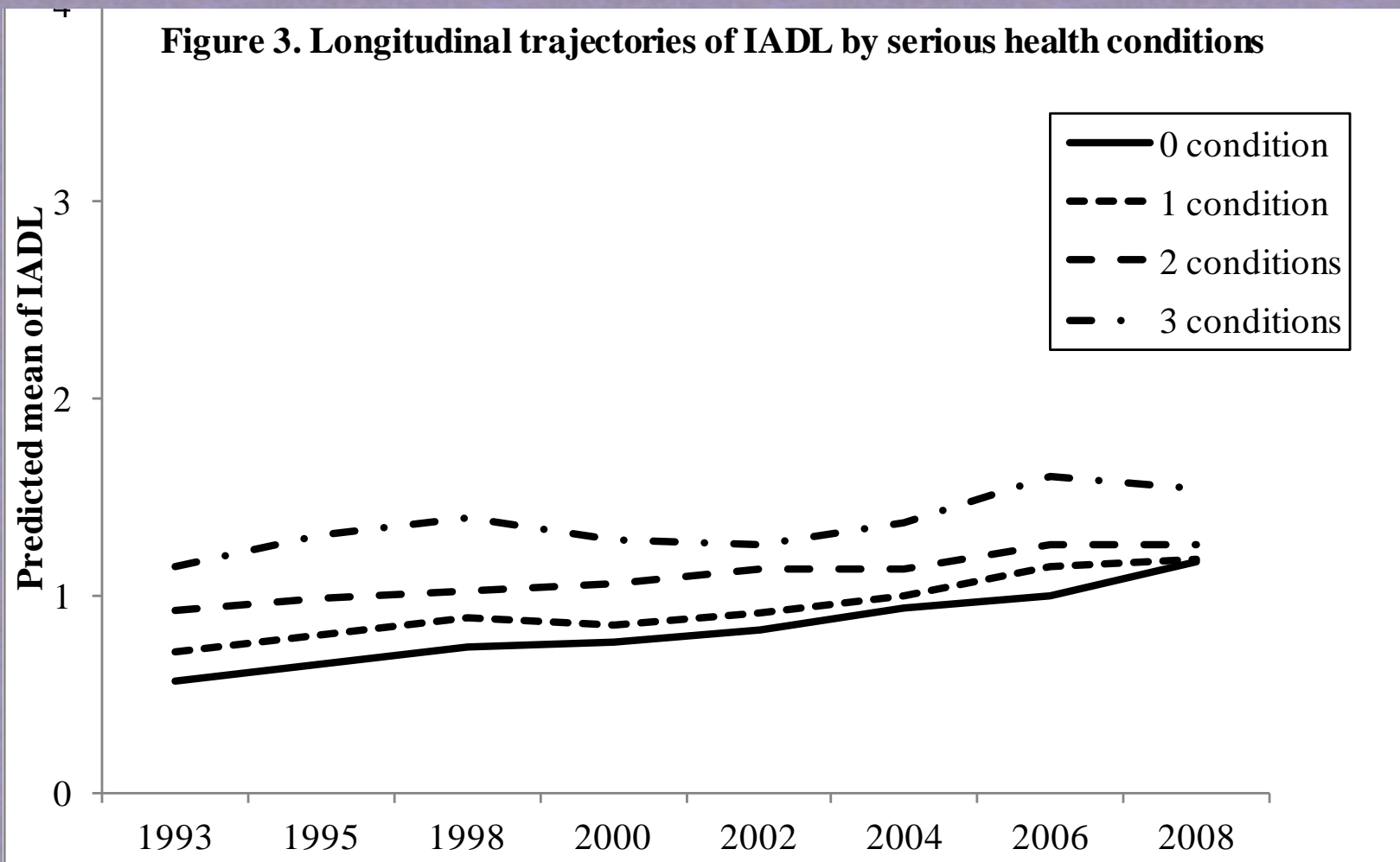


# TRENDS BY HEALTH STATUS

Compare cohort disability trends for people in good, middling, and poor health

- Do those with good health always have less disability?
- Does disability increase more gently (shallower slope) over time for them?

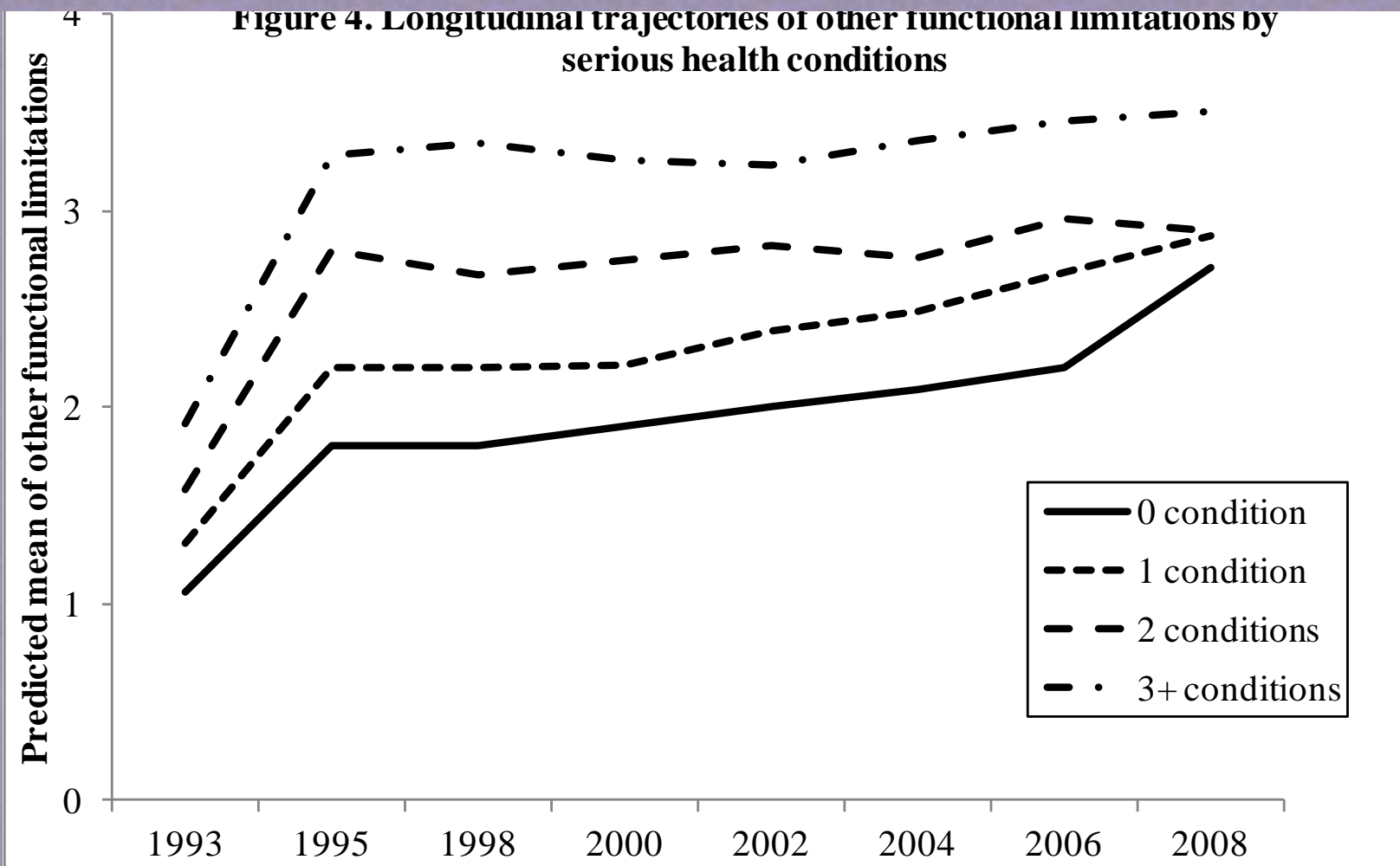
# IADL TRENDS



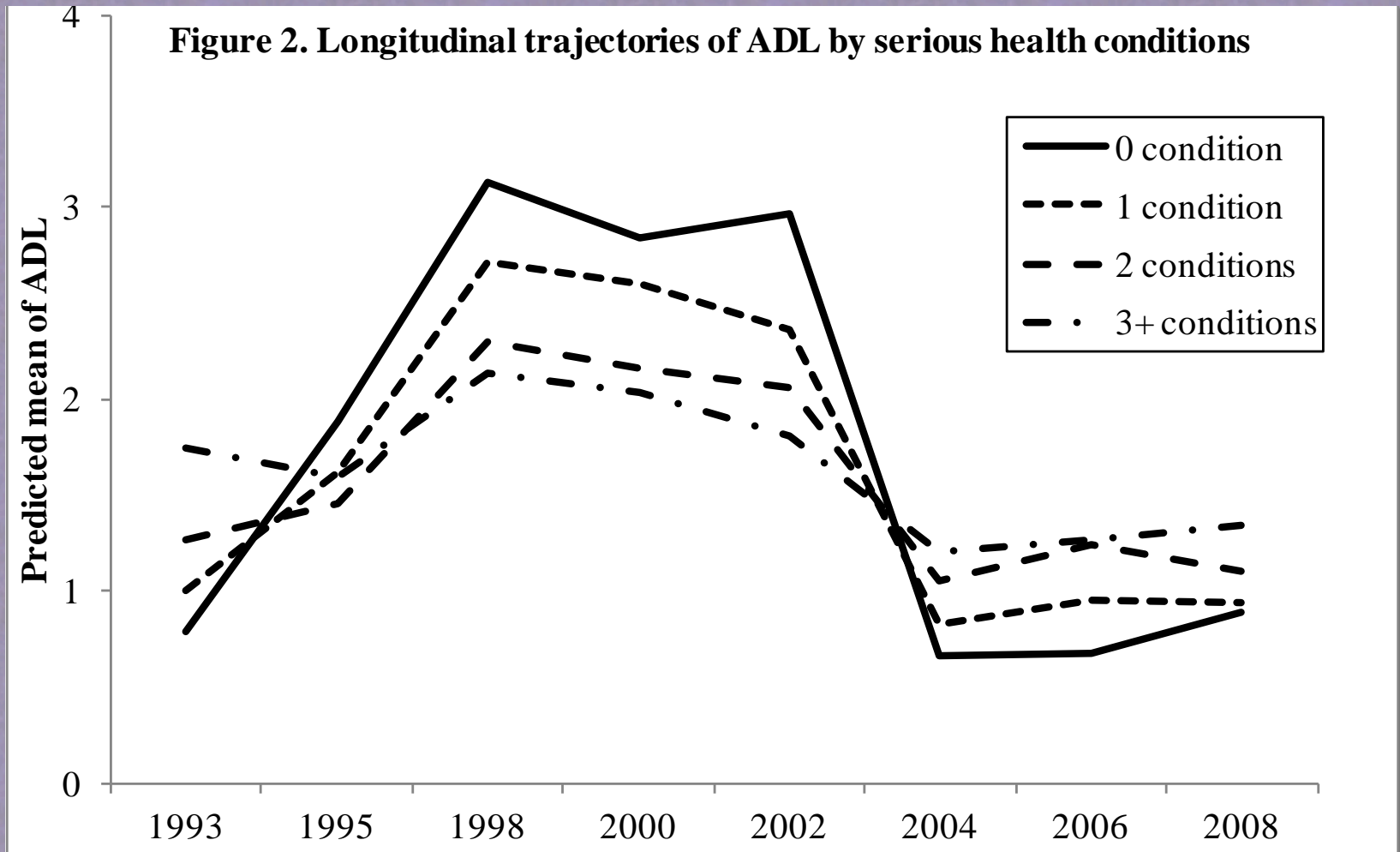


# FUNCTIONAL TRENDS

Figure 4. Longitudinal trajectories of other functional limitations by serious health conditions



# ADL TRENDS





# RESULTS

For people with few conditions, IADLs and limitations are **lower**. ADLs are an important exception; **higher** for half the period.

For people with few conditions, disability/limitation increases more **sharply** over time.

In sum: Further evidence that the most-ill cohort members die, leaving rather healthy survivors. The healthiest among them benefit from fewer IADLs and functional troubles, and remarkably, they often acquire or manage more ADL disabilities.

# CONCLUSION

Mortality selects strongly for advanced-age persons with very poor functional status.

Force of mortality appears greatest for ADL disability, then IADL disability, and least for functional limitations.

As a result, very old survivors typically have good functional status, similar to or even better than the population 15 years earlier.



# LITERATURE

Compare with literature on:

- Mortality rates by ADL, IADL, and limitations
- Individual-level trajectories for disability
- Other cohort studies of “fitness” among survivors

# NEXT STEPS

Redo analysis with RAND data set

Comments and help from REVES colleagues



# CONTACT

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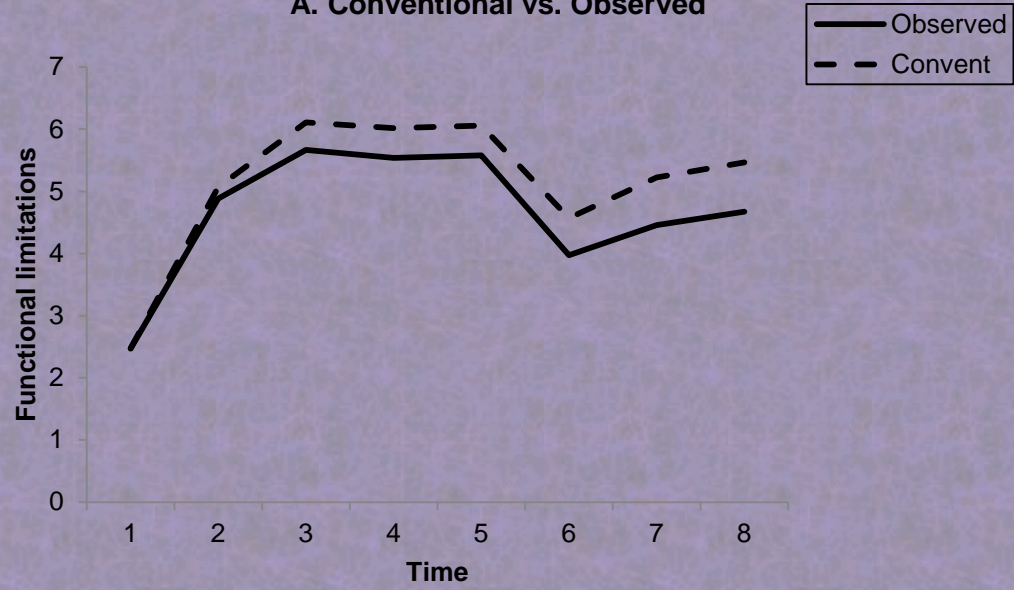
## References:

Liu & Engel, *Statistics in Medicine*, 31(29), 2012

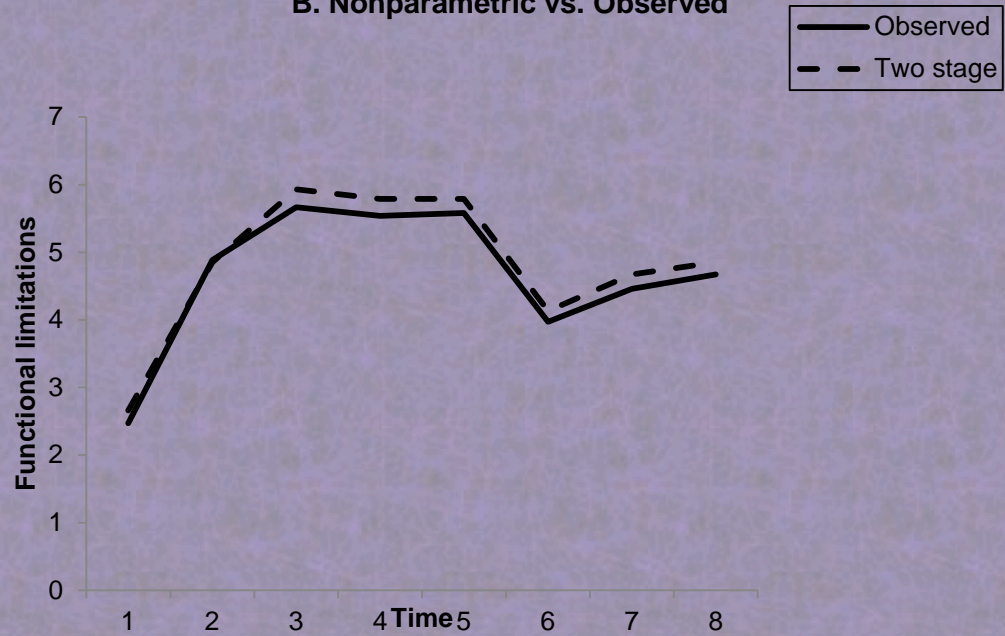
Liu, Engel, Kang, & Gore, *Journal of Modern Applied  
Statistical Methods*, 9(2), 2010

Little & Rubin, *JASA*, 94(448), 1999

**A. Conventional vs. Observed**



**B. Nonparametric vs. Observed**





# COHORT TRENDS

