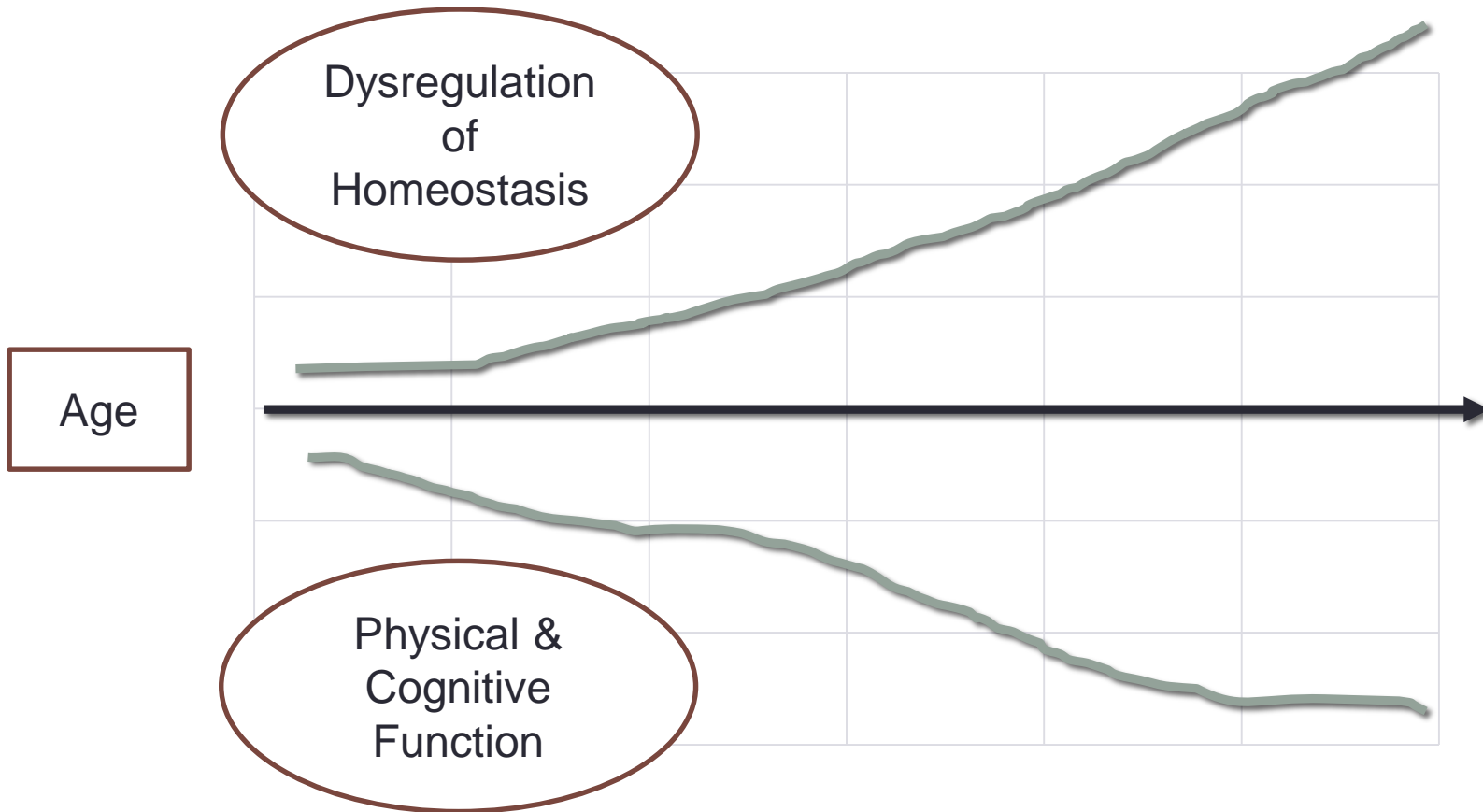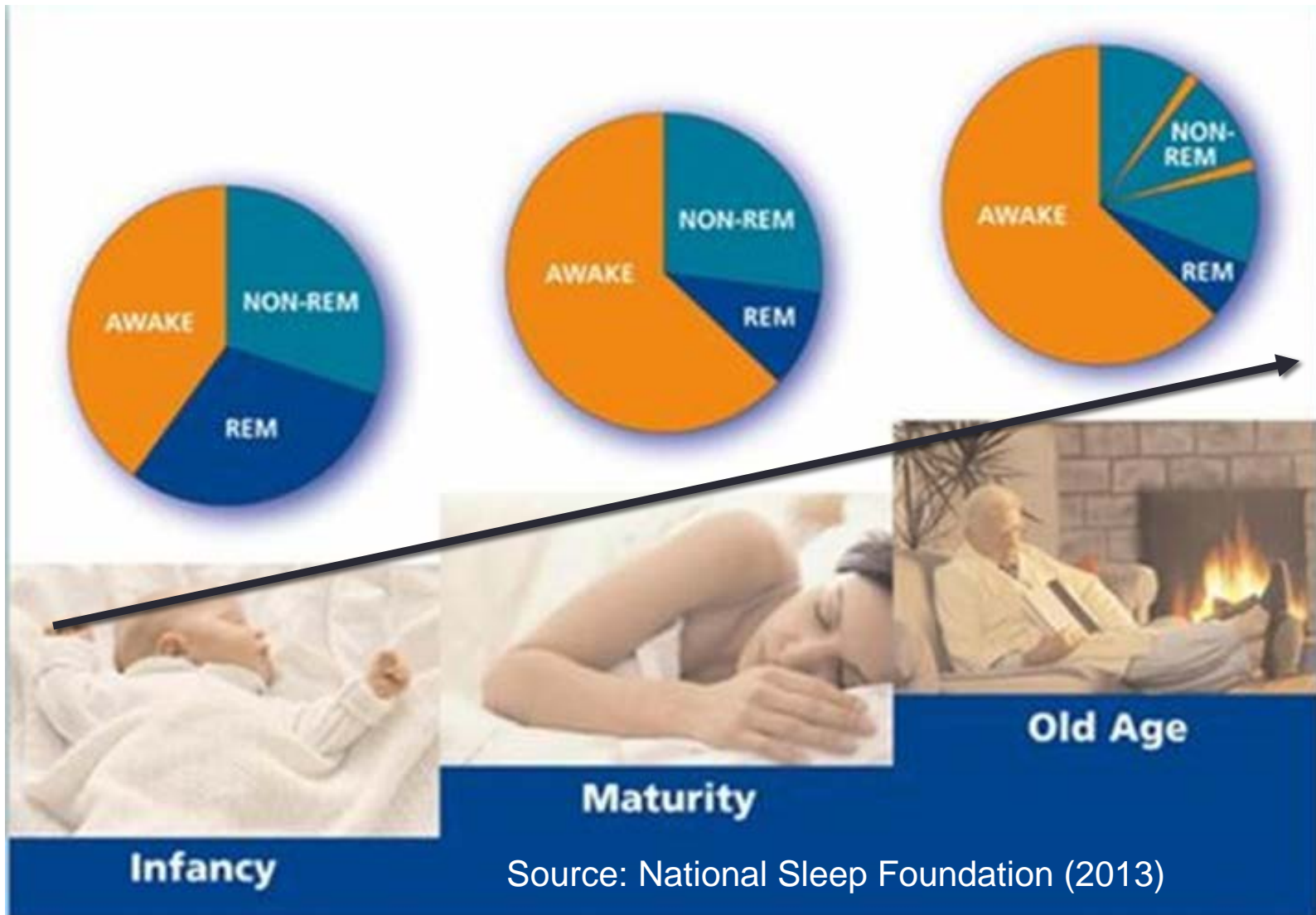# POVERTY AND SLEEP IN LATER LIFE

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The Frailty Process

Dysregulation of Homeostasis

Age

Physical & Cognitive Function

Aging Process and Frailty of Sleep

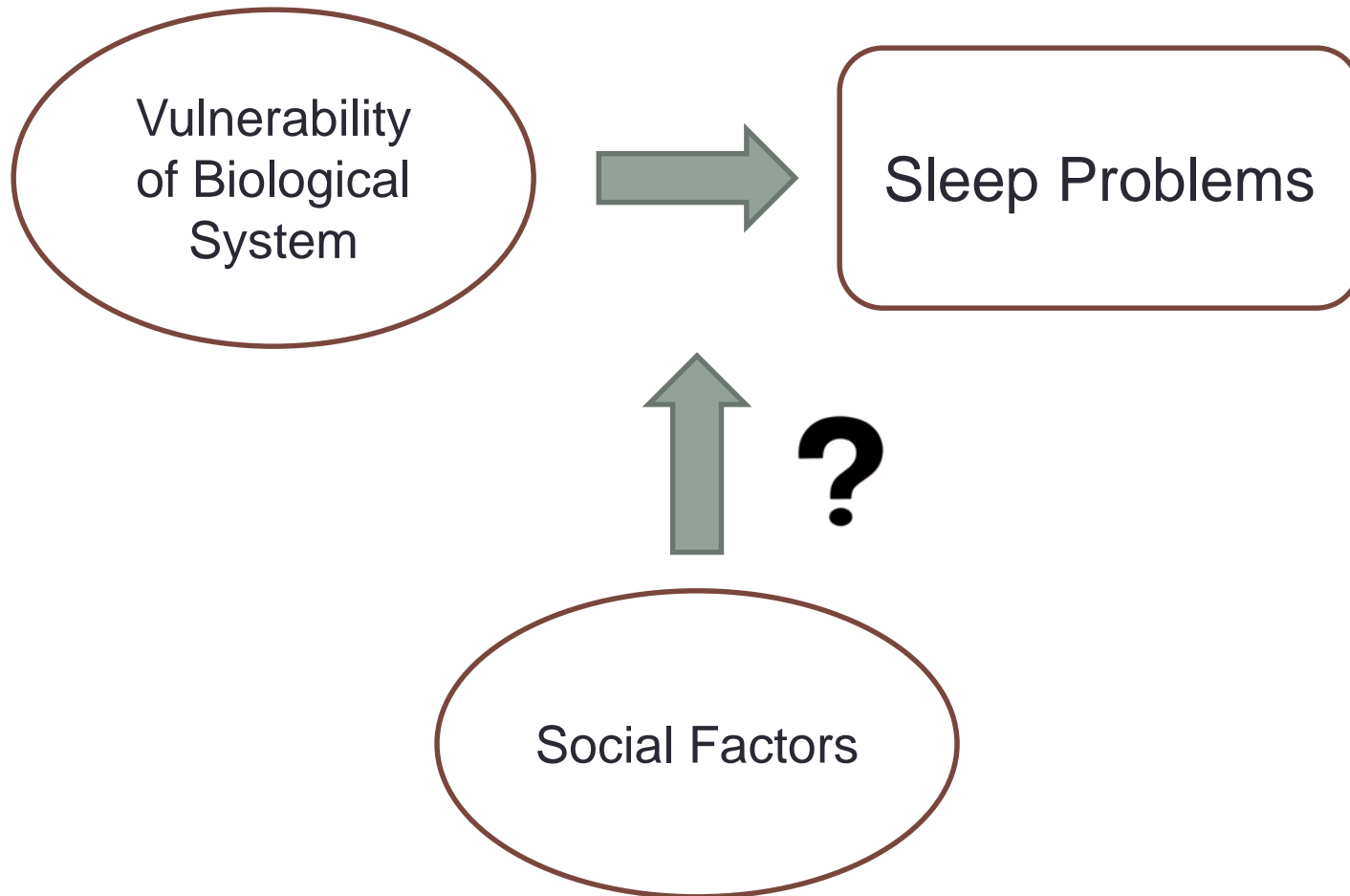Source: National Sleep Foundation (2013)

High Prevalence of Poor Sleep in Old Age

- Insufficient sleep
  - One-fourth of older adults have less than 6 hours of sleep (Liu et al., 2014)

- Insomnia symptoms
  - Nearly half of older adults have at least one insomnia symptom (Foley et al., 1995)
  - 40% of older adults have trouble falling asleep (Lauderdale et al., 2014)

Poor Sleep as a Risk Factor

Poor Sleep

Chronic Diseases

Excess Mortality
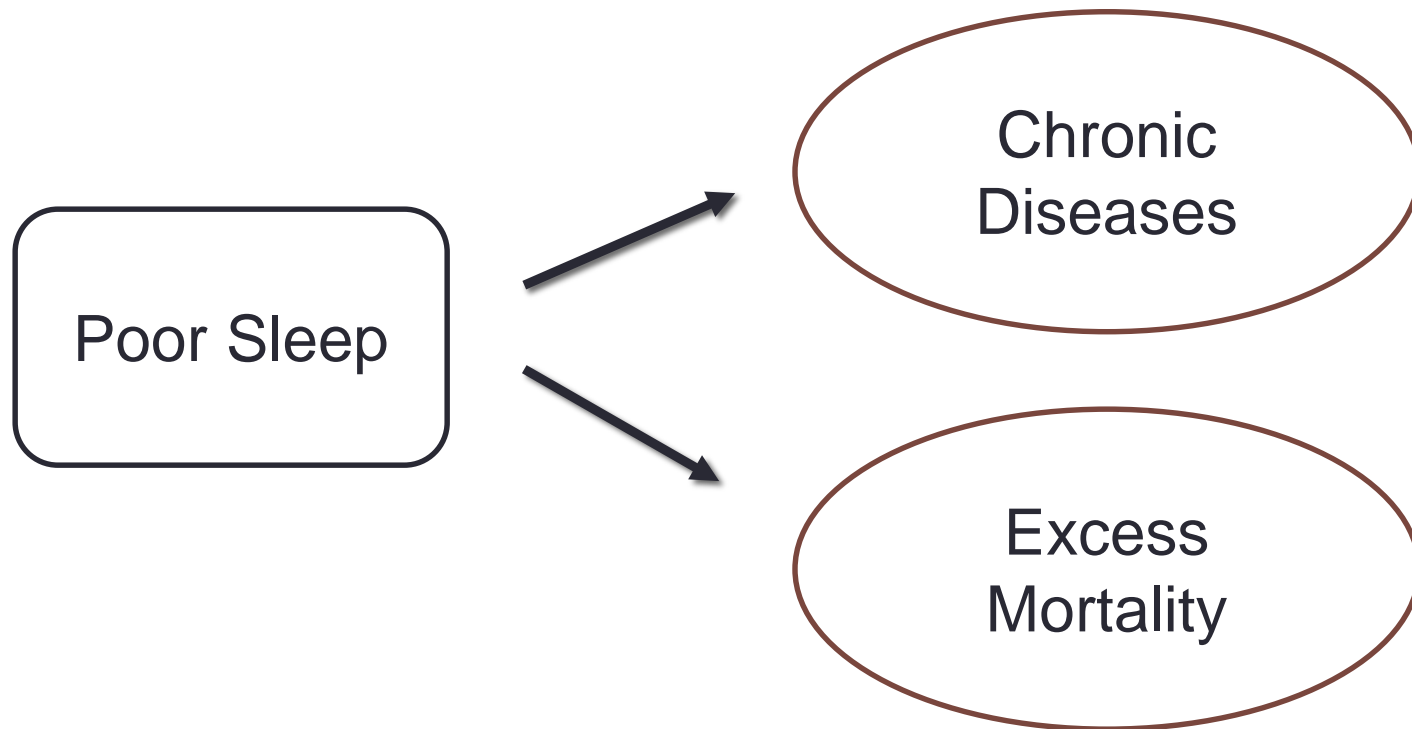
Causes of Frailty of Sleep in Old Age

Vulnerability of Biological System

Sleep Problems

Social Factors

?

Economic Hardship and Sleep in Old Age

- Economic well-being is an influential factor for healthy aging (Bowling, 2004; Schoeni, Martin, Andreski, & Freedman, 2005)
  - Older adults have a higher risk of becoming poor
  - Transitions in later life are associated with changes in economic status

How Economic Hardship Can Affect Sleep?

- Negotiation of sleep
  - Economic constraints
  - Social roles and social structures
- Stress process
  - Poverty as a stressor
  - Stress proliferation process
  - Stress, hormones, and physiological processes

Panel Study of Income Dynamics-Disability and Use of Time Supplement (DUST)

- Panel Study of Income Dynamics (PSID)
  - Started with a nationally representative sample of about 5000 families in1968
  - Annually before 1997 and biennially after
- 2013 Disability and Use of Time Supplement (DUST)
  - Either household head or spouse 60 or older as of Dec 31, 2012 (included single older adults)
  - N=1,693

Panel Study of Income Dynamics-Disability and Use of Time Supplement (DUST)

- DUST time-use data
  - Each older adult was asked to complete two (one weekday, one weekend day) 24-hour time diary
  - Started from 4am of the selected day
  - Used same codes from the American Time Use Survey for activities

Indicators of Sleep Problems

- Insufficient sleep (<6 hours)
  - Each adult was asked to complete two (one weekday, one weekend day) 24-hour time diary
  - Focus on longest sleep episode
- Difficulty falling asleep
  - When reported sleep in time diary, respondent was asked "Did it take you more than half an hour to fall asleep? (yes/no)"

Measures of Economic Hardship

- Linked DUST to the core PSID
- Current poverty (2013, DUST survey year)
  - Federal poverty line, adjusting for family size
  - 133% FPL
  - Approximately ~ 16%
- Long-term poverty (2009-2013)
  - Five years or more
  - Approximately ~ 8%

Analytical Strategy

- Multilevel models

$$Y_{ij} = \alpha + \beta T_{ij} + \gamma X_j + \delta Z_{ij} + \varepsilon \cdots\cdots (1)$$

$$Y_{ij} = \alpha + \beta TD_{ijt} + \gamma XH_{jt} + \delta ZH_{ijt} + \varepsilon \cdots\cdots (2)$$

- T: poverty status
- X: family-level covariates
- Z: individual-level covariates
- TD: duration of the exposure to poverty
- XH: history of family-level covariates
- ZH: history of individual-level covariates

Analytical Strategy (Cont.)

- Counterfactual models
  - Inverse probability treatment weight (IPTW)
  - Marginal structural model
    - 2 X 2 X 2 = 8 pathways

$$IPTW_{ijt} = \prod_{t=1}^{T} \frac{P(T_t = t_{it} \mid T_{it-1}, X_{i1})}{P(T_t = t_{it} \mid T_{it-1}, X_{it-1})}$$

Analytical Strategy (Cont.)

- Use classification and regression tree (CART) for estimating propensity score
  - Machine learning approach
  - Recursively partitioning the data space and fitting a simple prediction model within each partition.
  - The partitioning can be represented graphically as a decision tree
  - Non-parametric
- Stabilized weights
  - Do not increase or decrease bias, but can increase precision

Current Poverty and Sleep Problems

|	Insufficient Sleep Log odds ratio (SE)	Difficulty Falling Asleep Log odds ratio (SE)
A. Weekday Diary		
Unadjusted model	0.360 (0.161)*	0.755 (0.164)***
Regression-adjusted model	0.131 (0.202)	0.528 (0.208)*
IPTW model	0.206 (0.222)	0.392 (0.224)†
B. Weekend Diary		
Unadjusted model	0.297 (0.175)	0.847 (0.172)***
Regression-adjusted model	-.001 (0.219)	0.447 (0.221)*
IPTW model	-0.117 (0.241)	0.412 (0.235)*

Note. † P<.1; * P<.05; ** P<.01; *** P<.001

Long-Term Poverty and Sleep Problems

	Insufficient Sleep Log odds ratio (SE)	Difficulty Falling Asleep Log odds ratio (SE)
A. Weekday Diary		
Unadjusted model	0.418 (0.213)*	0.991 (0.212)***
Regression-adjusted model	-0.016 (0.269)	0.695 (0.276)*
IPTW model	0.140 (0.313)	0.558 (0.310) †
B. Weekend Diary		
Unadjusted model	0.445 (0.230)	0.829 (0.231)***
Regression-adjusted model	0.033 (0.289)	0.445 (0.294)
IPTW model	0.129 (0.324)	0.546 (0.324)

Note. † P<.1; * P<.05; ** P<.01; *** P<.001
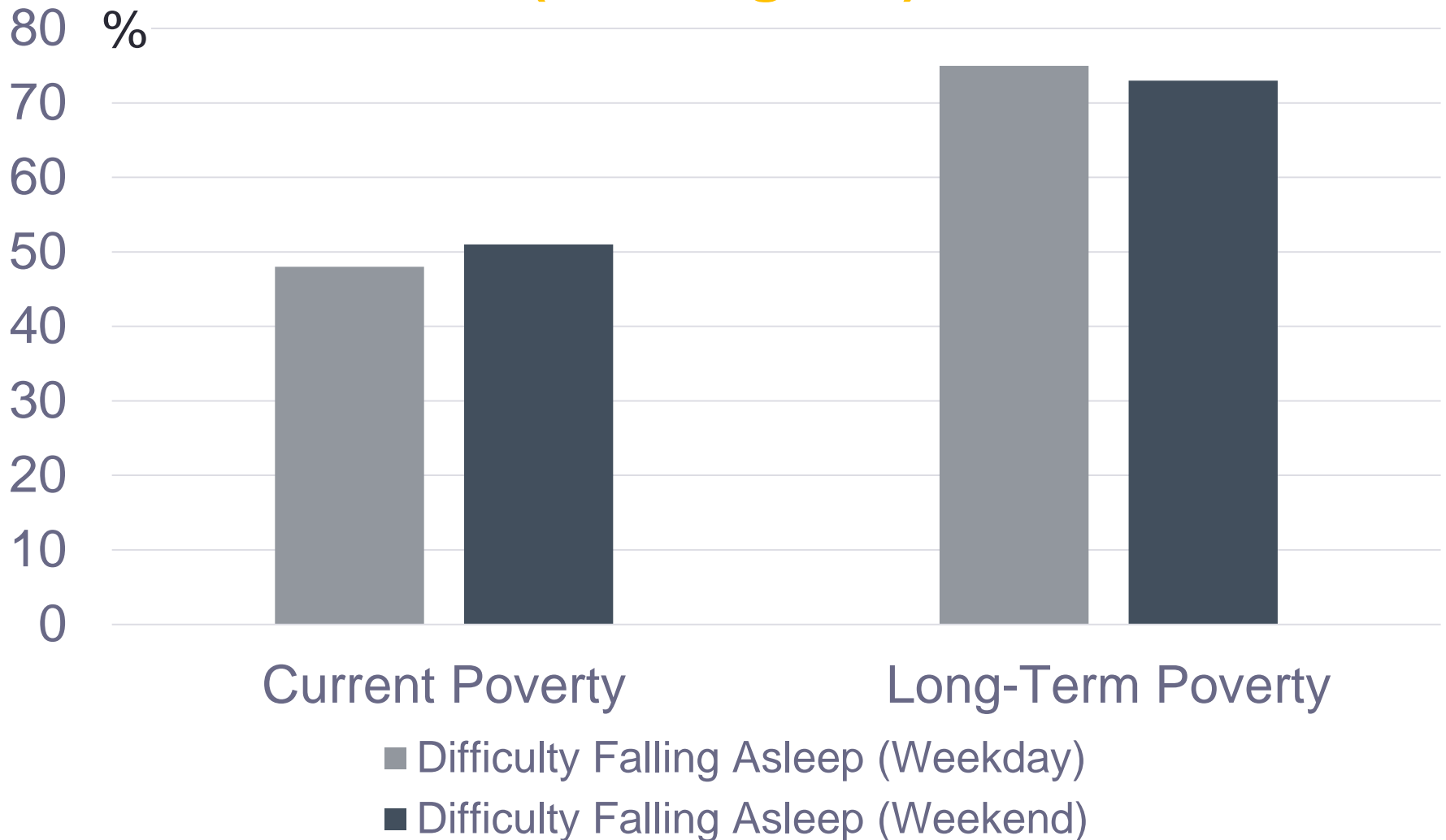
Discussion

- Consistent patterns for weekdays and weekends

- Non-effect of insufficient sleep
  - Coping: older adults strive to maintain normal sleep hours in the face of economic hardship
  - Additional analysis on sleep duration showed small positive effect
 - Coping may be less successful for sleep initiation

Limitations

- Limitations
  - Not a nationally representative sample of older adults
  - Income and poverty information not available between the two interview years
  - Measurement error of sleep indicators
  - Ignorability assumption

Conclusion

- This study adds to the understanding of determinants of sleep problems in old age
  - Sleep health is consequential for older adults' health and well-being
- Poverty has no effect on insufficient sleep
- Poverty can reduce older adults' abilities to initiate sleep
  - Effects for both current and long-term poverty
  - Effects for both weekdays and weekend days
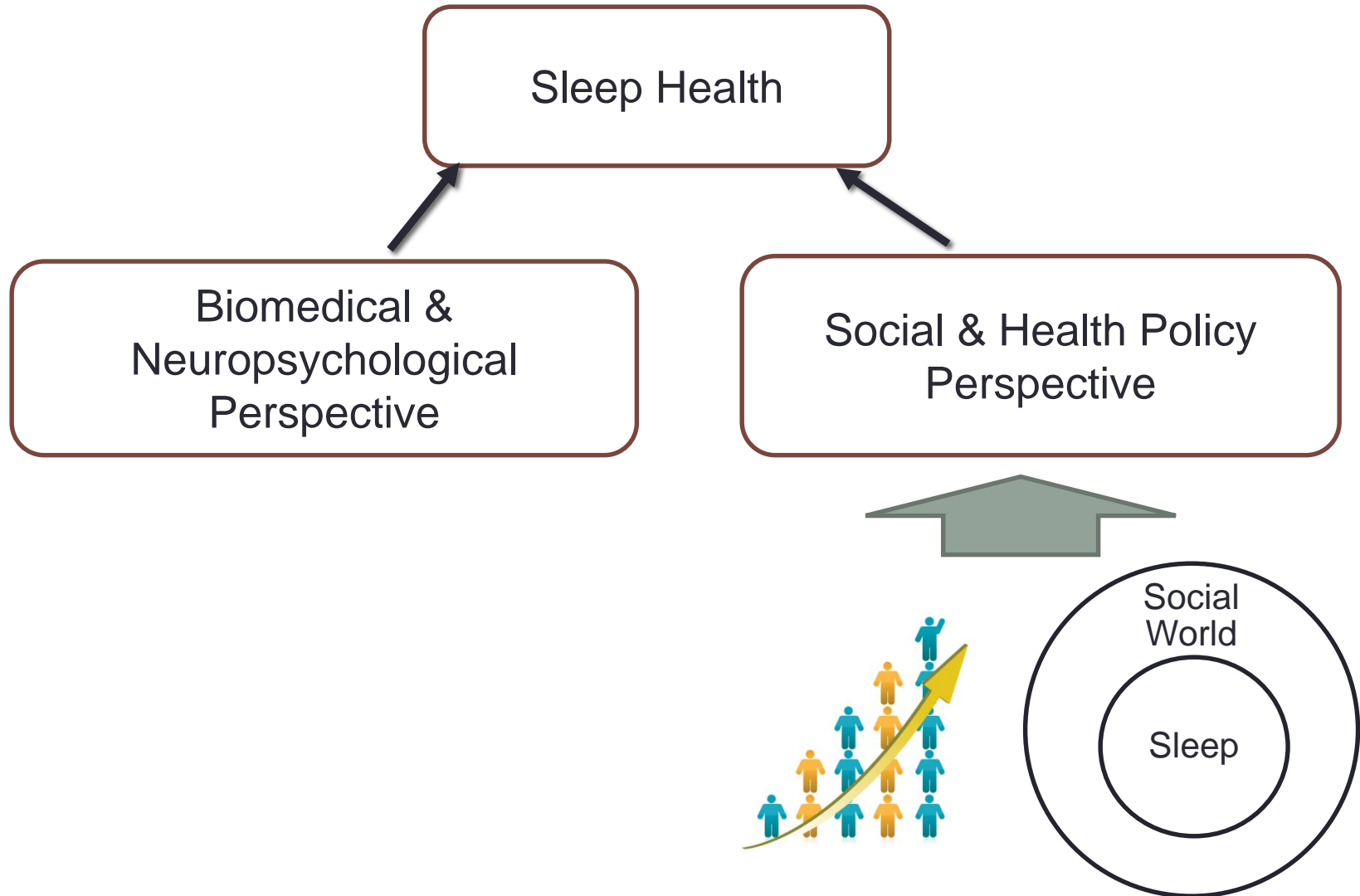
Acknowledgement

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Thank you !