Structural Equation Modeling of Health Literacy and Medication Adherence by Older Asthmatics

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Asthma in Older Adults

- Prevalence: 6-9%
- Worse morbidity, mortality (vs. ages 18-64)
  - Poor short term control: 68% vs. 53%, p <.001[†]
  - Mortality rate: 42 vs. 14 per million[‡]
- Poor adherence to inhaled corticosteroids (ICS)
  - 38%[§]

[†]Talreja *Ann Allergy Asthma Immunol* 1991
[‡]http://www.health.ny.gov/statistics/ny_asthma/pdf/2009_asthma_surveillance_summary_report.pdf
[§]Federman *J Am Geriat Soc* 2014

Background

- Correlates of poor ICS adherence among older adults
  - Low HL
  - Beliefs
- These variables also associated with one another
- Causal pathways have not been examined

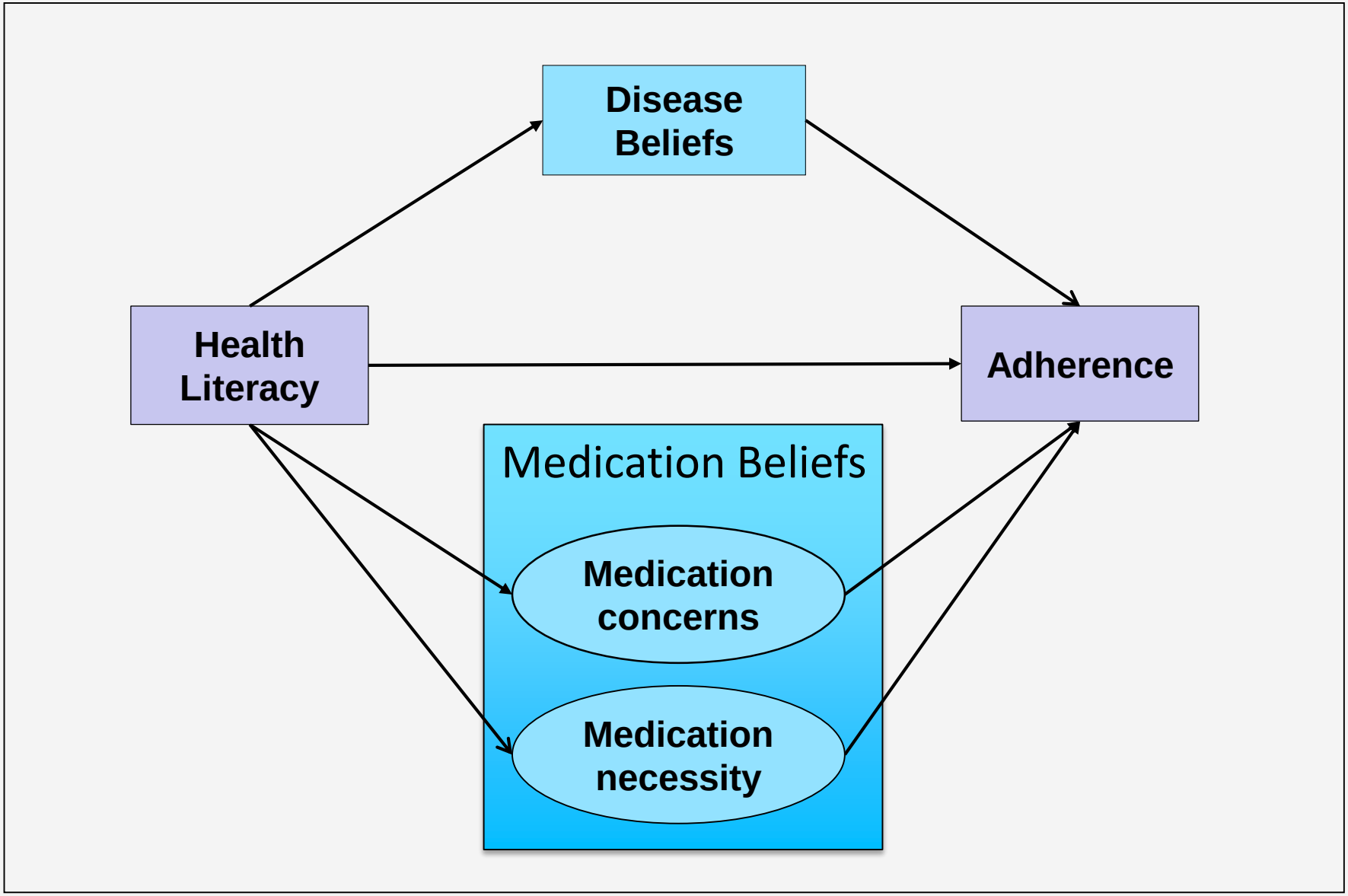
Federman *JAGS* 2014
O'Conor *Chest* 2014

Objective

- To examine mediational relationships of
  - Health literacy
  - Cognition
  - Illness and medication beliefs

  on med adherence among older adults with asthma

Hypothesized Pathways



Methods

- Asthma Beliefs and Literacy in the Elderly (ABLE) Study
- Prospective cohort of older asthmatics (n=452)
  - Adults ≥60 years
  - Physician diagnosis of asthma (moderate-severe)
  - Excluded: smokers (≥10 pack-years); COPD and other chronic pulmonary diseases

Settings

- Primary care and pulmonary practices
  - New York:
    - Mount Sinai Hospital (Tertiary hospital)
    - Lutheran Family Health Centers (FQHC)
  - Chicago:
    - Northwestern University (Tertiary hospital)
    - Erie Family Health Center (FQHC)
    - Mercy Family Health Center (FQHC)

Recruitment and Interviews

- Recruitment began January 2008
- Interviews in-person and by telephone
- English and Spanish

Outcomes

- Adherence to asthma controller medications
  - Inhaled corticosteroids (ICS)
  - Long-acting beta agonists (LABA)
  - Leukotriene inhibitors (LTI)

- Medication Adherence Rating Scale (MARS)
  - 10 items
  - Higher score = better adherence

Main Independent Variables

- Health Literacy (HL)
  - Short Test of Functional Health Literacy in Adults (STOFHLA)
    - Low HL: score <67
- Health beliefs
  - Brief Illness Perceptions Questionnaire
    - 11 items, single score
  - Beliefs about Medications Questionnaire
    - Latent variable
    - Scores for “medication necessity,” and “medication concerns”

Other Independent Variables

- Cognition
- SES: age, gender, race/ethnicity, English proficiency

Analysis

- Structural Equation Modeling (SEM)
  - Test pathways linking HL and adherence via medications and disease beliefs
  - Good model fit
    - Comparative Fit Index (CFI), >0.90
    - Root mean square error of approximation (RMSEA), <0.05
  - Data analysis with Mplus7

Results **Demographics by HL Level**

	Health Literacy		P
	Low N=152 (36%)	**Adequate N=270 (64%)**	
Age, *years*			
60-64	32	51	.002
65-69	27	24	
70+	39	26	
Male	16	16	.99
Race			
Non-Hispanic Black	33	30	<.0001
Non-Hispanic White	3	34	
Hispanic	60	27	
Income < $1,350 / month	80	40	<.0001
Education			
No high school	68	13	<.0001
Any high school	15	18	
Any college	17	67	

Results **Health Status by HL Level**

	Health Literacy		
	Low N=152 (36%)	**Adequate N=270 (64%)**	**P**
Poor general health	90	68	<.0001
Prescribed controller meds	77	80	.35
Inhaled steroids	76	77	.30
Leukotriene inhibitors	24	27	.70
Years with asthma, *mean (sd)*	32 (20)	31 (21)	.53
History of intubation	15	5	.0009

Results **Adherence by HL and Beliefs**

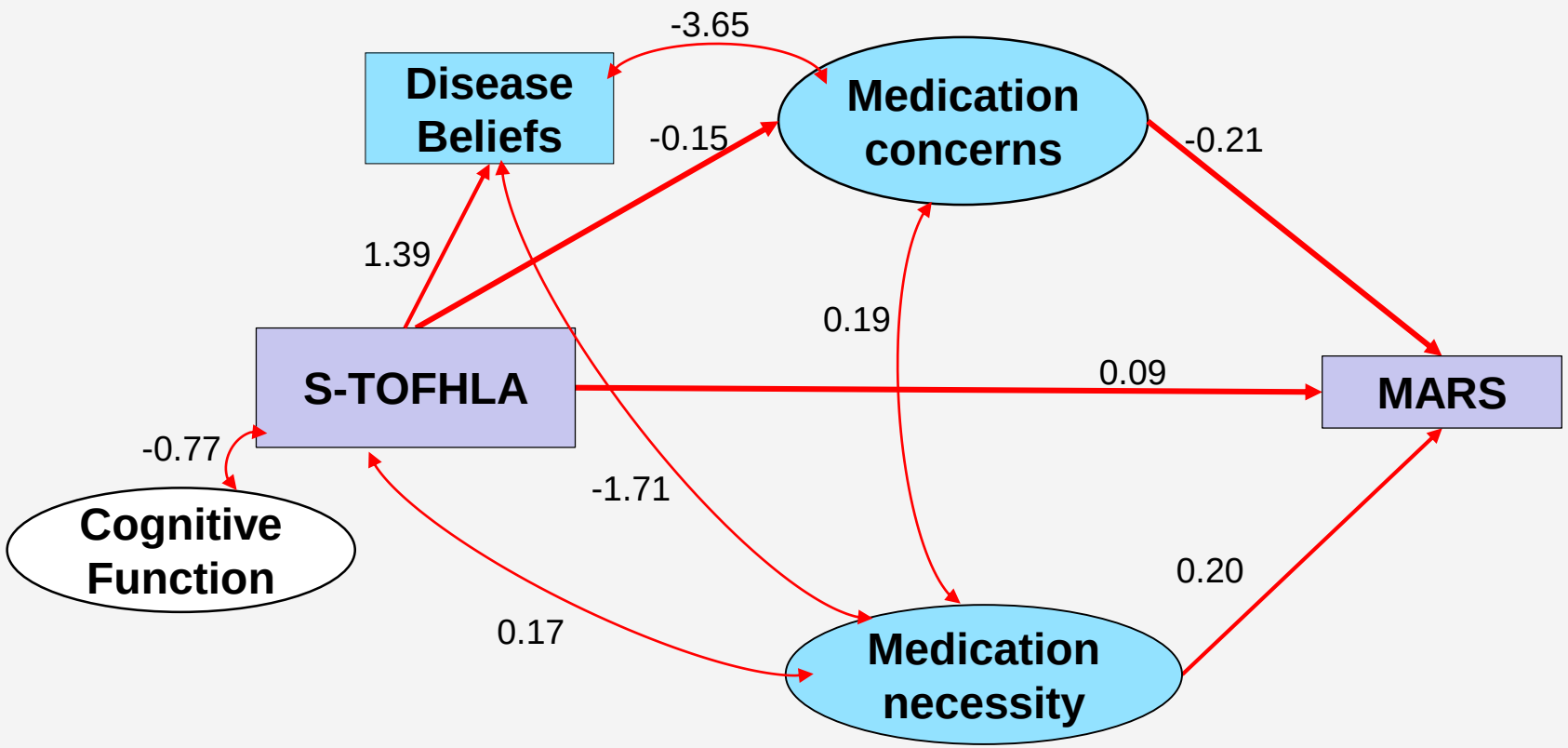
	Adherence
	Adjusted OR (95% CI)
Low health literacy	0.6 (0.4-0.9)
Illness Beliefs No symptoms, no asthma	0.5 (0.3-0.8)
	Adjusted β, P-value
Medication Beliefs Necessity Concerns	 0.48, p=.0005 0.47, p=.0005

Results SEM Model

CFI: 0.931 RMSEA: 0.051

Total effect of HL on adherence = 0.12

About ¼ of HL effect on adherence mediated through medication concerns



Conclusions

- HL has direct influence on adherence
- Effect is mediated by medication concerns
  - Not mediated by medication necessity and asthma illness beliefs

Limitations

- Cross sectional data

Implications

- May improve asthma controller medication adherence by addressing medication concerns
  - Trials are needed
- Must also remain responsive to problems of low HL

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Medication Adherence Rating Scale

1. I use my medication only when I need it.
   - Always, often, sometimes, rarely, never
2. I use my medication only when I feel breathless.
3. I decide to miss out a dose of my medication.
4. I try to avoid using my medication.
5. I forget to take my medication.
6. I change the dose of my medication.
7. I stop taking my medication for a while.
8. I use my medication if my other treatment doesn't work.
9. I use my medication before doing something which might make me breathless.
10. I take my medication less than instructed.
11. How often do you take your medication on days when you are NOT having symptoms?

Brief Illness Perception Questionnaire Scoring

Each item of the Brief IPQ assesses one dimension of illness perceptions:

- The **consequences** score is simply the response to item 1.
- The **timeline** score is the response to item 2
- The **personal control** scores is the response to item 3
- The **treatment control** score is the response to item 4
- The **identity** score is the response to item 5
- The **coherence** score is the response to item 7
- The **emotional representation** is the response to item 8.
- Illness **concern** is measured by item 6. This reflects a combination of emotional and cognitive representations.
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- Item 9 is the **causal** item. Reponses can be grouped into categories such as stress, lifestyle, hereditary, etc. determined by the particular illness studied. Categorical analysis can then be performed, either on just the top listed cause or all three listed causes.

- In some circumstances it may be possible to compute an overall score which represents the degree to which the illness is perceived as threatening or benign. The internal consistency of this score will depend on the illness studied and it is recommended this is checked. To compute the score, reverse score items 3, 4, and 7 and add these to items 1, 2, 5, 6, and 8. A higher score reflects a more threatening view of the illness.

Independent Variables

- Cognition
  - General: Mini Mental State Exam (MMSE)
  - Executive: Trails A, B
  - Word Fluency: Animal naming
  - Processing speed: pattern comparison
  - Working memory: Wechsler Adult Intelligence Scale letter number sequencing
  - Immediate and delayed recall: Wechsler Memory Scale II Story A

Results **Model 1**