

# Insomnia and objective assessment of sleep patterns

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# Question

- Non-Restorative sleep (NRS) and # Wakes have been reported to be associated based on subjective report
- There is a need to assess whether this finding can be supported with objective data.

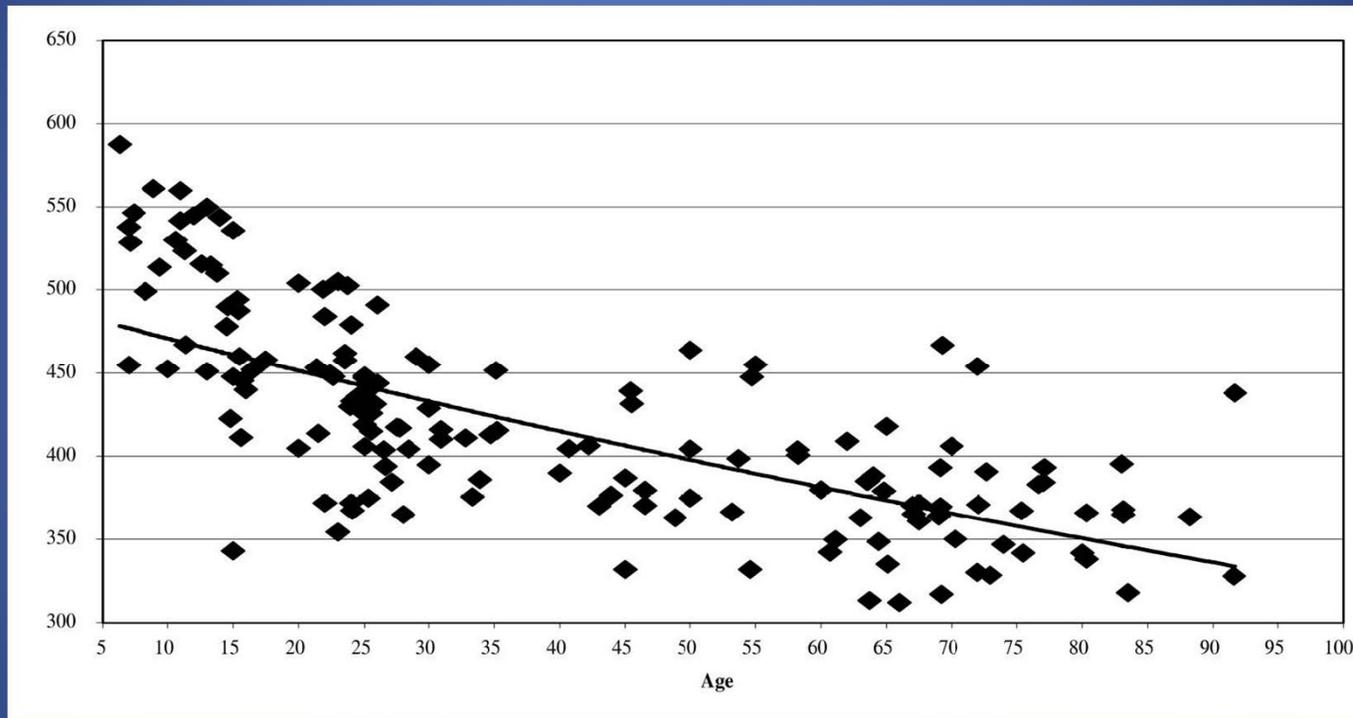
What is the relationship between subjective report and objective data?

# Subjective vs Objective

- SHHS 5 yr followup (Silva, 2007)
  - TST Habitual - home PSG (59 min)  $r=0.18$
  - “self-estimate of sleep parameters may be affected by ethnicity or socioeconomic status.”
- CARDIA (Lauderdale 2008)
  - TST Habitual - actigraphy (0.8 hours)  $r=0.47$
  - “self-reports and measured sleep varied by health, sociodemographic, and sleep characteristics.”
- Penn State Cohort
  - TST: Habitual – laboratory PSG
    - Normal 1.0 hour
    - Insomniac 0.4 hour

# Age & Sleep duration: objective

Objective sleep duration decreases with age



Total sleep time ↓↓

n=3577

Ohayon M et al. Sleep 2004;27:1255-73.

# Age & Sleep Duration: Subjective

- SHHS 5 yr follow up (Silva, 2007)
  - $\leq 67$  yrs vs  $>67$  yrs
    - Habitual: 424 min vs 421 min
- Subjective sleep duration remains constant with age in the Penn State Cohort (Age range 20-100 yrs)

# Gender

- Women tend to sleep better than men (Bixler 2009)
- However, women are more likely to complain of insomnia

# Subjective vs Objective Relationship

- Typically overestimate sleep duration by about 1 hour independent of where or how the objective data were collected
- Age and gender have a unique association with sleep reports
- Influences on subjective sleep duration are complex and multi-factorial including:
  - Age
  - Gender
  - Stress
  - Sleep complaints
  - SES
  - Life style
    - Alcohol
    - Smoking
    - Exercise

Bixler, 2009

- Is it of any diagnostic value to combine subjective and objective in the diagnosis of insomnia?

# Sleep Lab Measures and Diagnosis and Treatment of Insomnia

- Majority of sleep specialists supported the use of sleep lab in the diagnosis and treatment of insomnia (1970s, 1980s ICSD)
- Some investigators suggested that sleep lab is of no use in the evaluation of insomnia (Kales & Bixler 1982, Kales & Kales 1984, Vgontzas 1994, 1995)
- AASM guidelines: sleep lab is not indicated in the routine evaluation of insomnia (2002)
- Objective sleep measures may predict severity (Vgontzas 1998,2001)

# Chronic Insomnia

## Clinical implications (Diagnosis)

- Objective measures of sleep are a reliable index of the severity of insomnia
- Insomnia with objective short sleep duration is associated with significant morbidity and mortality similarly to sleep apnea
  - Hypertension (Vgontzas Sleep 2009)
  - Diabetes (Vgontzas Diabetes Care 2009)
  - Mortality (Vgontzas 2009)
- Objective measures may lead to meaningful phenotypes of insomnia

- Association between PSG variables and sleep complaints based on the Penn State Cohort
- Preliminary results

# Penn State Cohort

- General Population
- Age Range 20-100 years
- Phase I = Telephone
  - Men 4,364 (resp rate = 73.5%)
  - Women 12,219 (resp rate = 74.1%)
- Phase II = Sleep Laboratory
  - Men 741 (resp rate = 67.8%)
  - Women 1,000 (resp rate = 65.8%)

# Sample

- Single night PSG
  - Fixed 8 Hr recording
- Selected AHI<5
- N=1345
  - Men=543
  - Women=852
- NRS = 14.7%
- DFA = 11.4%
- DMS = 16.5%

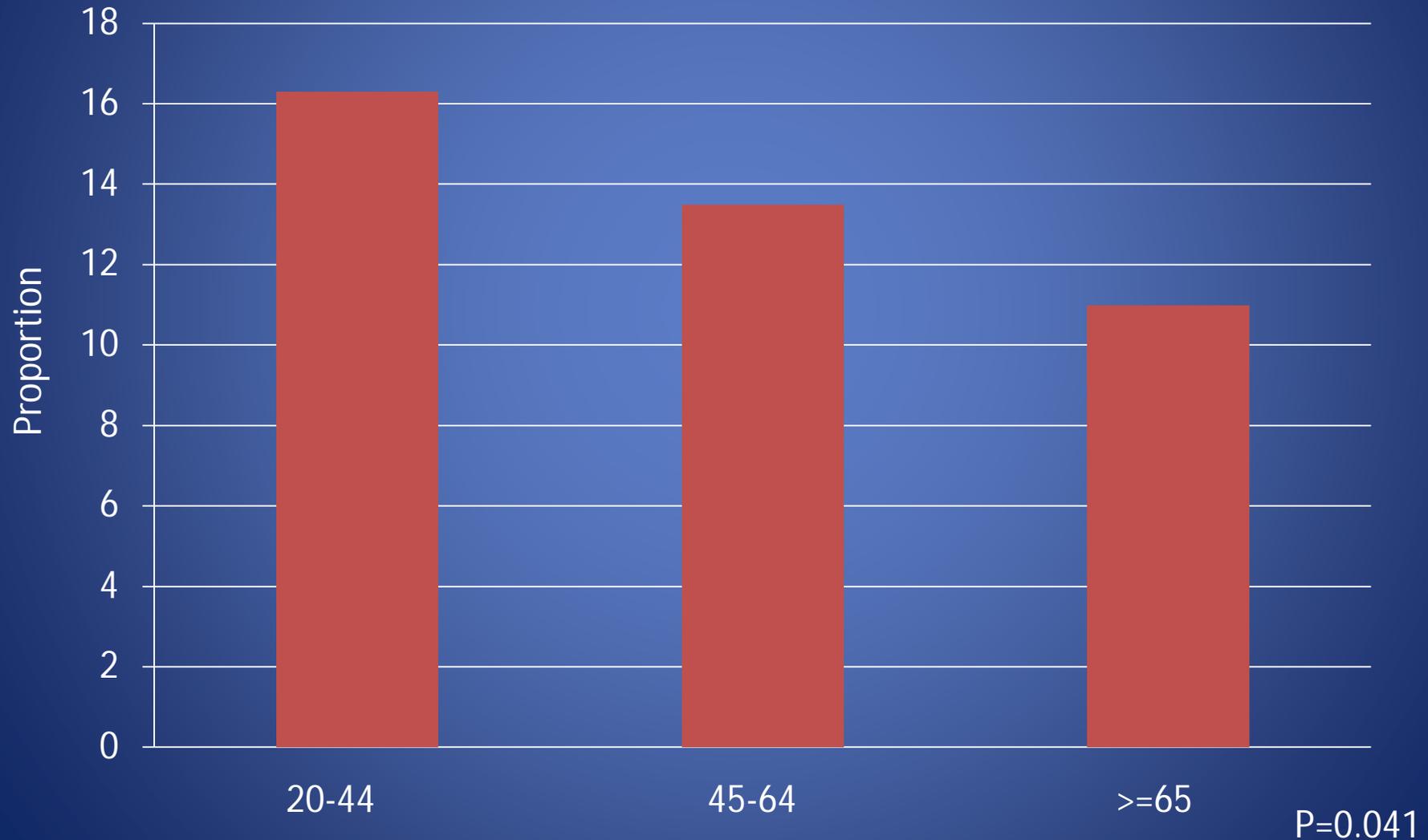
# Outcome Variables

- Non-Restorative sleep (NRS)
- Difficulty Falling Asleep (DFA)
- Difficulty Maintaining Sleep (DMS)
- Insomnia (INS)
- Excessive Daytime Sleepiness (EDS)

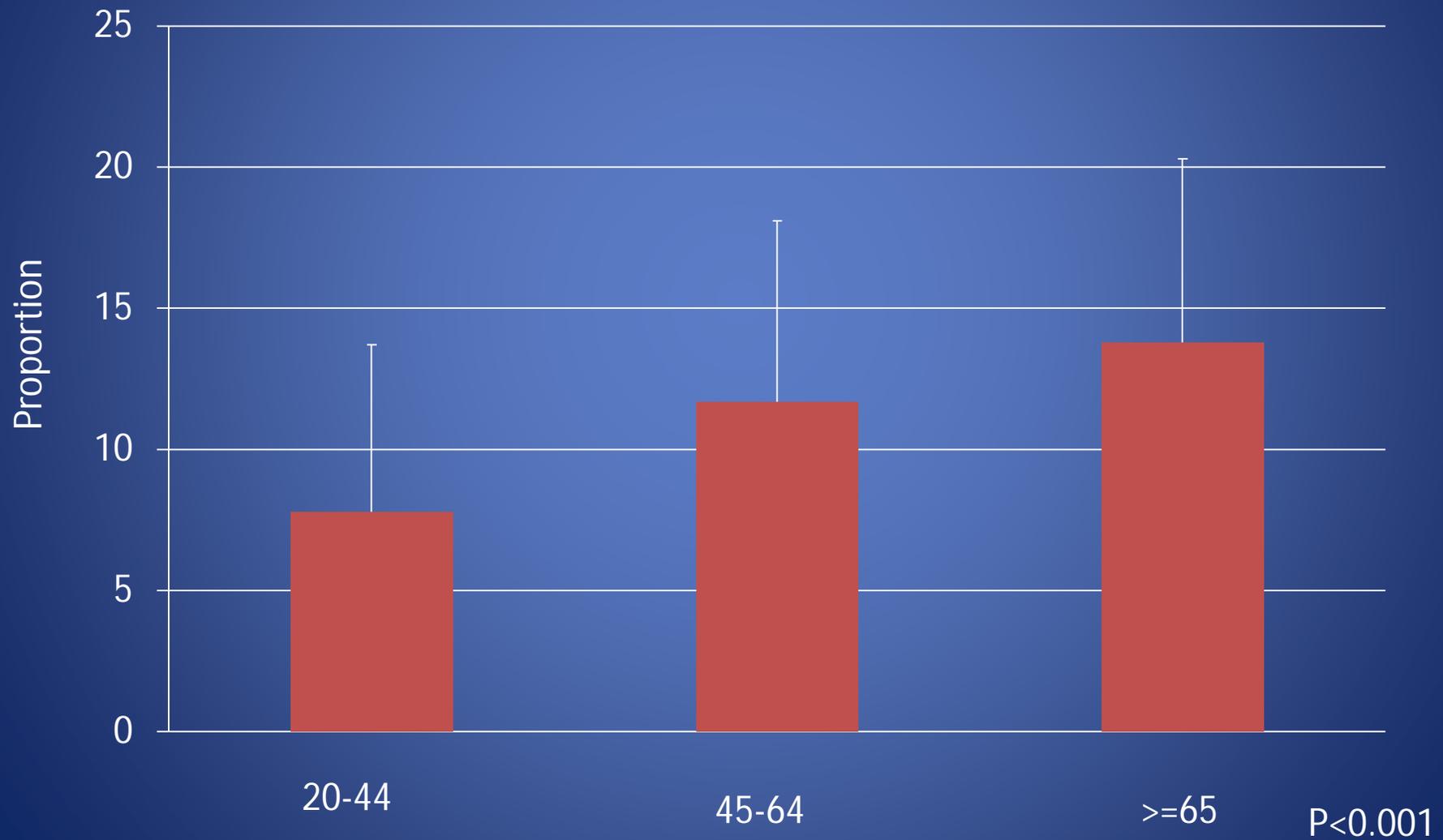
# PSG Variables

- Sleep Latency (SL)
- Sleep Efficiency (SE)
- # wakes (#W)
- Difficulty Restoring Sleep (DRS)

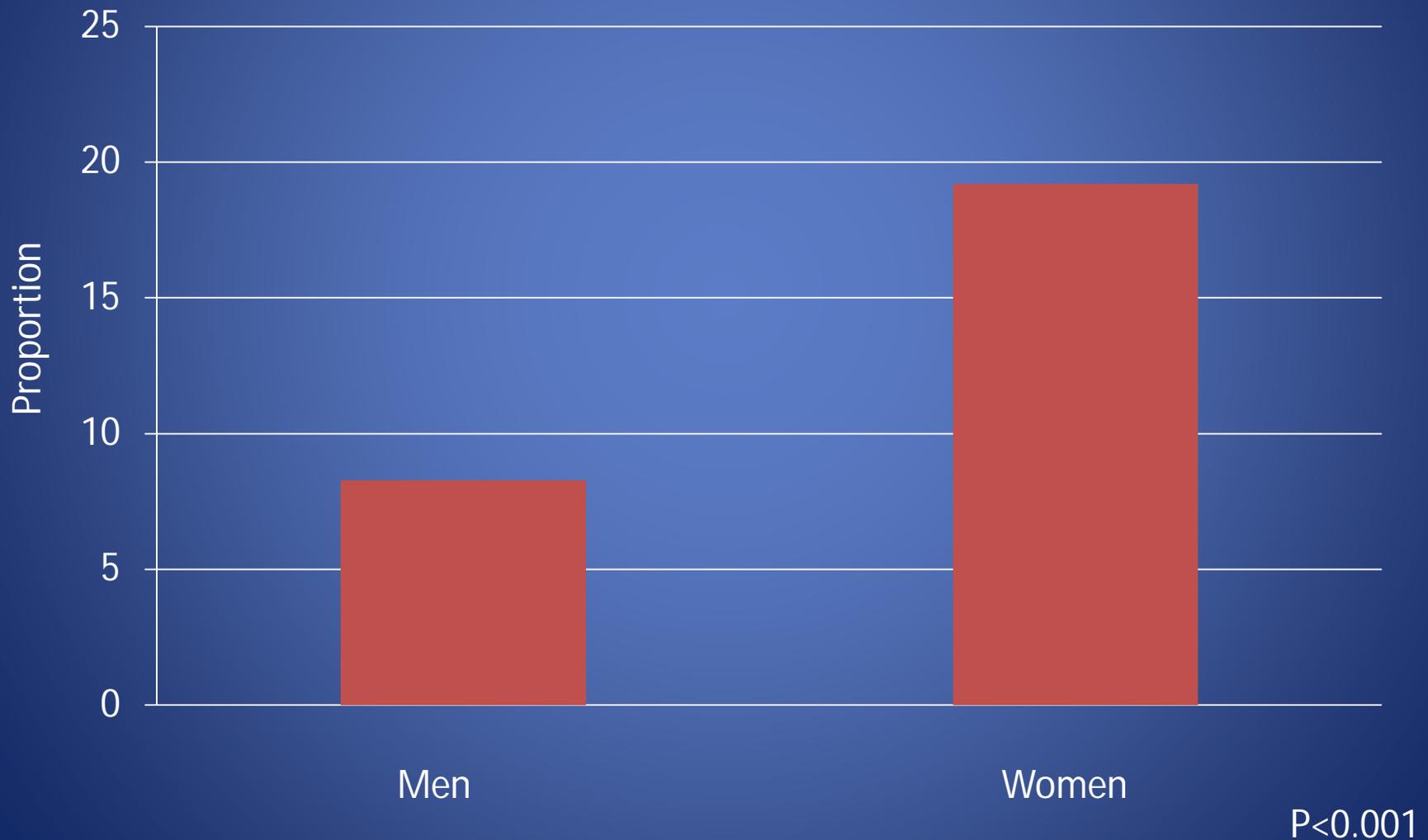
# Non-Restorative Sleep: Age



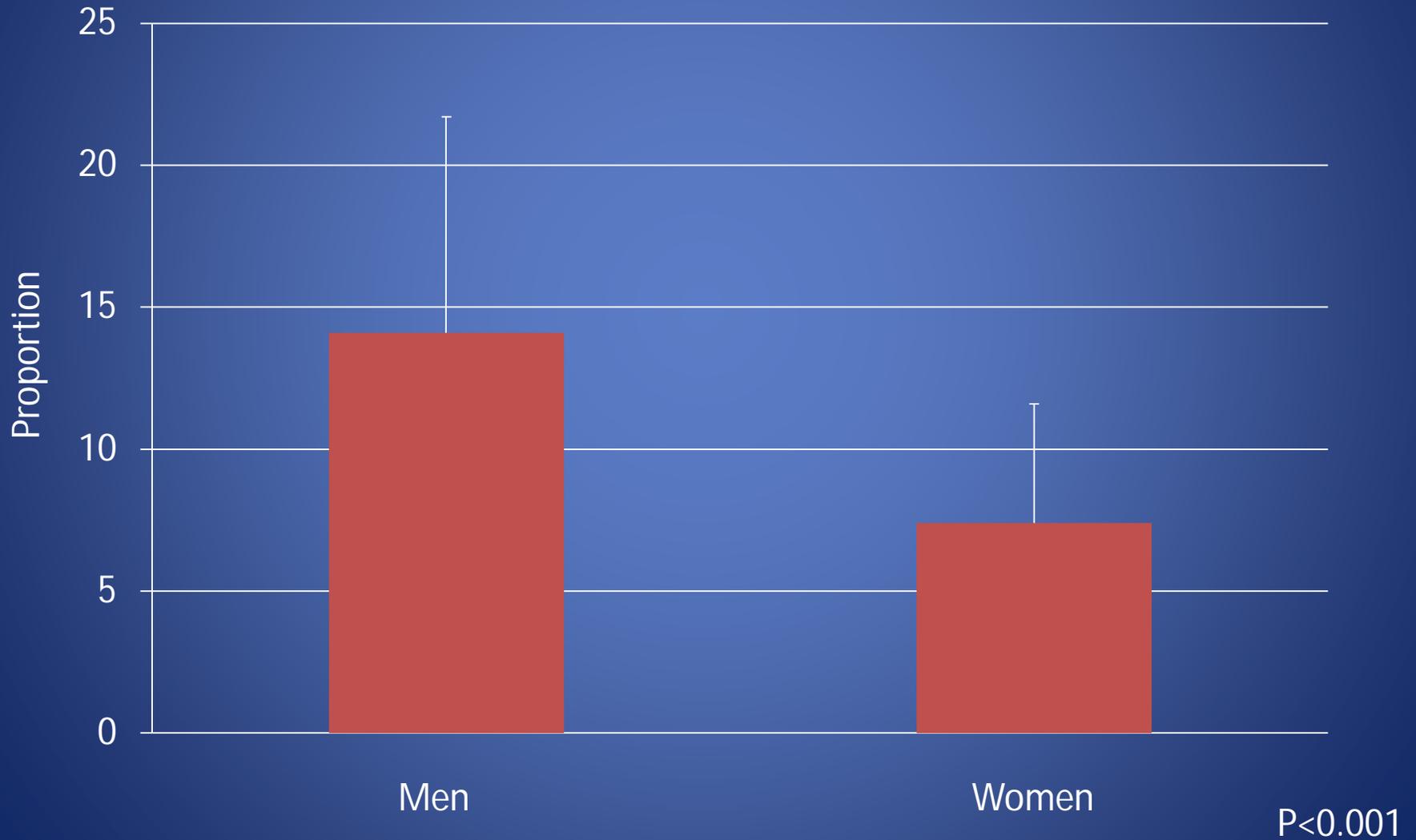
# # Wakes: Age



# Non-Restorative Sleep: Gender



# # Wakes: Gender



# Interaction

- Strong interaction between age and gender observed with # Wakes.
- Thus, analysis was completed on each gender separately
- Logistic Regression
  - Controlled for age, BMI, Minority

# Significant OR's associated with each outcome variable for Men

	BMI	Minority	PSG		Depression
NRS	1.098				8.509
DFA			DRS	1.057	
DMS	1.116				4.593
INS					11.489
EDS	1.055		DRS	1.051	8.427

# Significant OR's associated with each outcome variable for Women

	BMI	Minority		PSG	Depression
NRS	1.034		#W	.930	2.415
DFA		2.409	SL	1.008	3.100
DMS	1.038		SE	.981	2.844
INS		2.404	SE	.978	2.556
EDS	1.073				4.526

# Significant OR's for different definitions of NRS for Men

Model		BMI	Minority	PSG	Depression
I	NRS	1.091			7.674
II	NRS	1.003			8.841
III	NRS	1.097			8.042

I Controlling for DFA & DMS

II Controlling for habitual sleep duration

III Controlling for DFA, DMS & habitual sleep duration

# Significant OR's for different definitions of NRS for Women

Model		BMI	Minority	PSG	Depression
I	NRS	1.022		#W 0.931	
II	NRS	1.031			2.413
III	NRS	1.033		#W 0.874	

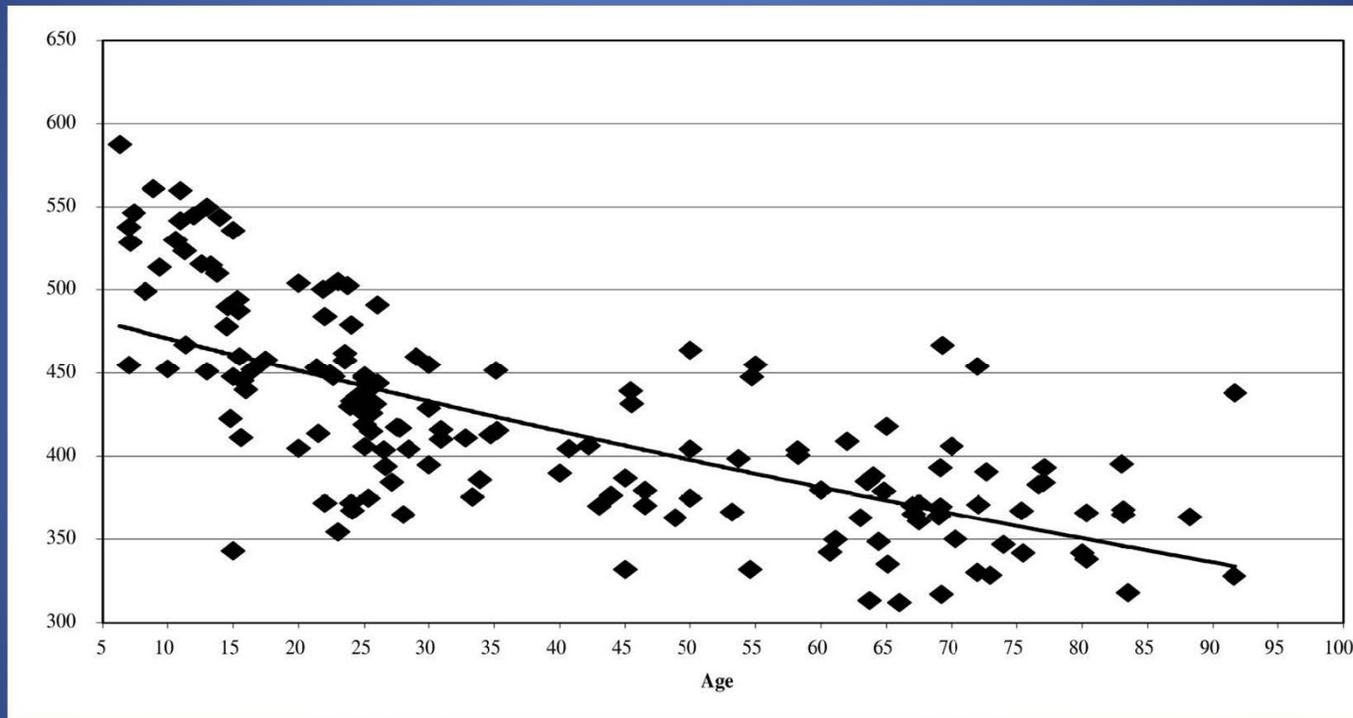
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# Age & Sleep duration: objective

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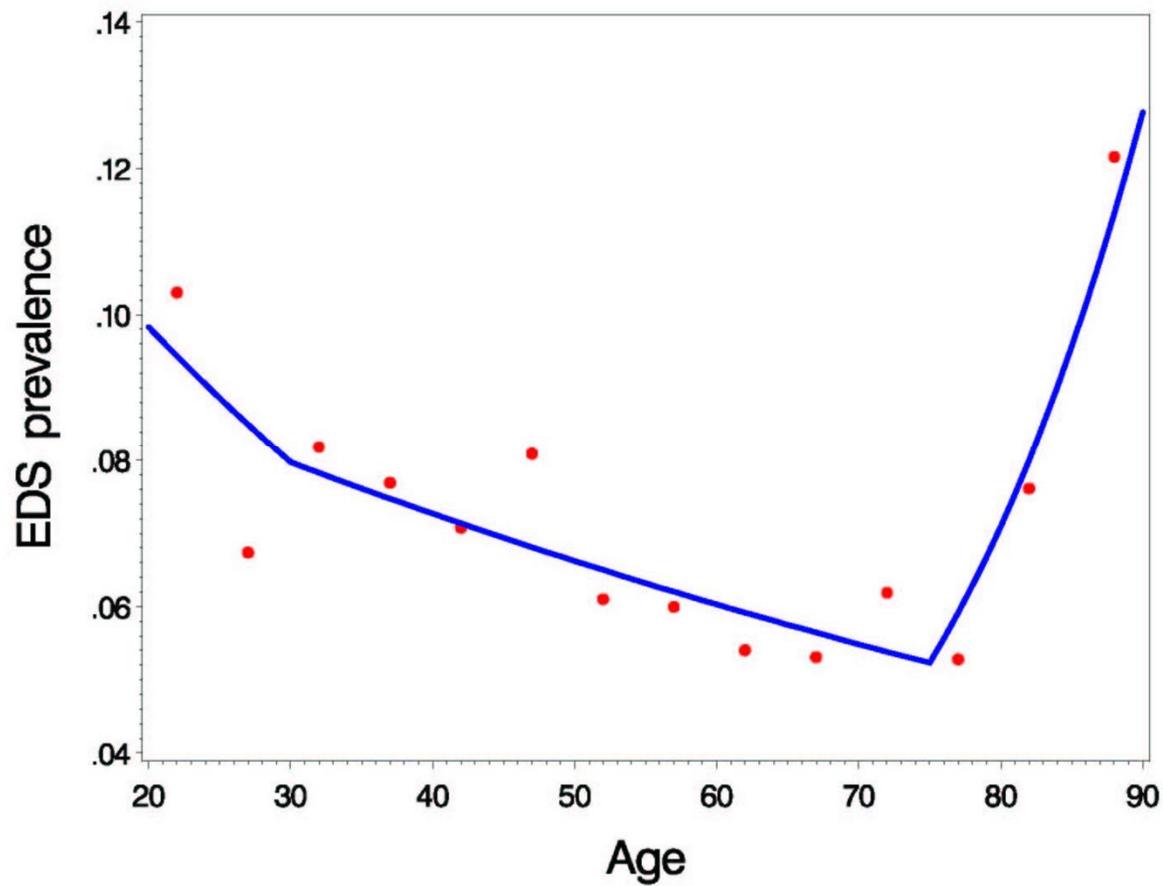


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# Prevalence Subjective EDS (Age)



$P < 0.0001$

# EDS associated with NRS

- Model EDS as outcome
- Controlled for age, BMI, gender, DFA, DMS, habitual sleep duration, and depression
- Final model
  - Age OR = 0.973
  - BMI OR = 1.063
  - Depression OR = 5.068
  - NRS OR = 5.910

# Summary

## Preliminary Results

- Depression and obesity had a consistent and strong relationship with the outcome variables
- PSG variables appear to contribute less to the association
- Men and women appear to differ in terms of the relationship between PSG and outcome variables
- NRS is common in individuals with many different health as well as primary sleep problems thus the objective mechanism may be multifactorial
- Further refinement of this association is warranted