

Age and Medical Conditions

Analysis Report

HPP 10K Dataset

Ages 40-70 | N = 23,473

Conditions with $n \geq 100$ cases

37 significant associations

22 increase with age | 15 decrease with age

EXECUTIVE SUMMARY

STUDY DESIGN

- Cross-sectional analysis of HPP 10K cohort
- Age range: 40-70 years (94% of cohort)
- Sample size: 23,473 subjects
- Minimum cases per condition: 100

KEY FINDINGS

37 conditions show significant age associations ($p<0.05$):

- 22 conditions INCREASE with age
- 15 conditions DECREASE with age

TOP 5 CONDITIONS INCREASING WITH AGE:

- Osteoarthritis: 2.50x odds per decade (n=611)
- Glaucoma: 2.42x odds per decade (n=161)
- Ischemic Heart Disease: 2.39x odds per decade (n=285)
- Hypertension: 2.36x odds per decade (n=2494)
- Retinal detachment: 2.23x odds per decade (n=200)

TOP 5 CONDITIONS DECREASING WITH AGE:

- Polycystic Ovary Disease: 0.53x odds per decade (n=582)
- Endometriosis and Adenomyosis: 0.67x odds per decade (n=278)
- Allergy: 0.71x odds per decade (n=4220)
- Sinusitis: 0.79x odds per decade (n=752)
- B12 Deficiency: 0.79x odds per decade (n=1110)

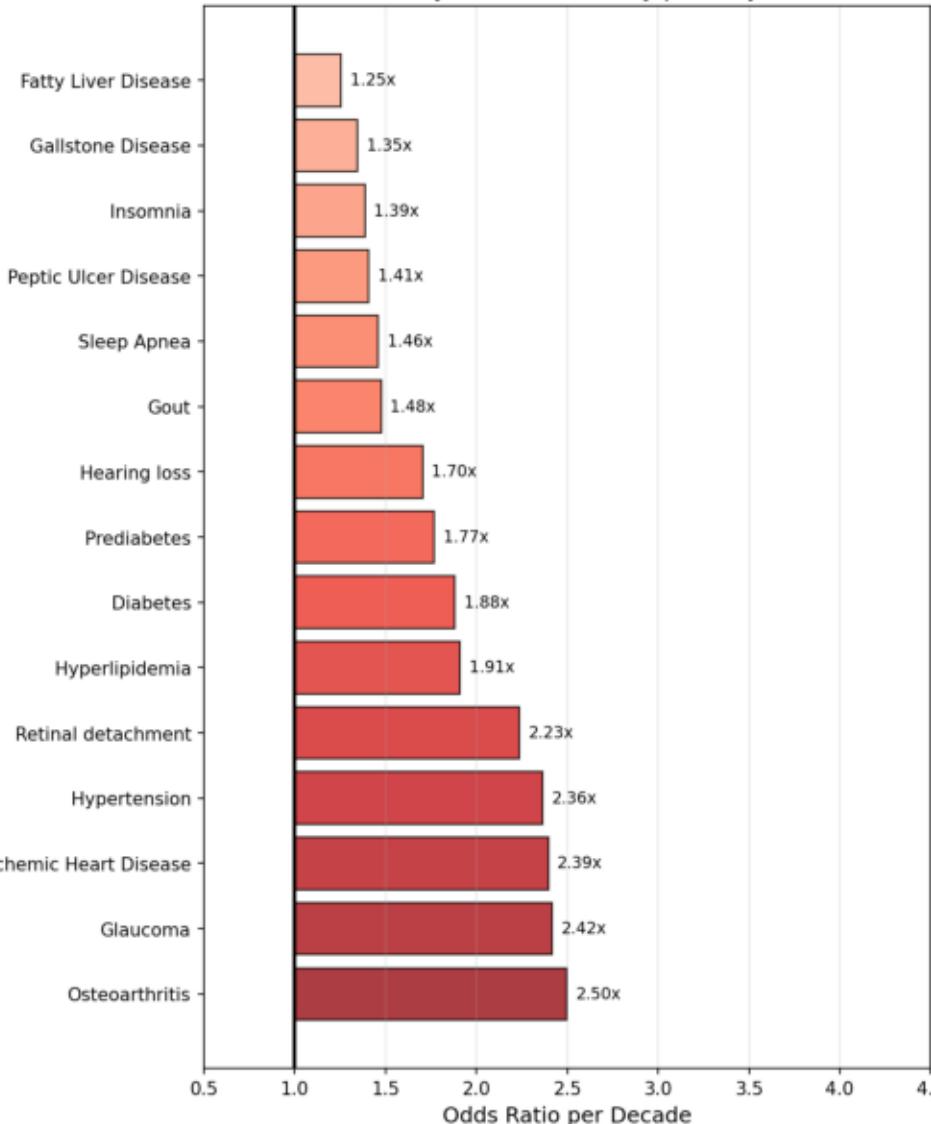
INTERPRETATION

Cardiovascular conditions (AF, IHD, hypertension) and sensory conditions (glaucoma, hearing loss) show expected age-related increases. Mental health conditions show decreasing prevalence, likely due to cohort effects and survival bias.

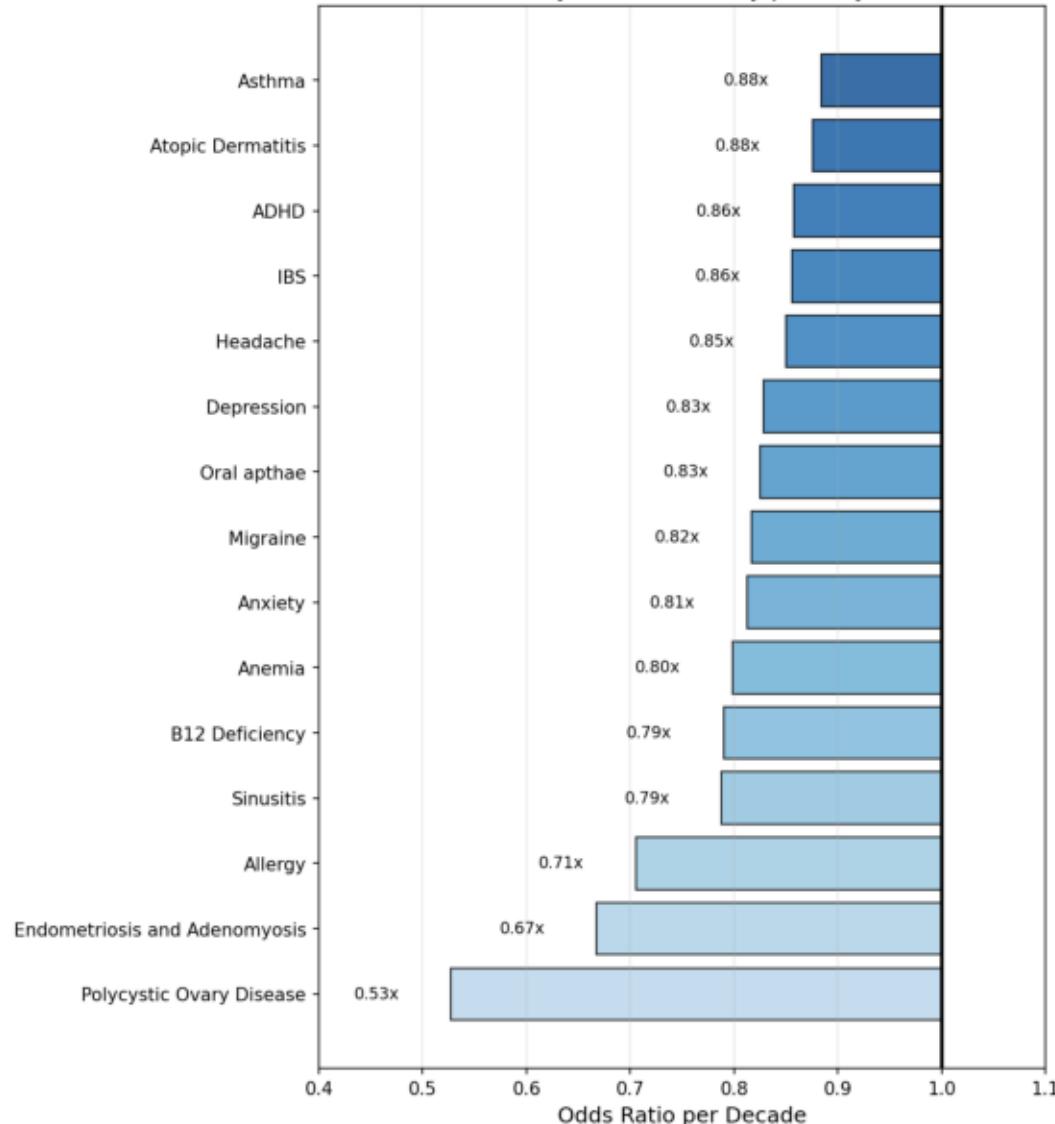
Summary: Odds Ratio per Decade of Age

Age Effect on Medical Conditions: Summary
(Odds Ratio = 2.0 means twice as likely per decade of age)

Conditions that INCREASE with Age
 (How many times more likely per 10 years)



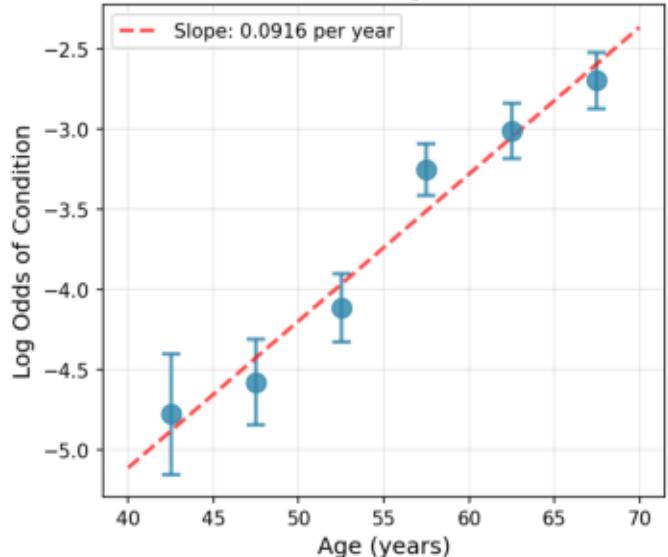
Conditions that DECREASE with Age
 (How many times less likely per 10 years)



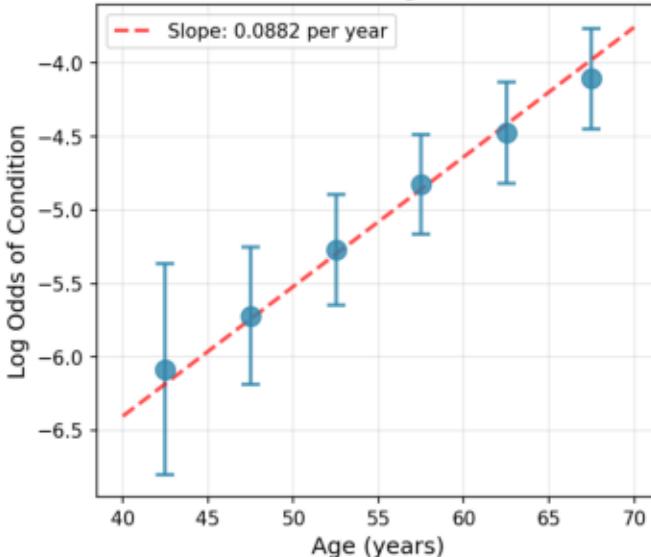
Top Conditions Increasing with Age (Log Odds)

Top 6 Conditions INCREASING with Age
(Log Odds vs Age)

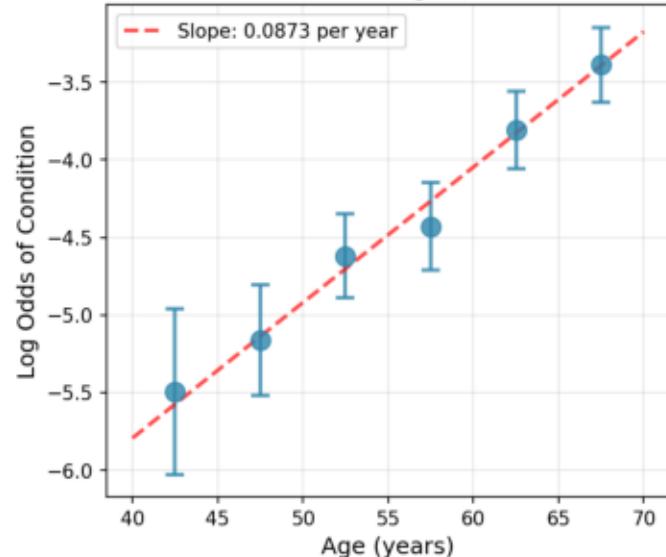
Osteoarthritis
↑ increases with age (n=611) ***



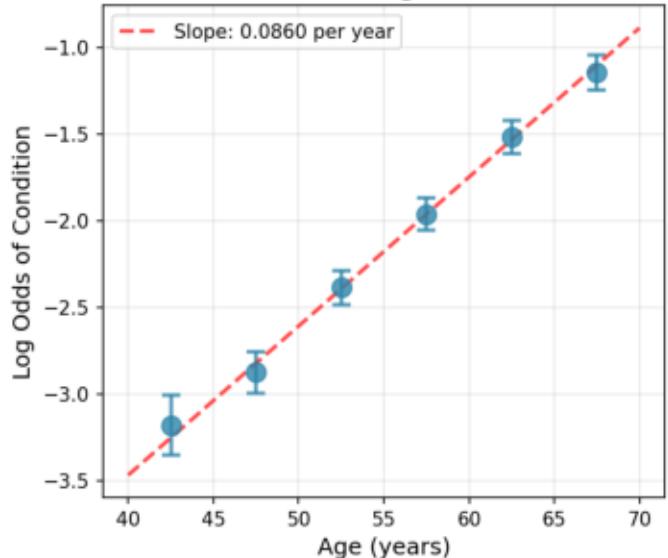
Glaucoma
↑ increases with age (n=161) ***



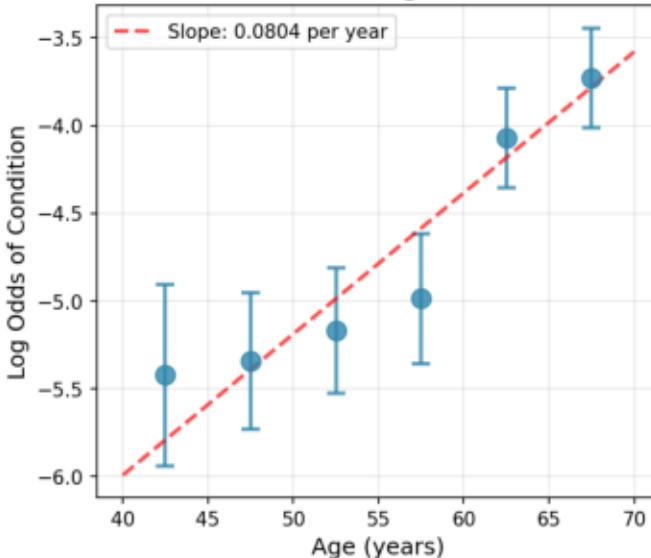
Ischemic Heart Disease
↑ increases with age (n=285) ***



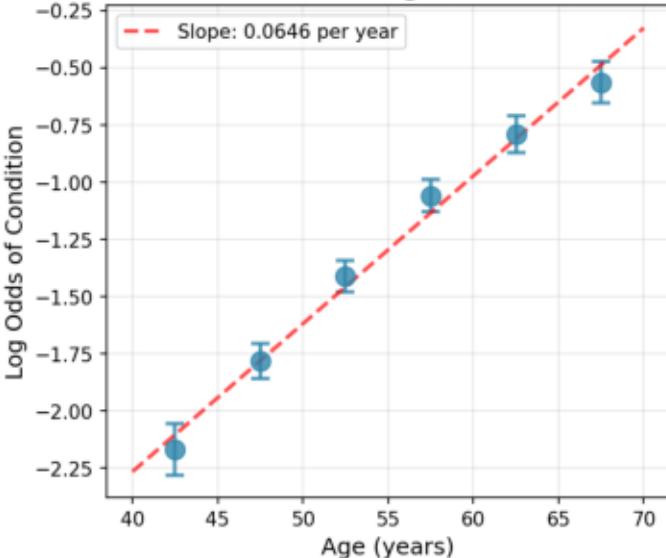
Hypertension
↑ increases with age (n=2494) ***



Retinal detachment
↑ increases with age (n=200) ***



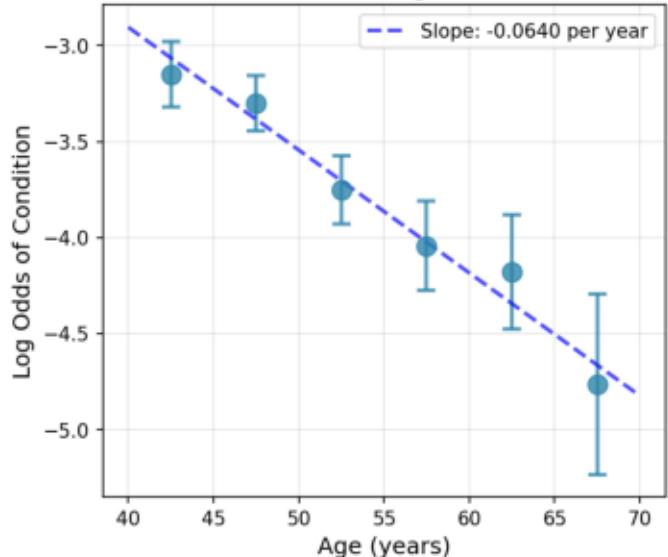
Hyperlipidemia
↑ increases with age (n=5013) ***



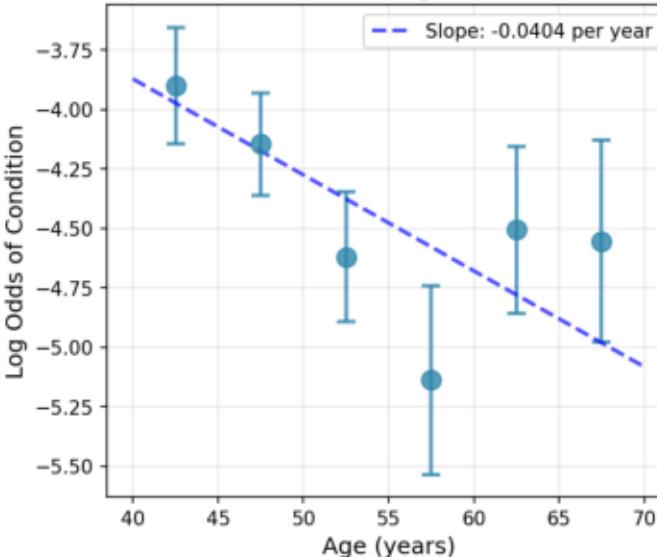
Top Conditions Decreasing with Age (Log Odds)

Top 6 Conditions DECREASING with Age
(Log Odds vs Age)

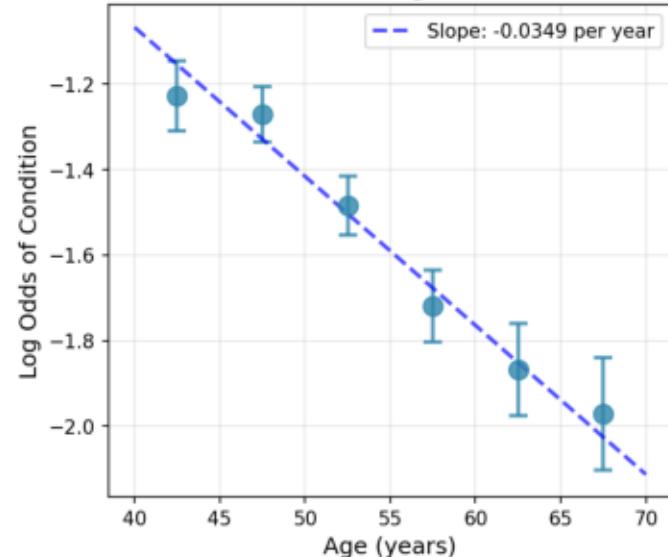
Polycystic Ovary Disease
↓ decreases with age (n=582) ***



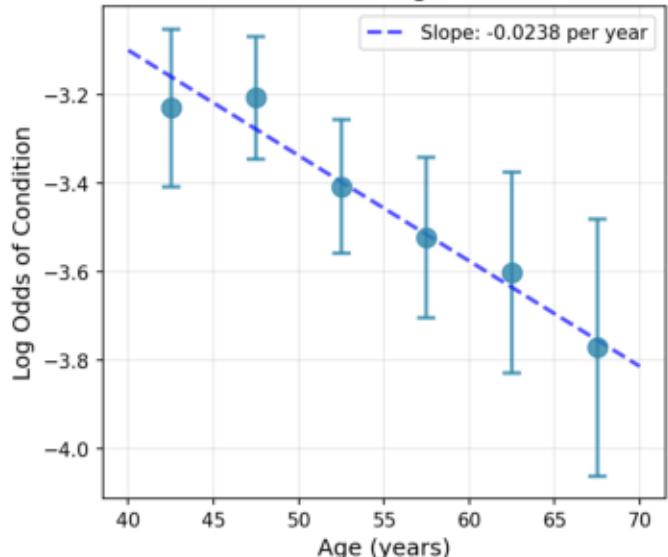
Endometriosis and Adenomyosis
↓ decreases with age (n=278) ***



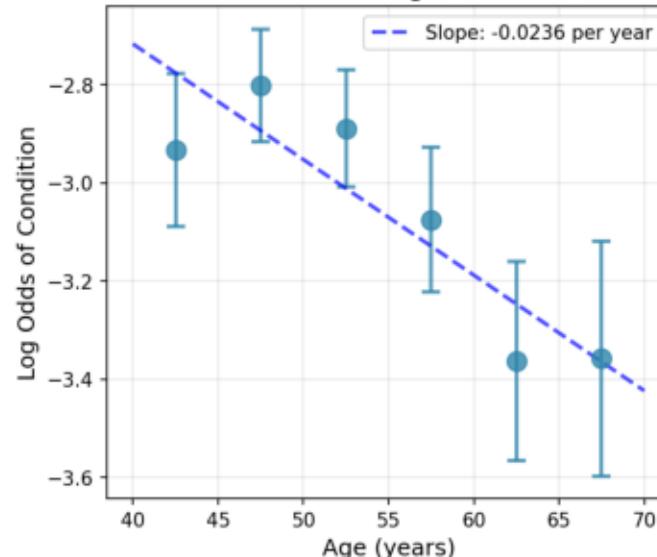
Allergy
↓ decreases with age (n=4220) ***



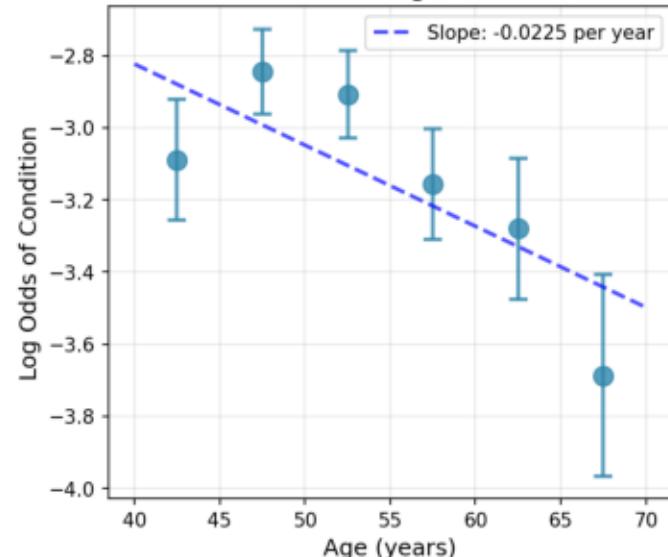
Sinusitis
↓ decreases with age (n=752) ***



B12 Deficiency
↓ decreases with age (n=1110) ***

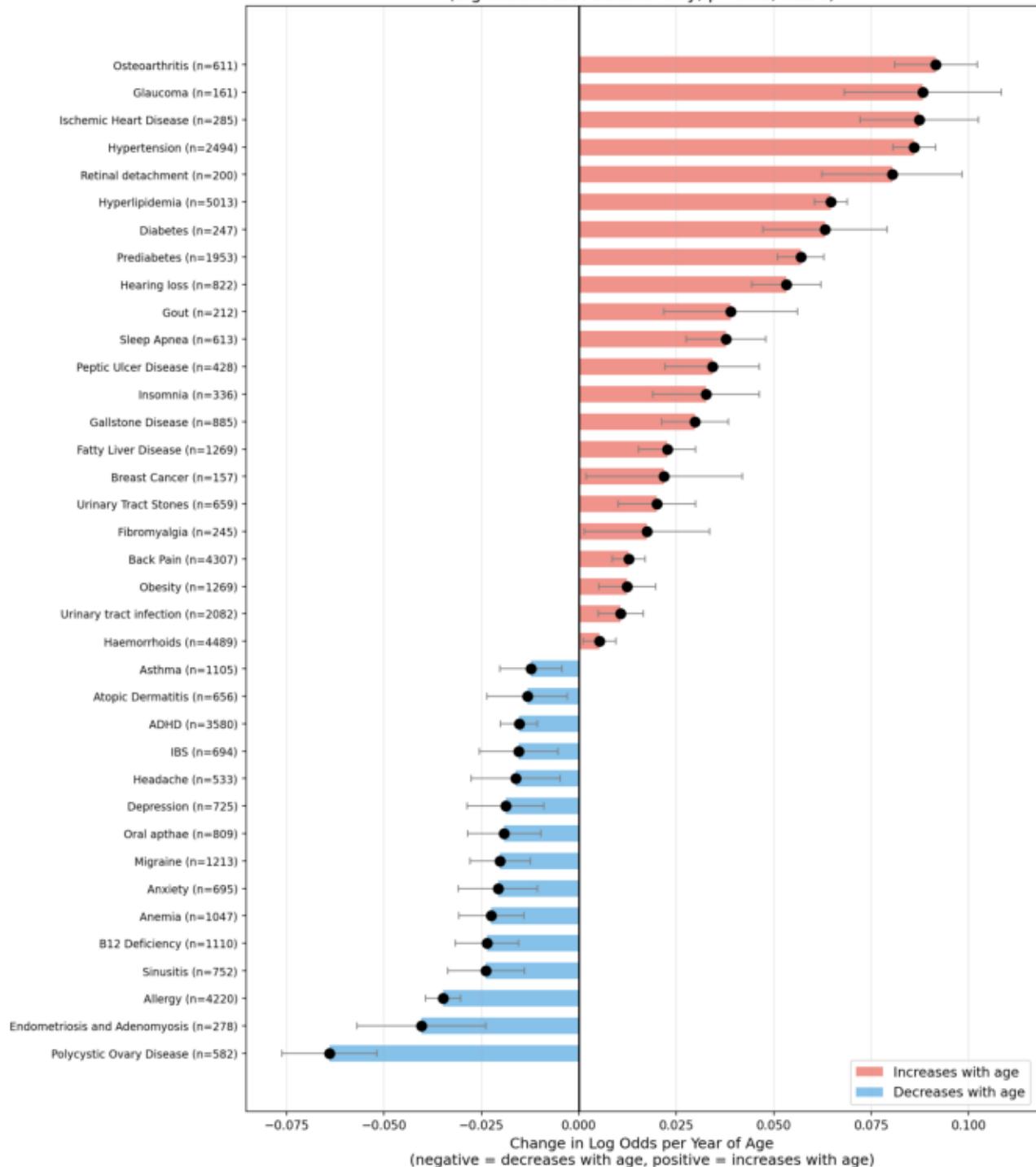


Anemia
↓ decreases with age (n=1047) ***



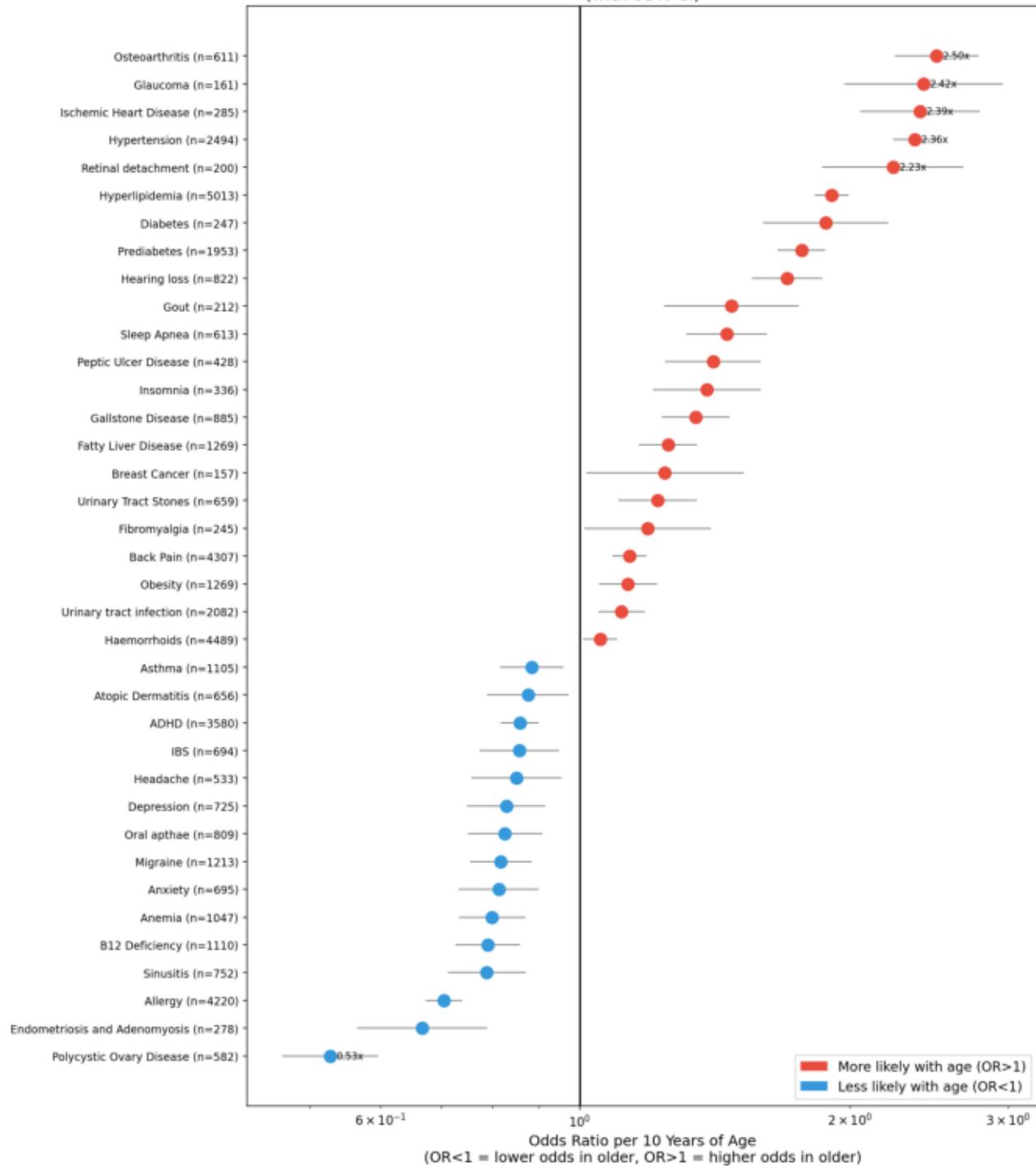
Forest Plot: Age Effect on All Significant Conditions

Age Effect on Medical Conditions
(Significant associations only, $p < 0.05$, $n \geq 50$)



Odds Ratio per Decade with 95% Confidence Intervals

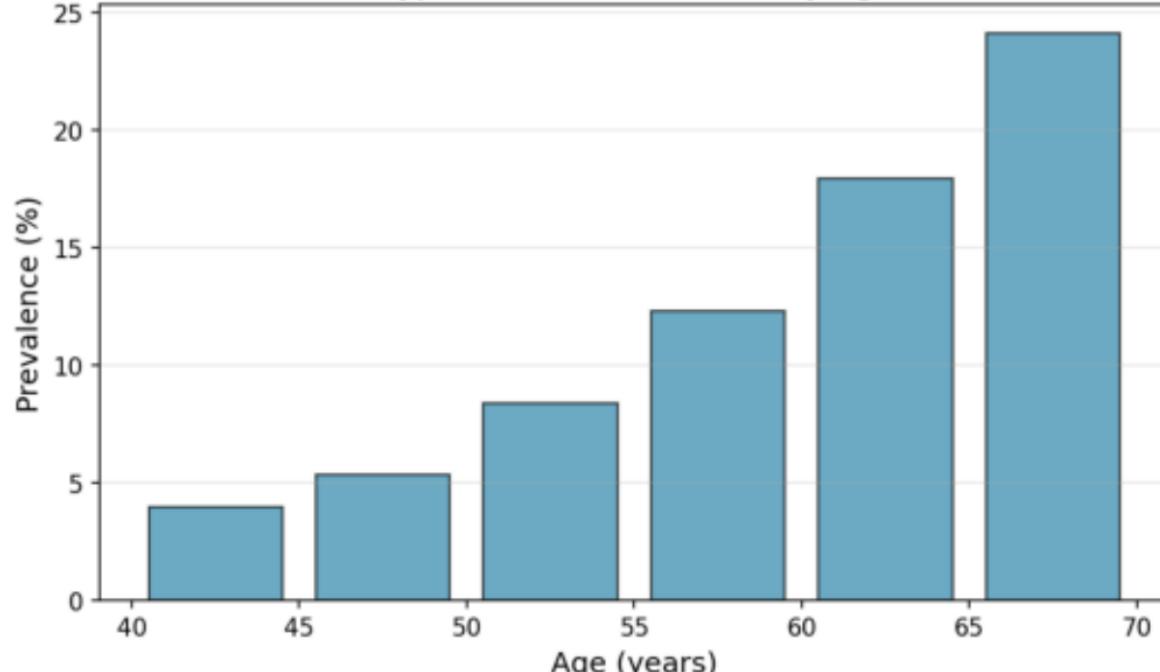
How Much More/Less Likely is Each Condition per Decade of Age?
(with 95% CI)



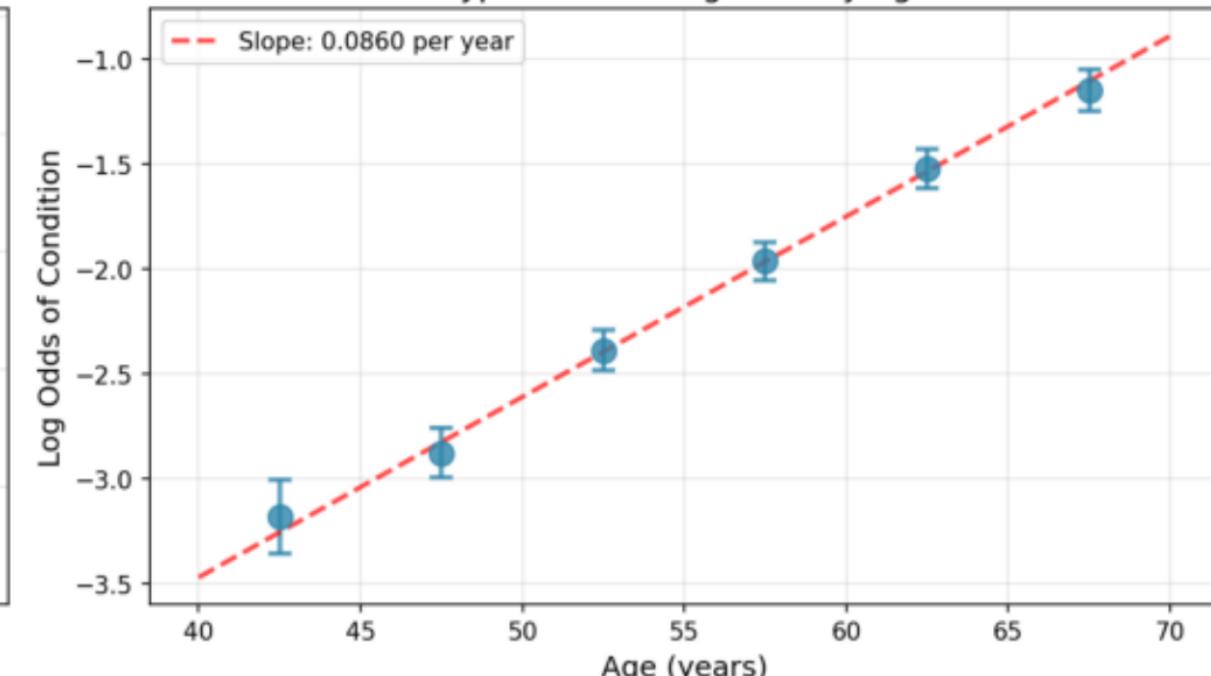
Hypertension: Prevalence vs Log Odds

Hypertension INCREASES with age
Odds Ratio per decade: 2.36x

Hypertension: Prevalence by Age



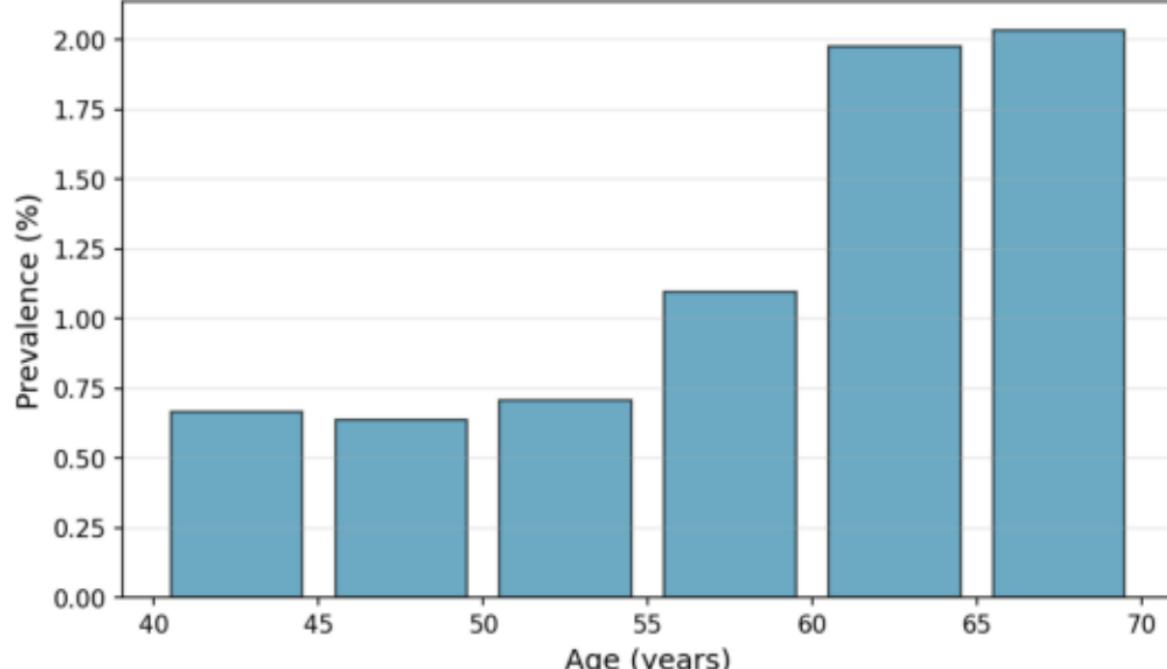
Hypertension: Log Odds by Age



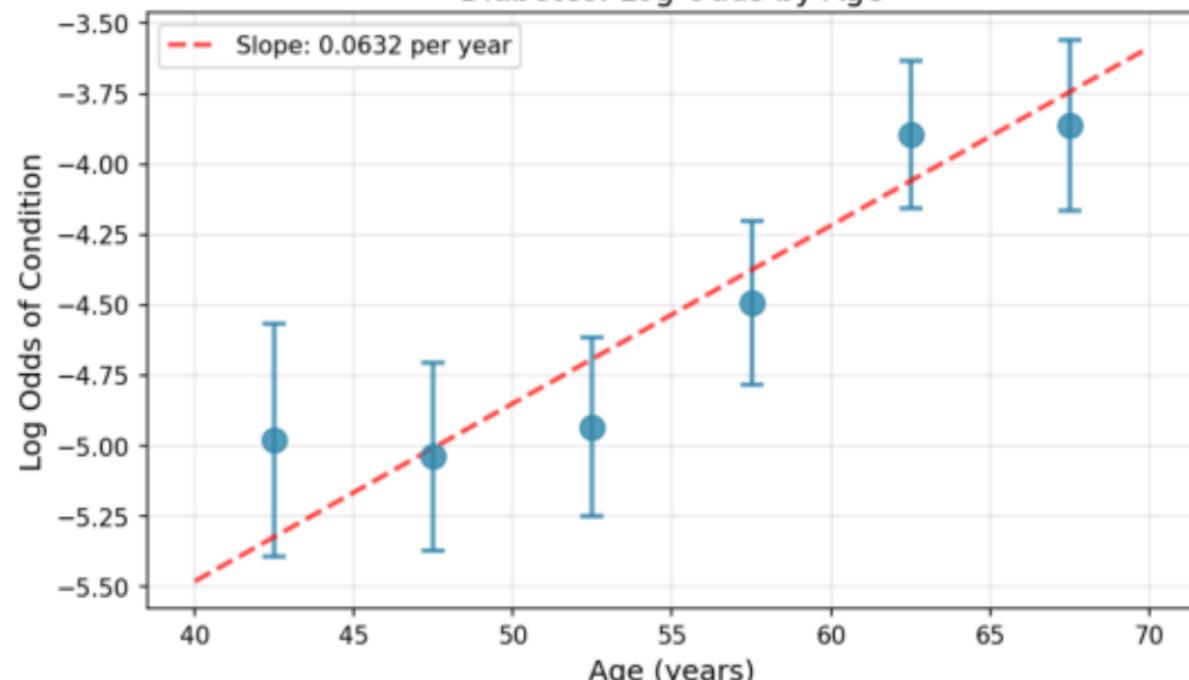
Diabetes: Prevalence vs Log Odds

Diabetes INCREASES with age
Odds Ratio per decade: 1.88x

Diabetes: Prevalence by Age



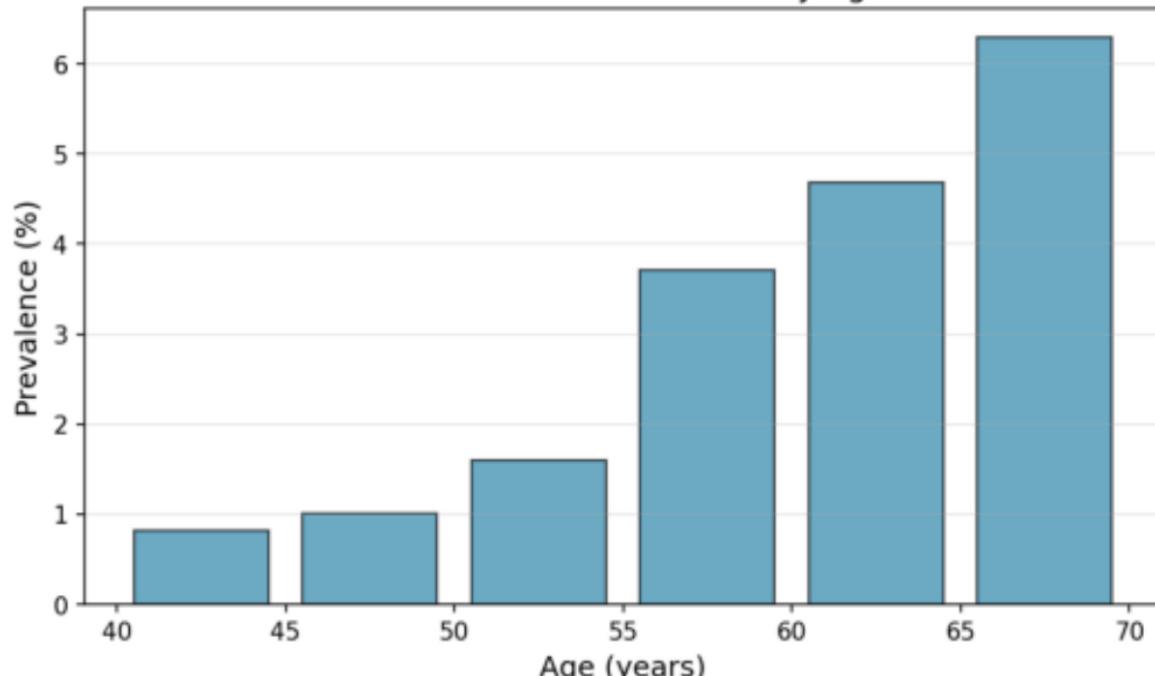
Diabetes: Log Odds by Age



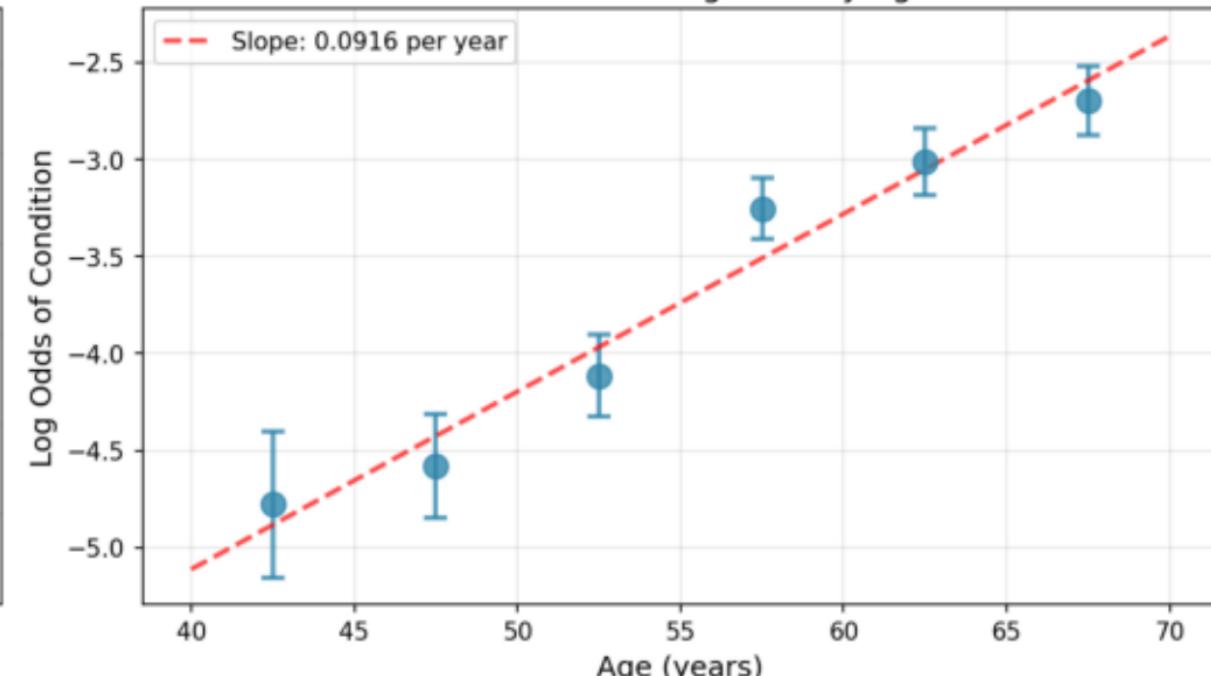
Osteoarthritis: Prevalence vs Log Odds

Osteoarthritis INCREASES with age
Odds Ratio per decade: 2.50x

Osteoarthritis: Prevalence by Age



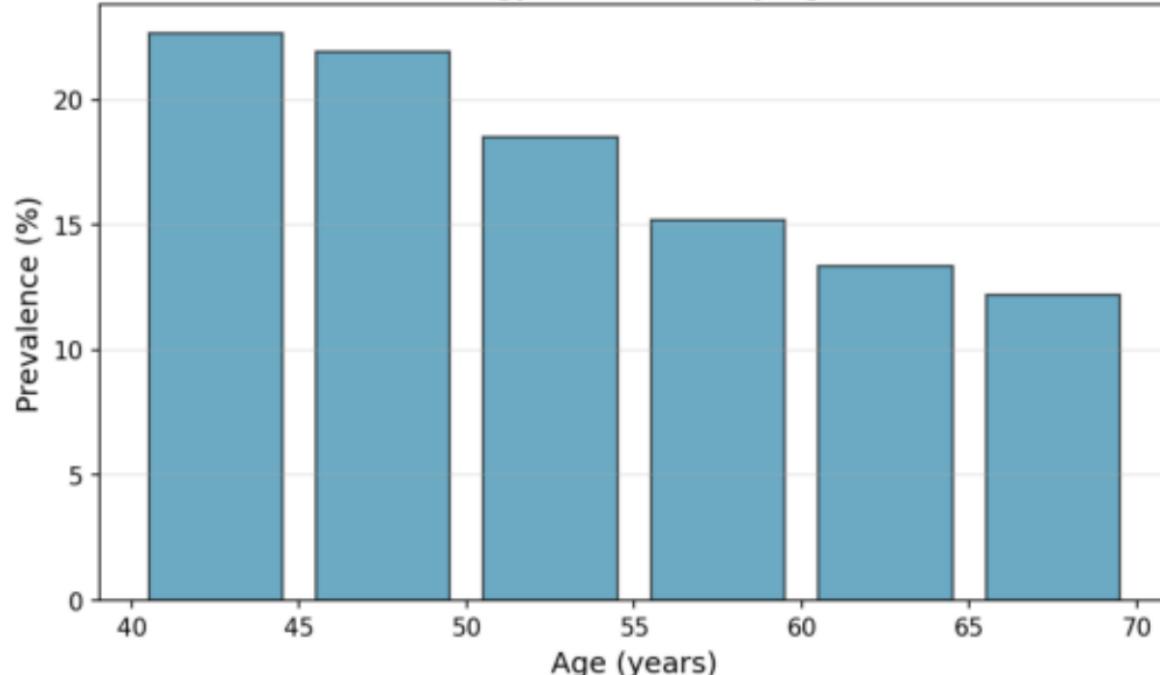
Osteoarthritis: Log Odds by Age



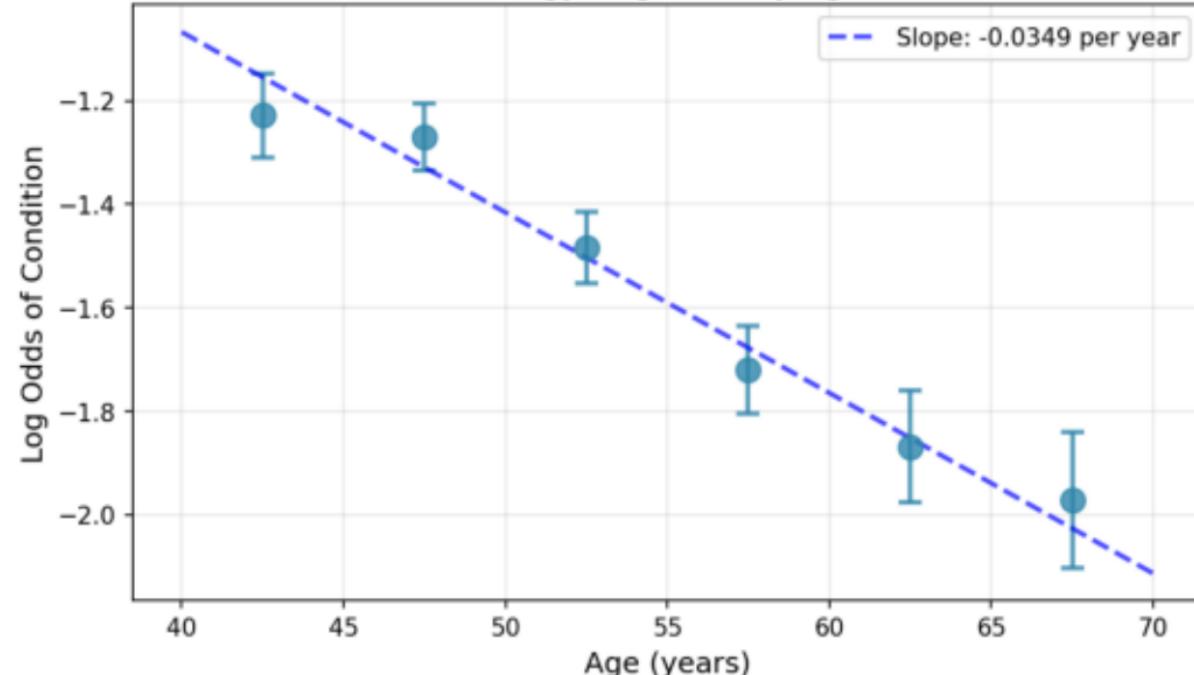
Allergy: Prevalence vs Log Odds

Allergy DECREASES with age
Odds Ratio per decade: 0.71x

Allergy: Prevalence by Age



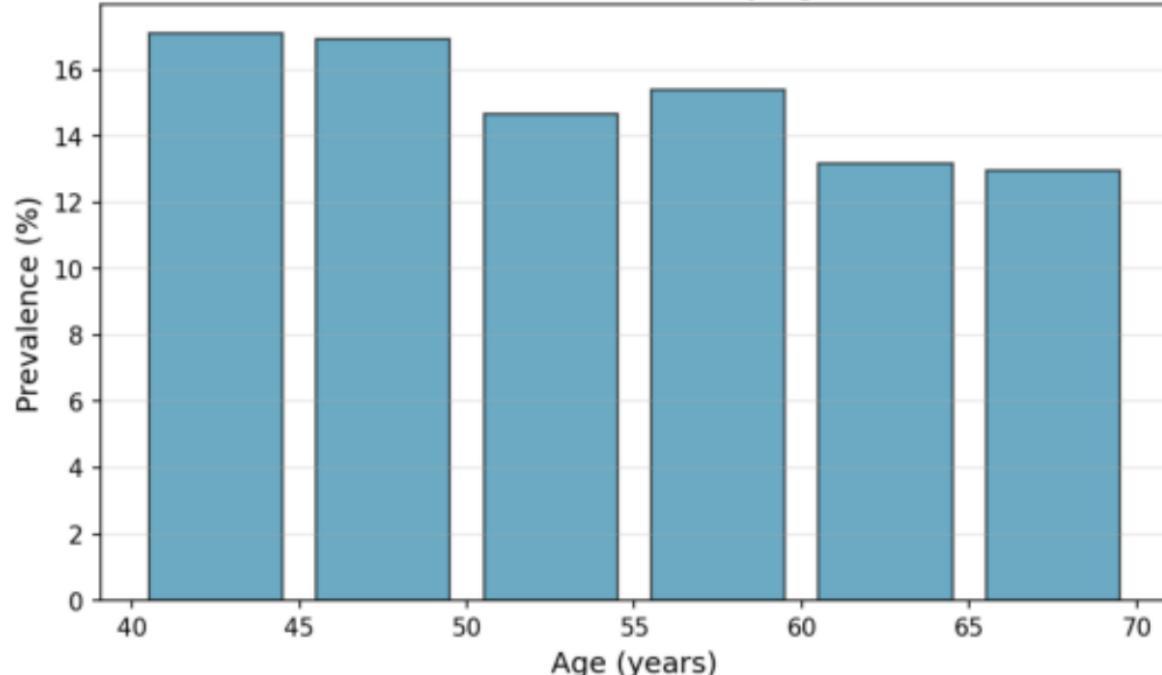
Allergy: Log Odds by Age



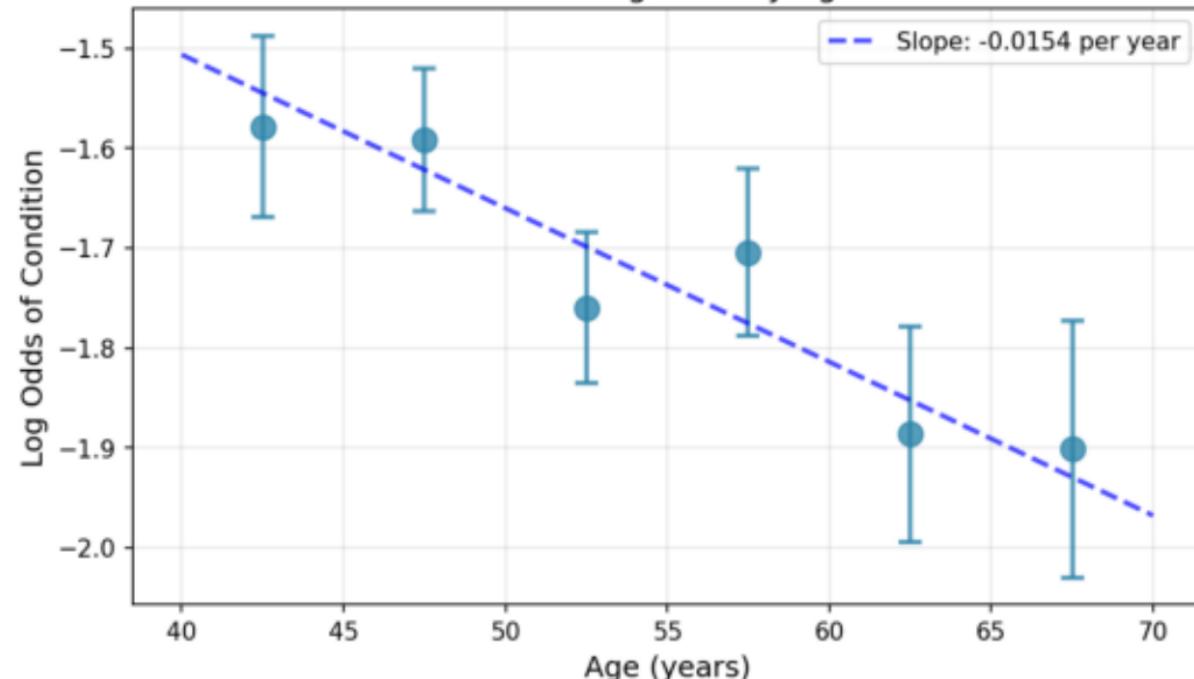
ADHD: Prevalence vs Log Odds

ADHD DECREASES with age
Odds Ratio per decade: 0.86x

ADHD: Prevalence by Age



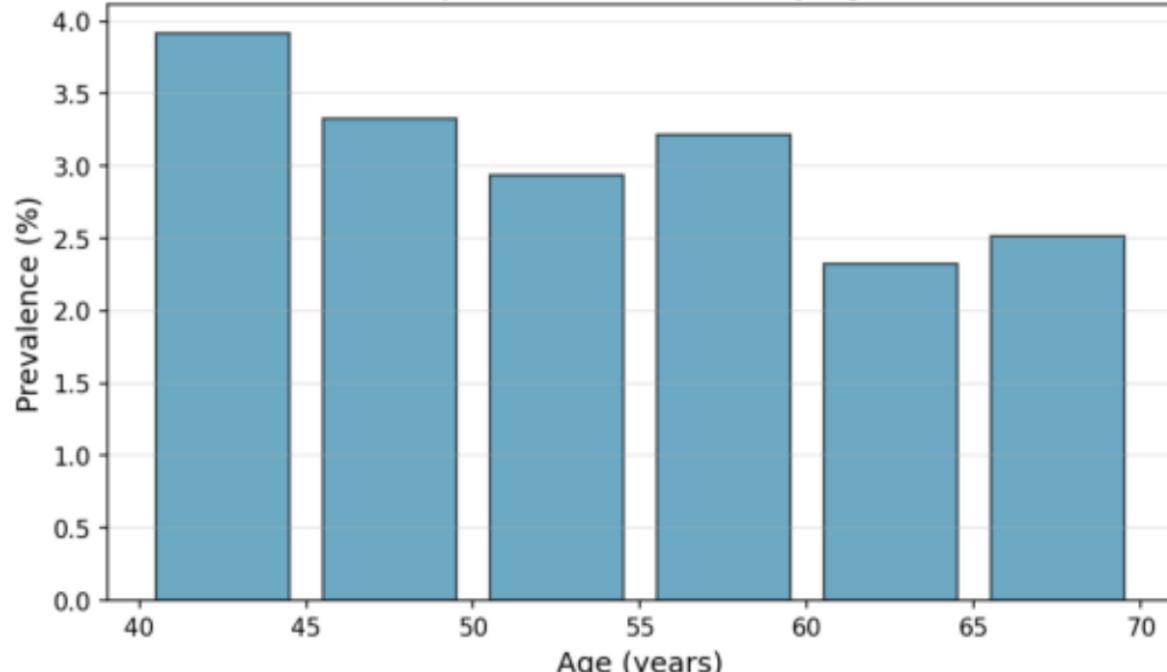
ADHD: Log Odds by Age



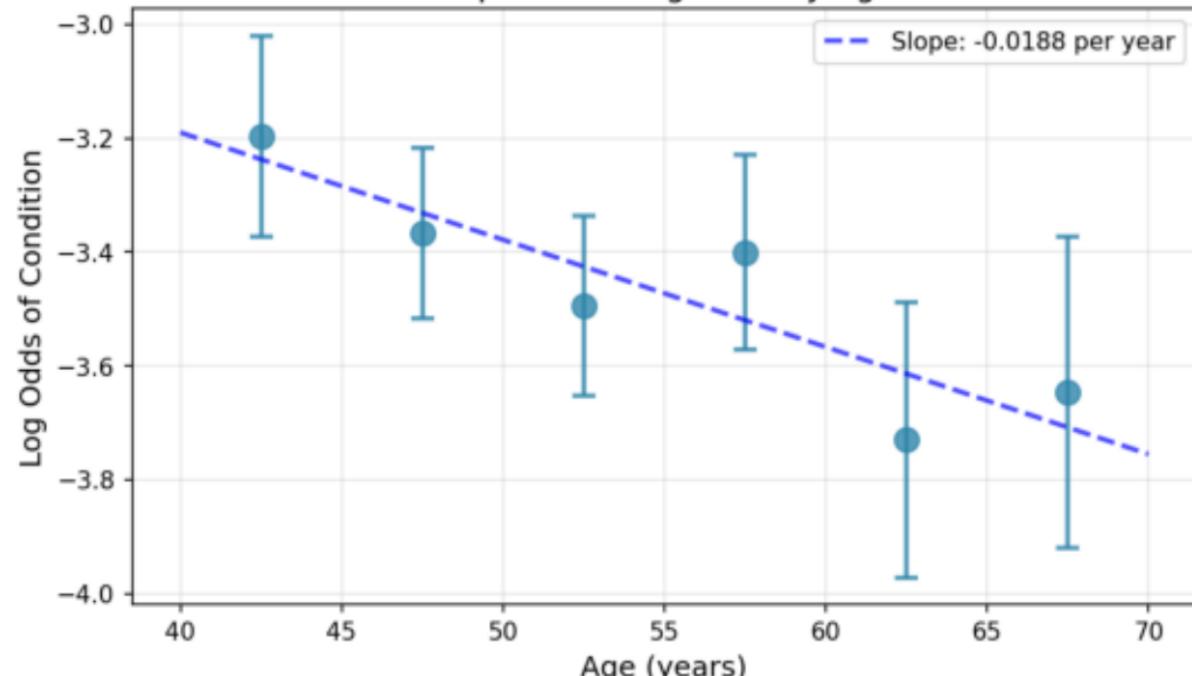
Depression: Prevalence vs Log Odds

Depression DECREASES with age
Odds Ratio per decade: 0.83x

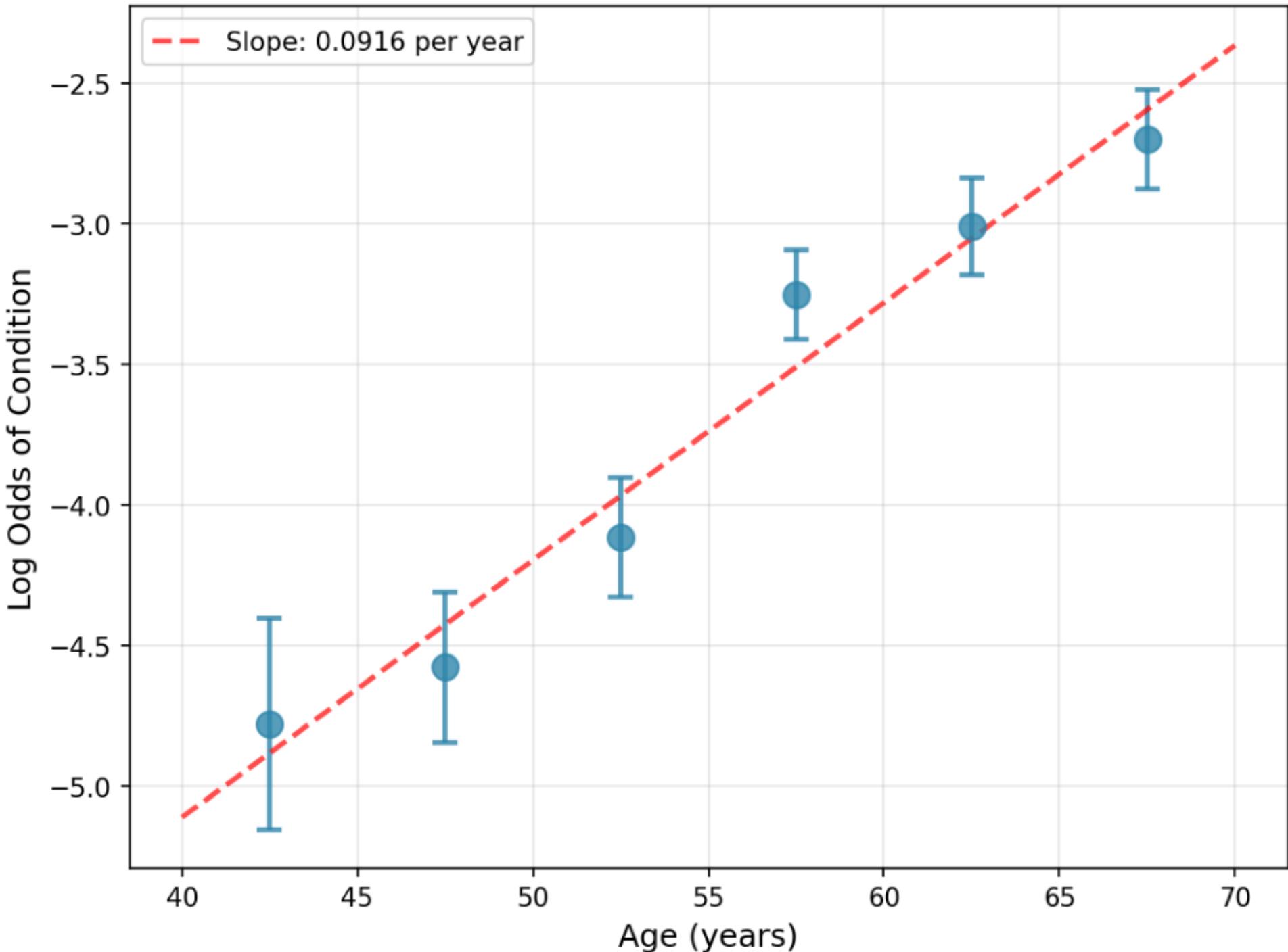
Depression: Prevalence by Age



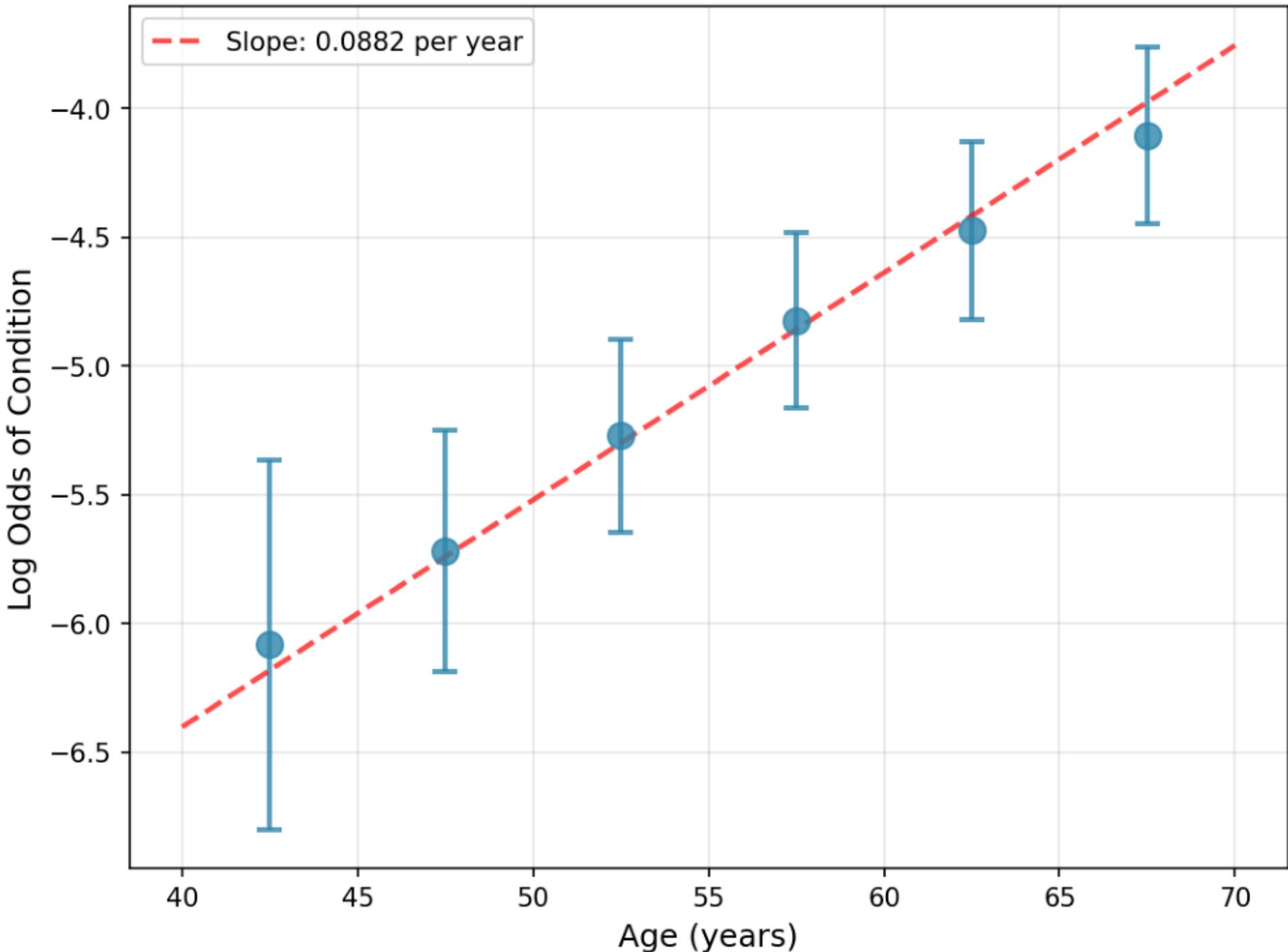
Depression: Log Odds by Age



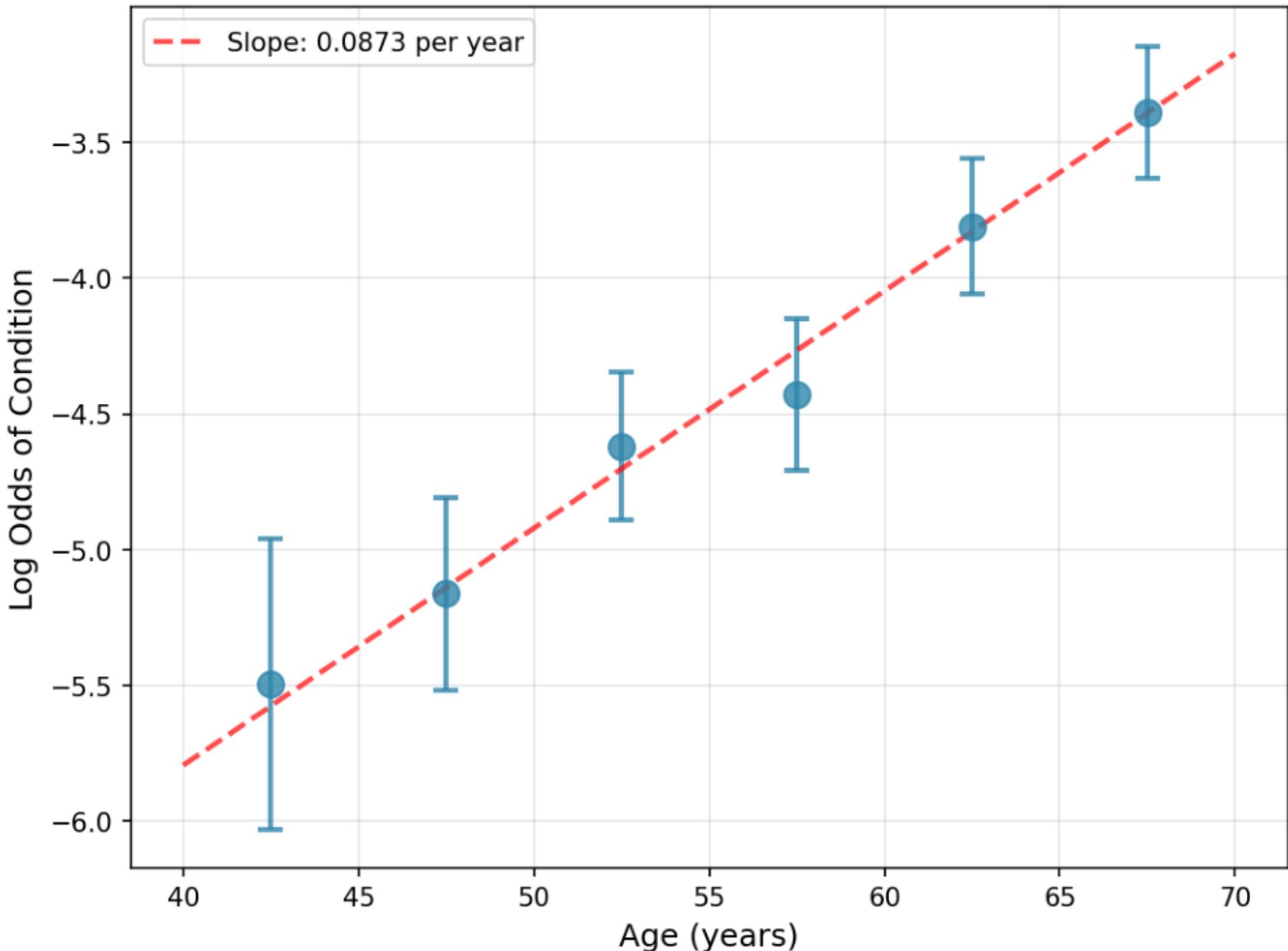
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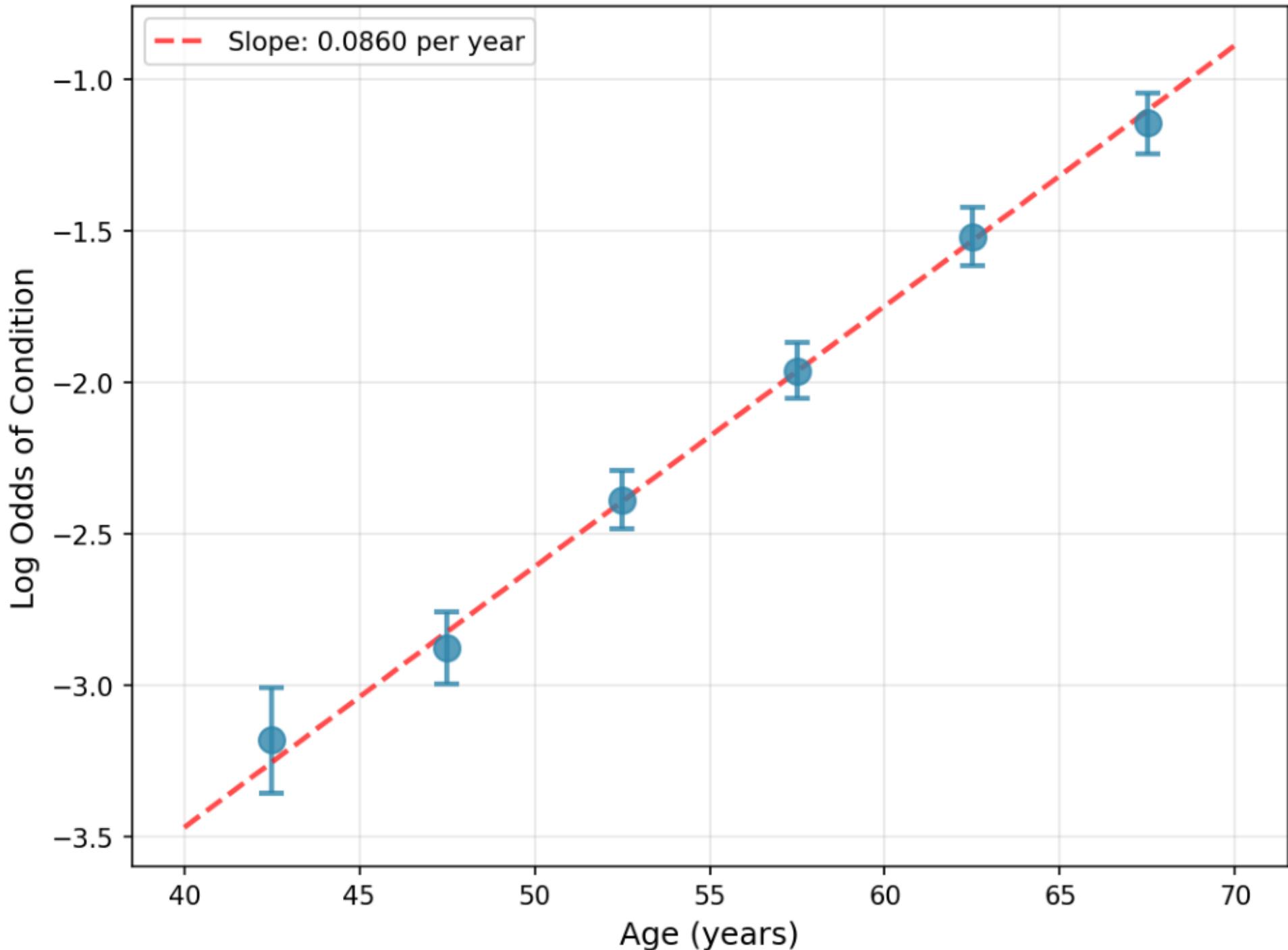
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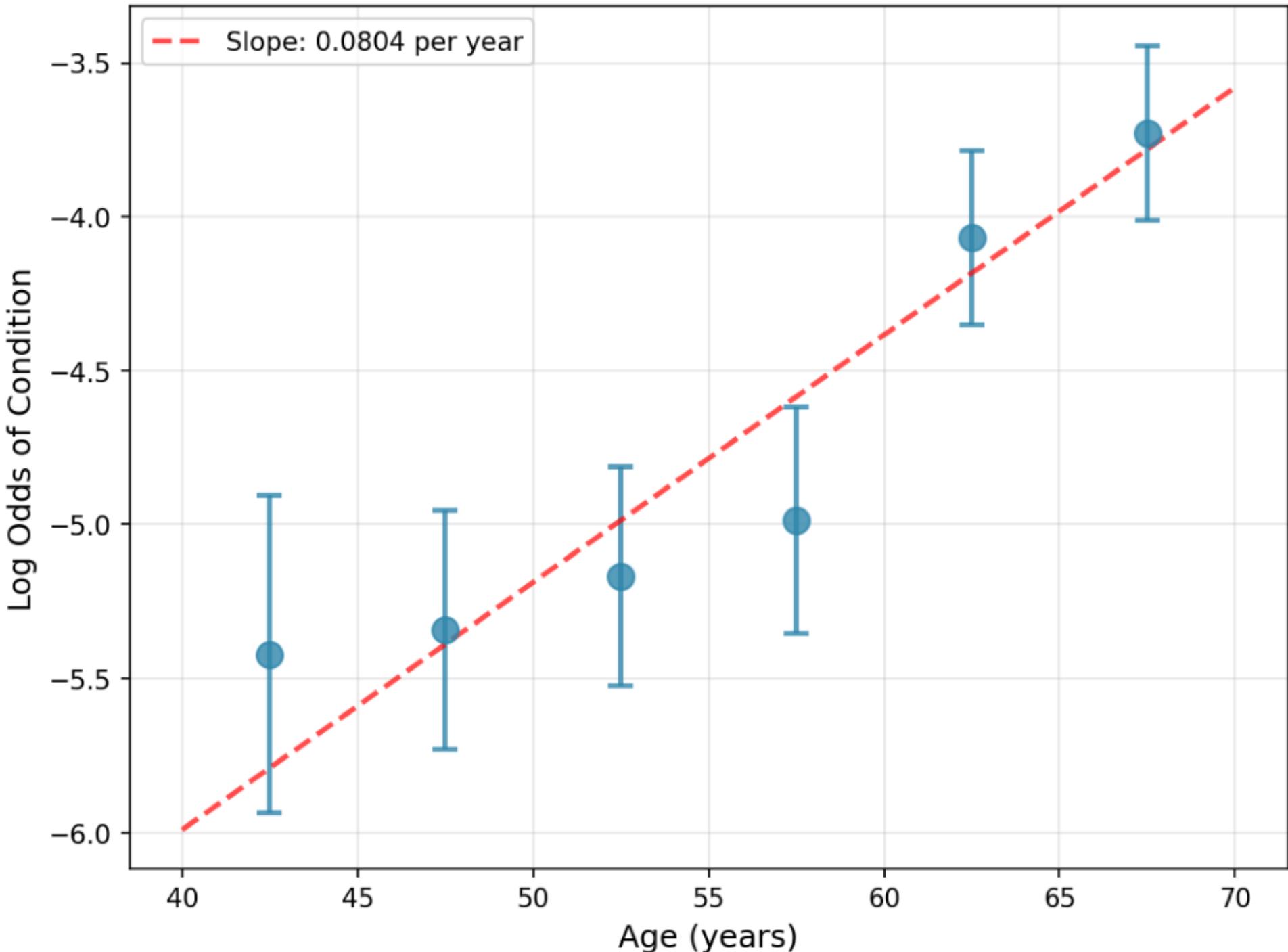
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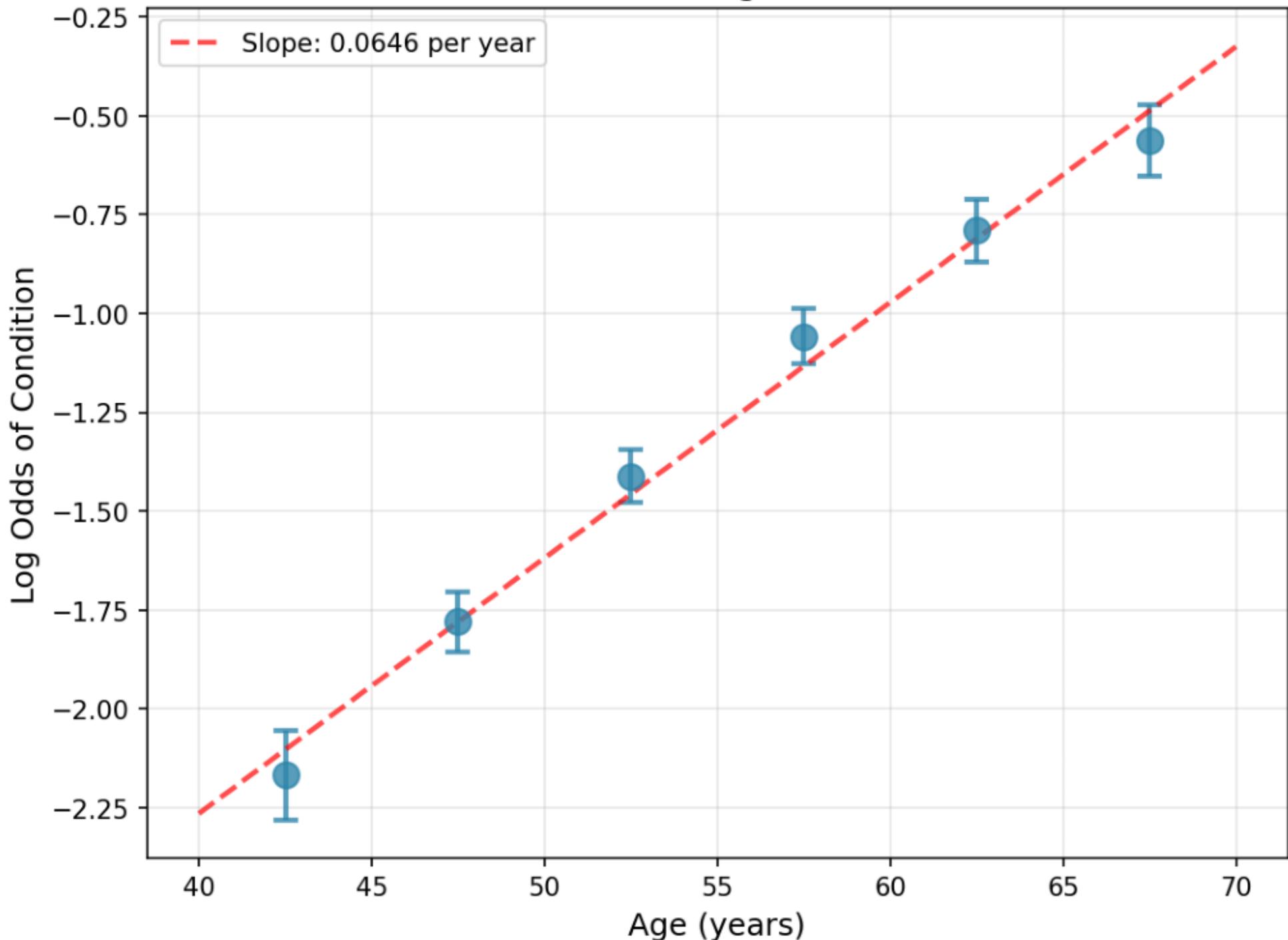
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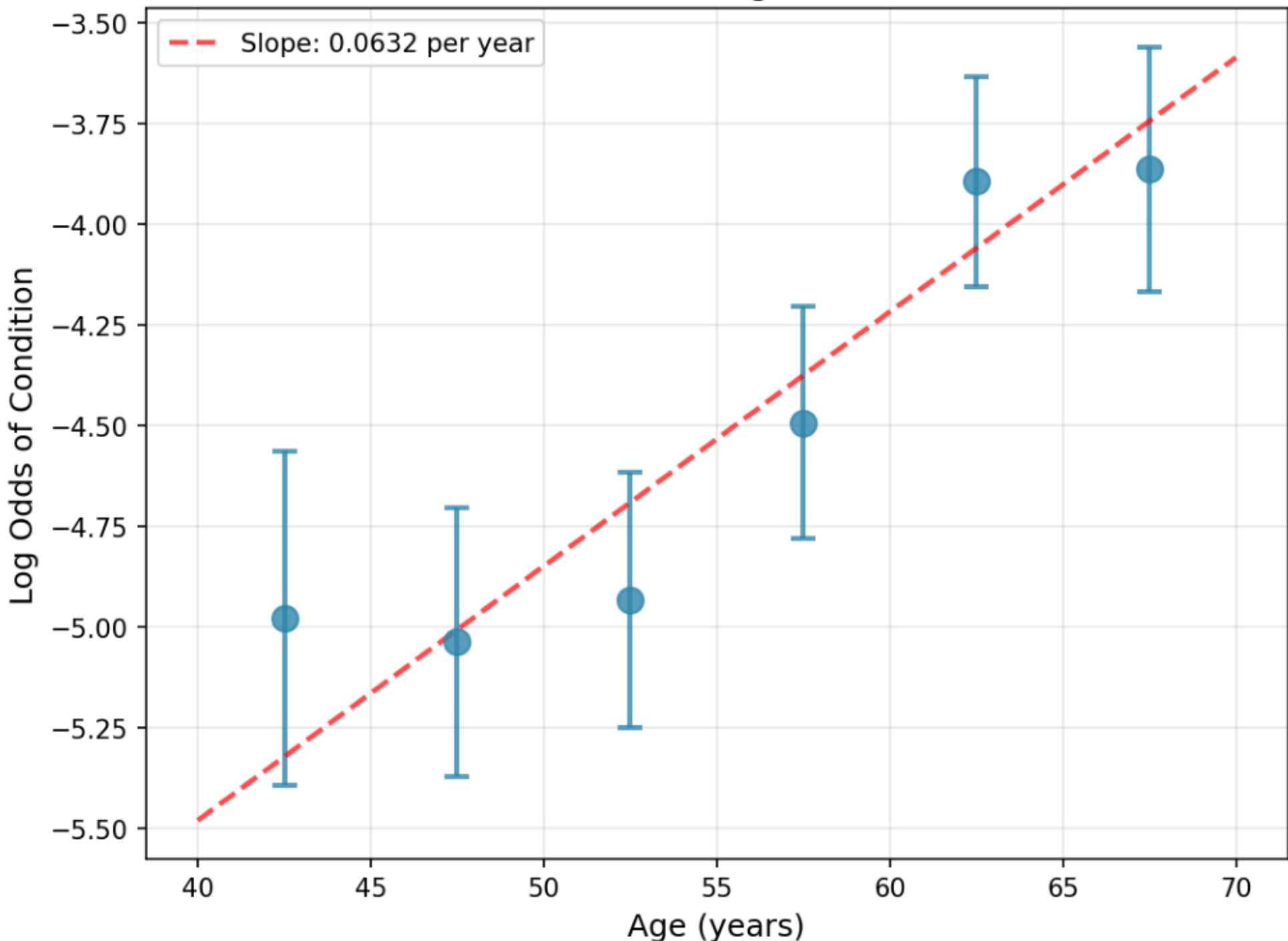
Retinal detachment
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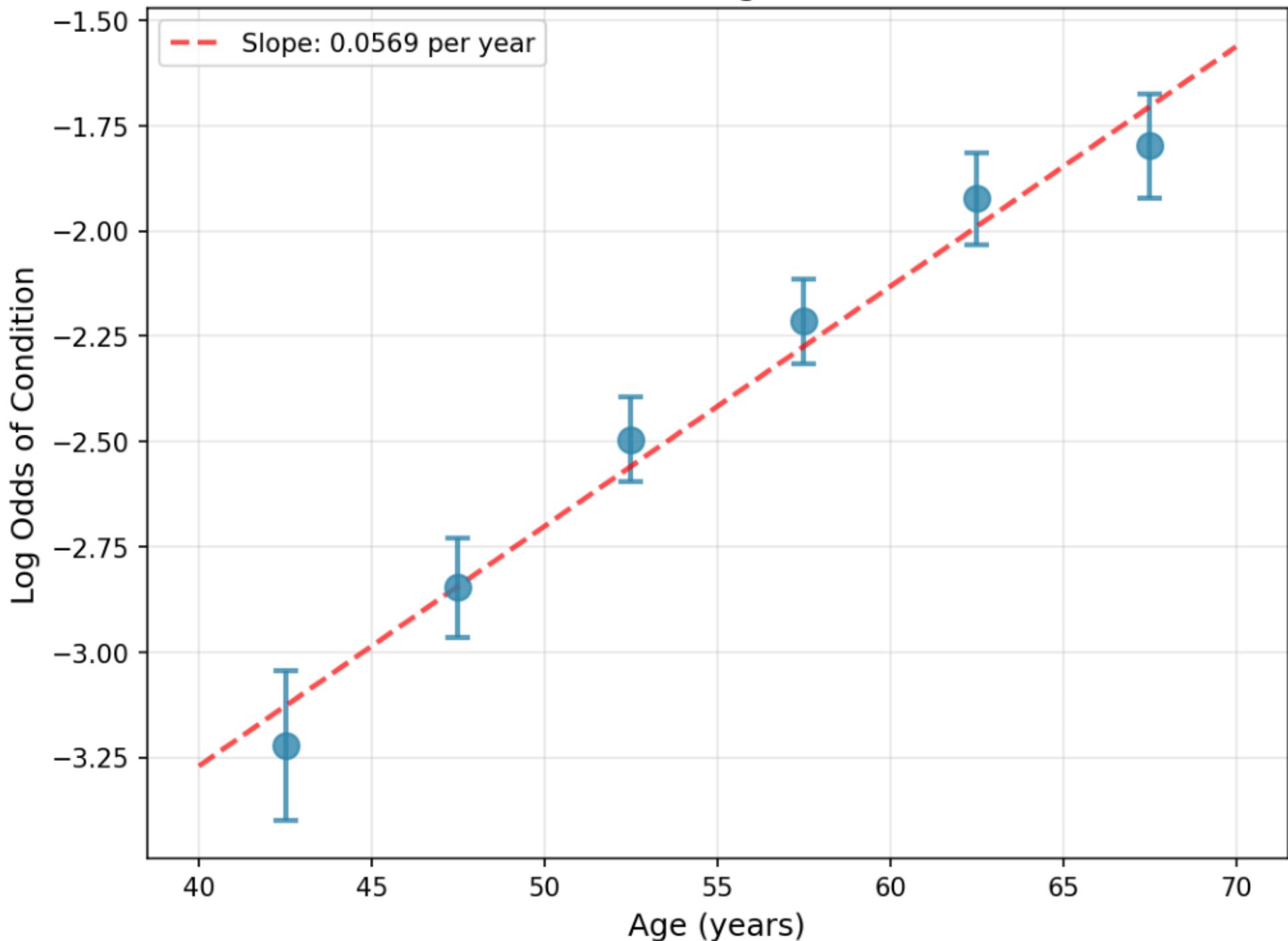
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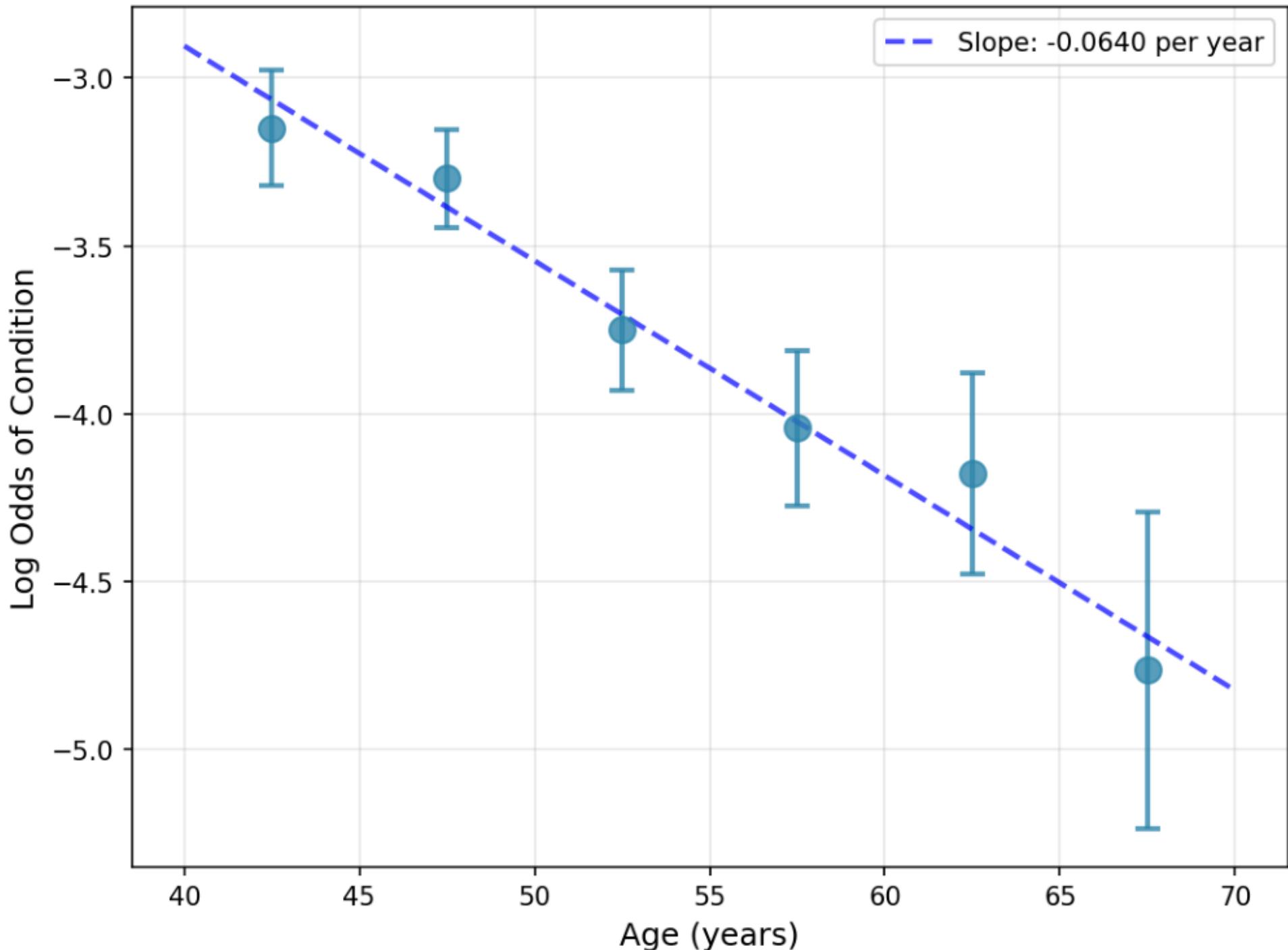
Diabetes
↑ increases with age (n=247) ***



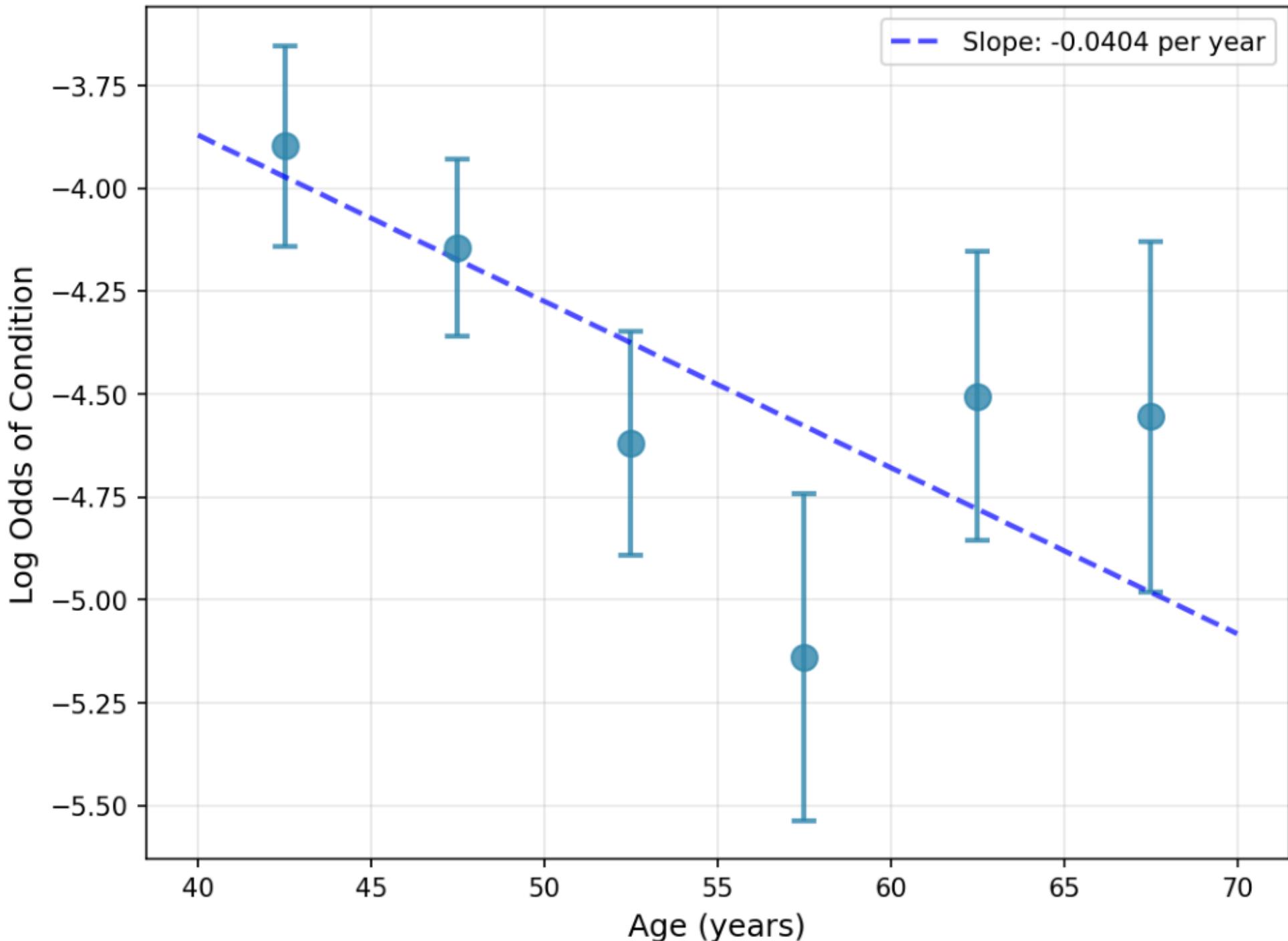
Prediabetes
↑ increases with age (n=1953) ***



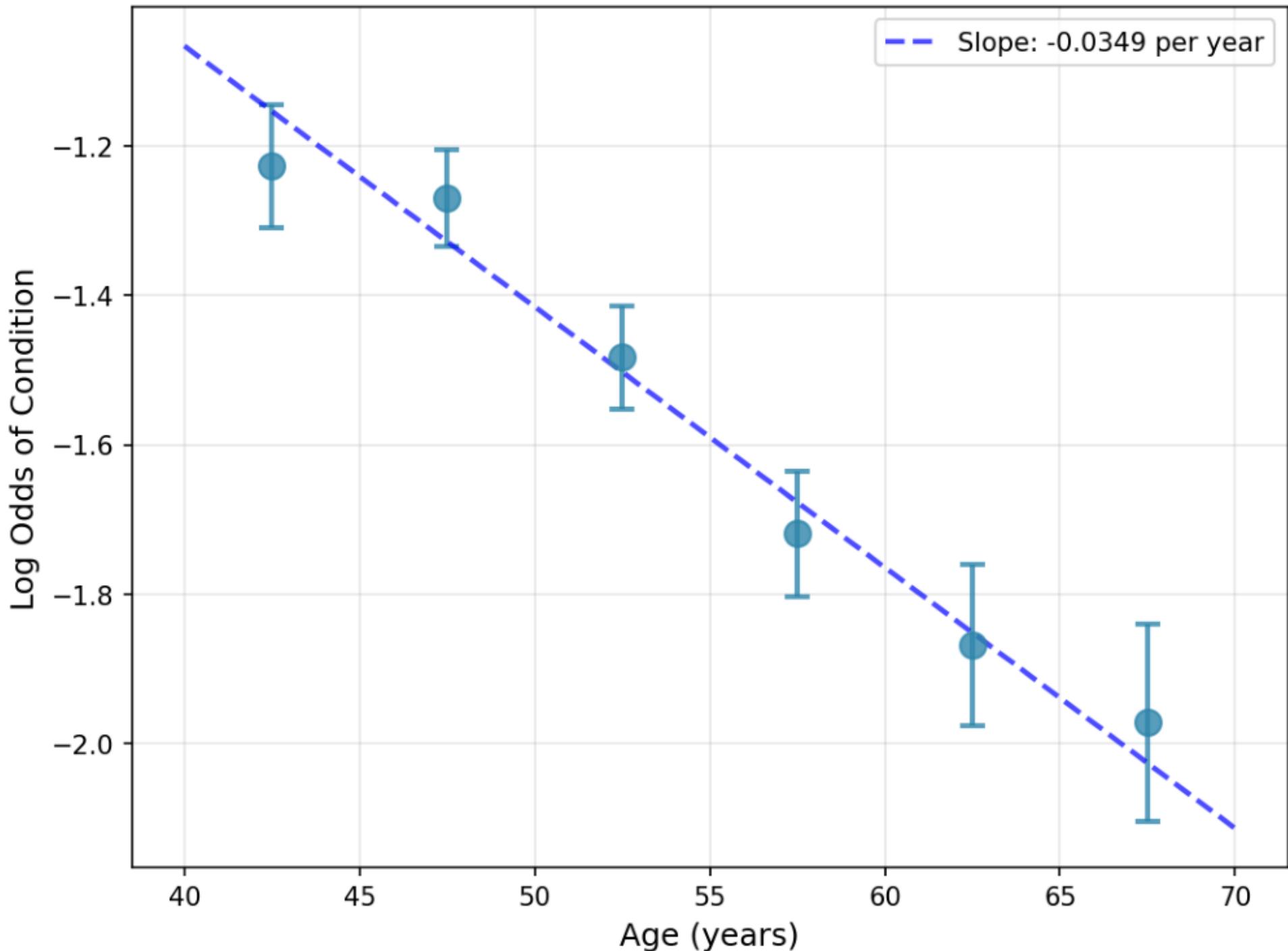
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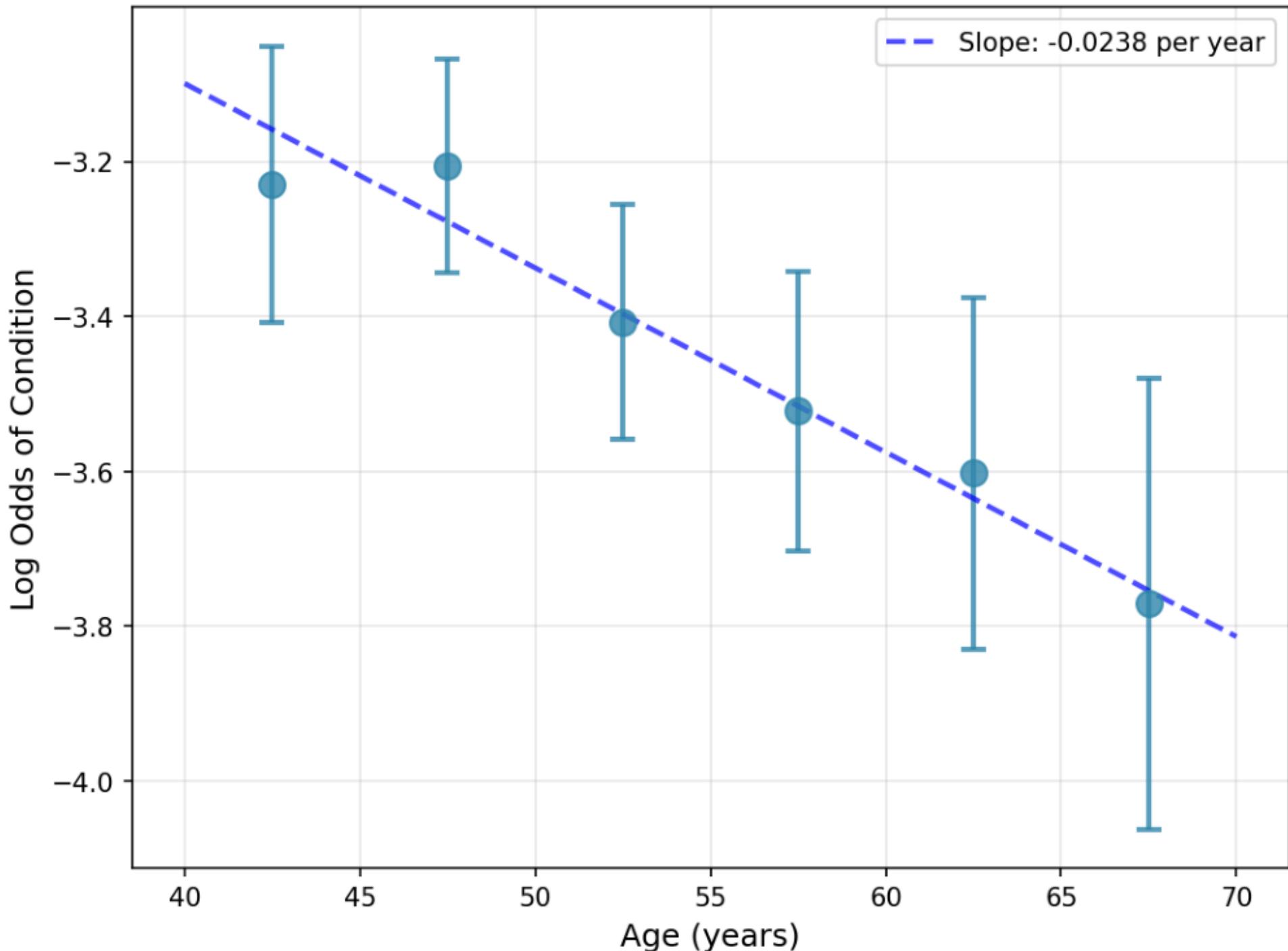
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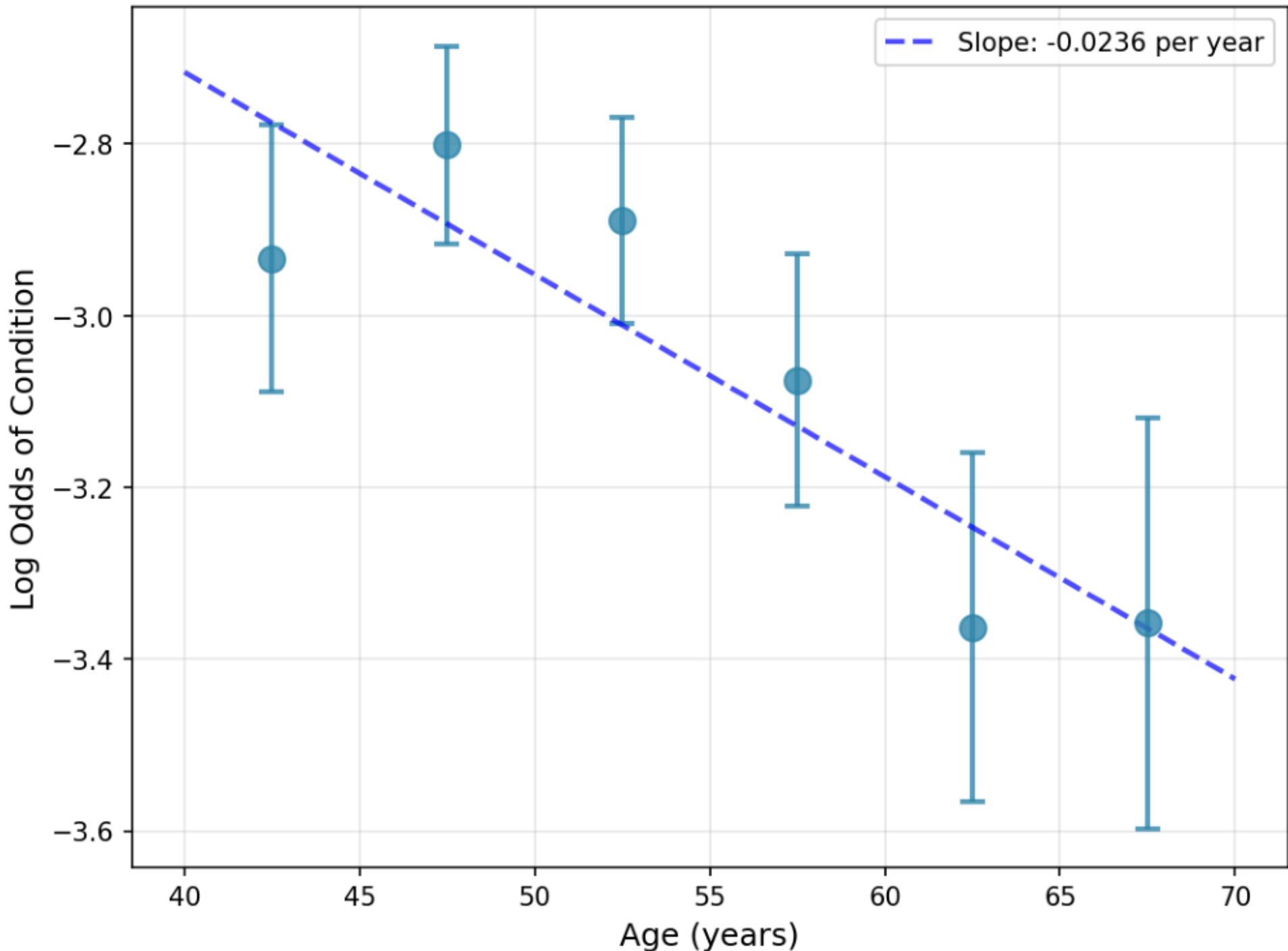
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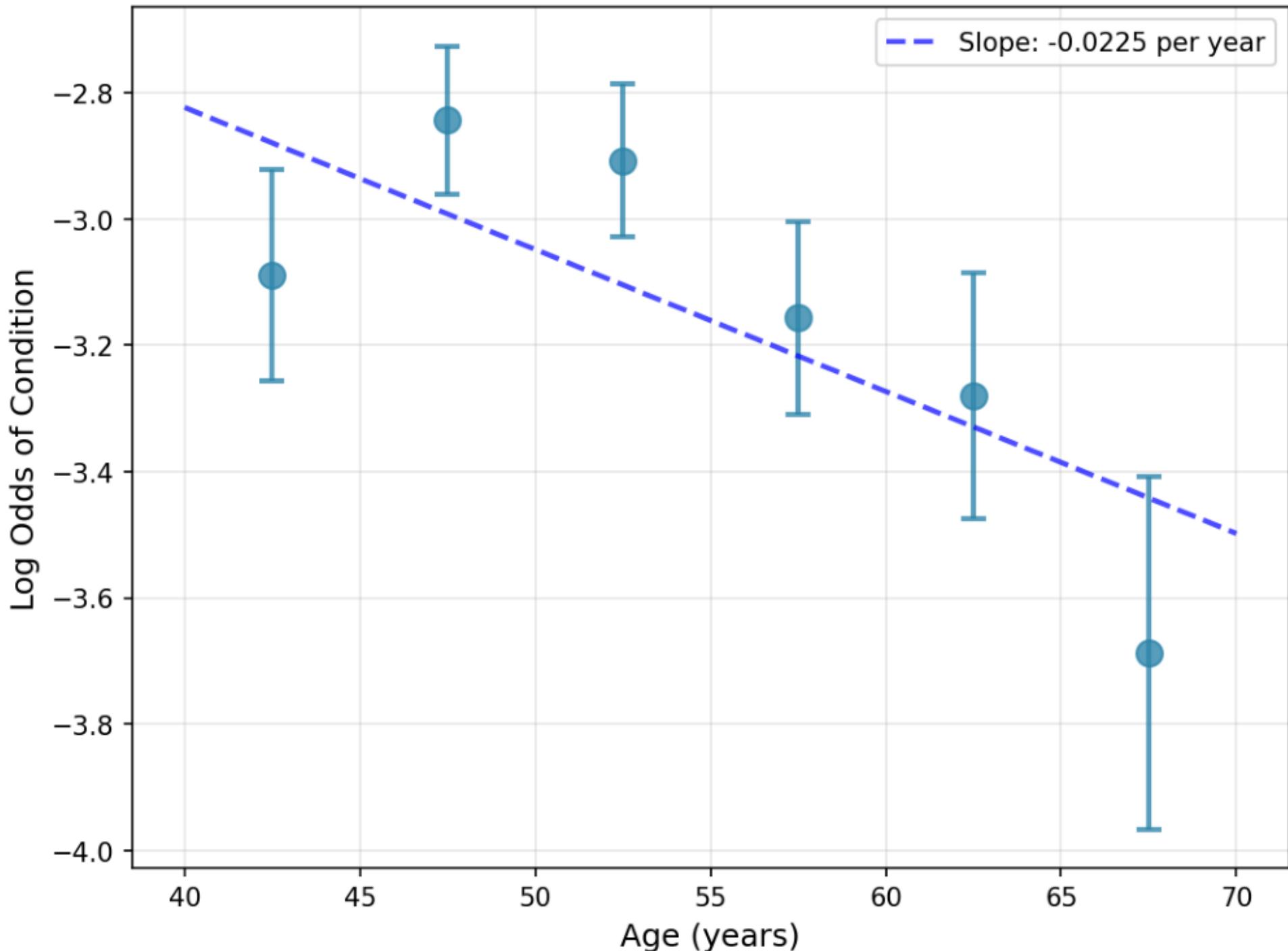
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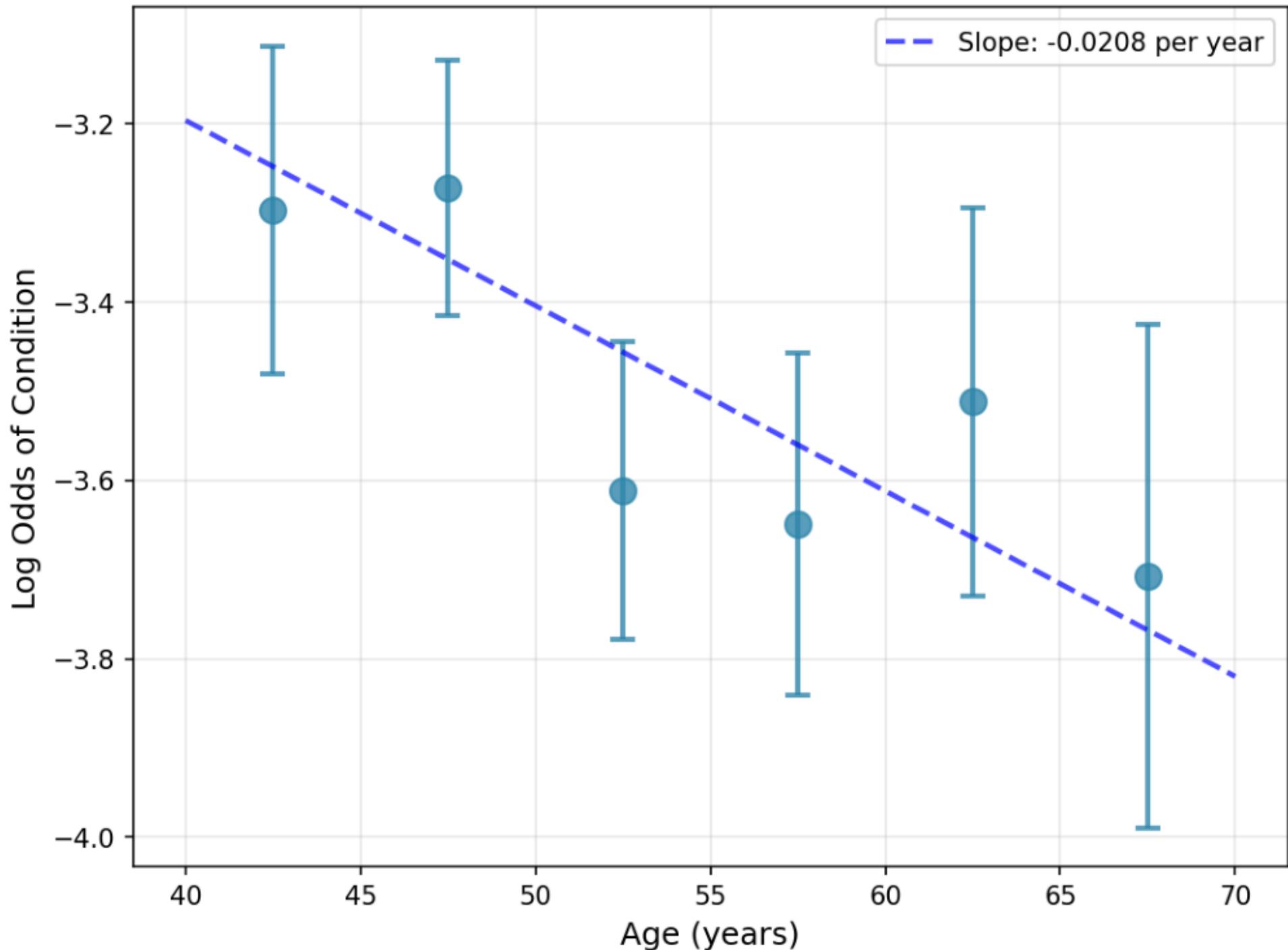
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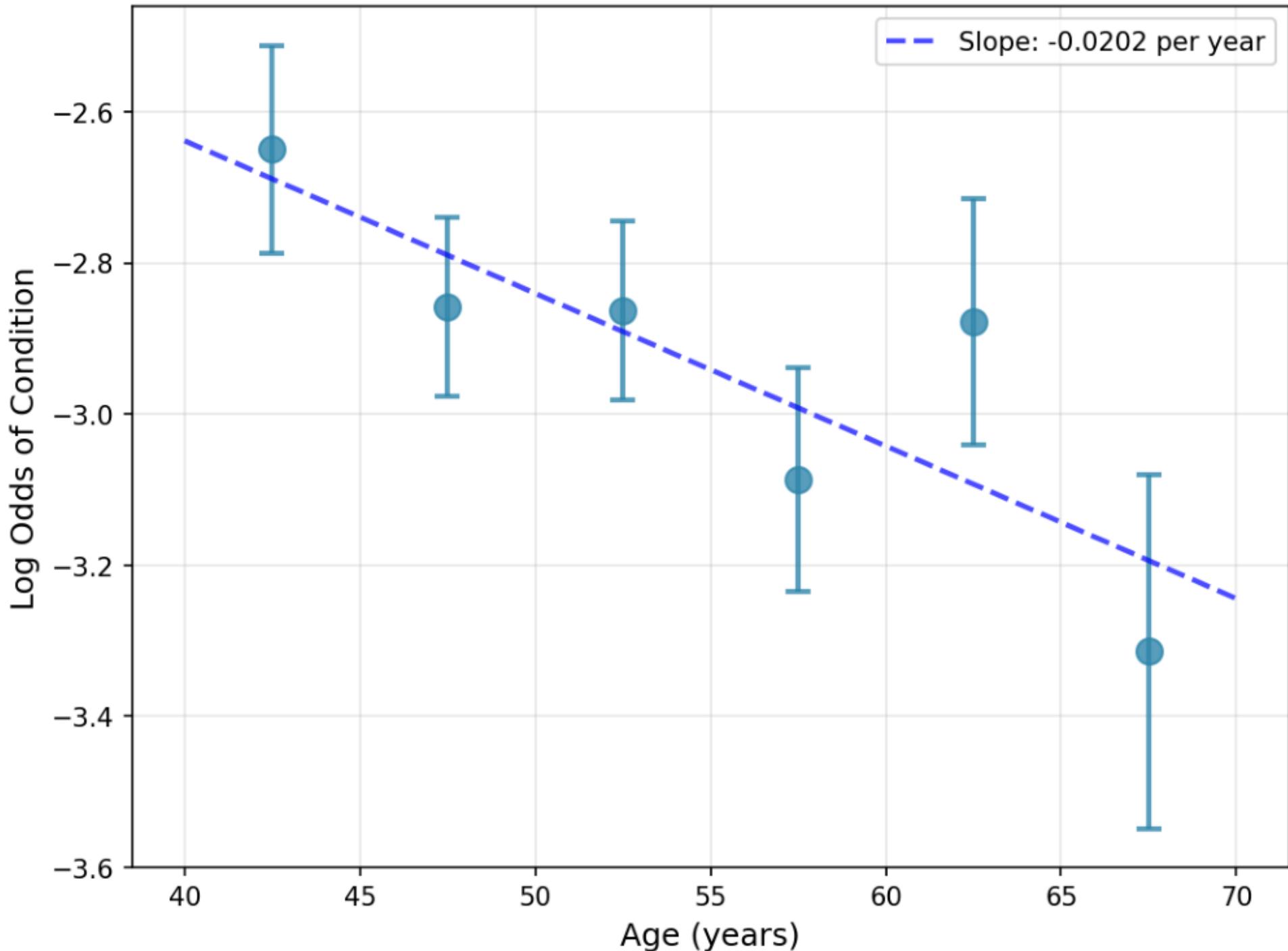
Anemia
↓ decreases with age (n=1047) ***



Anxiety
↓ decreases with age (n=695) ***

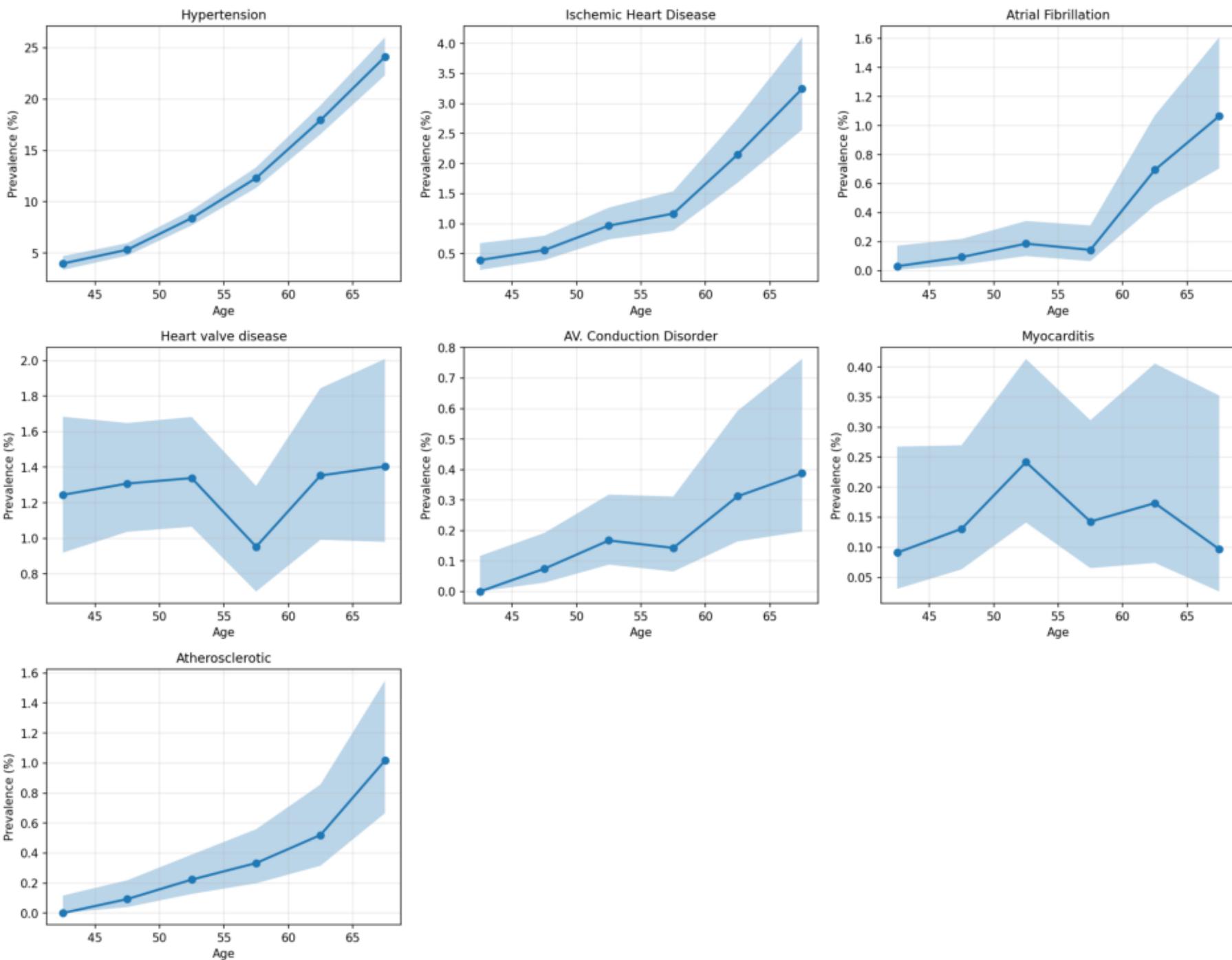


Migraine
↓ decreases with age (n=1213) ***



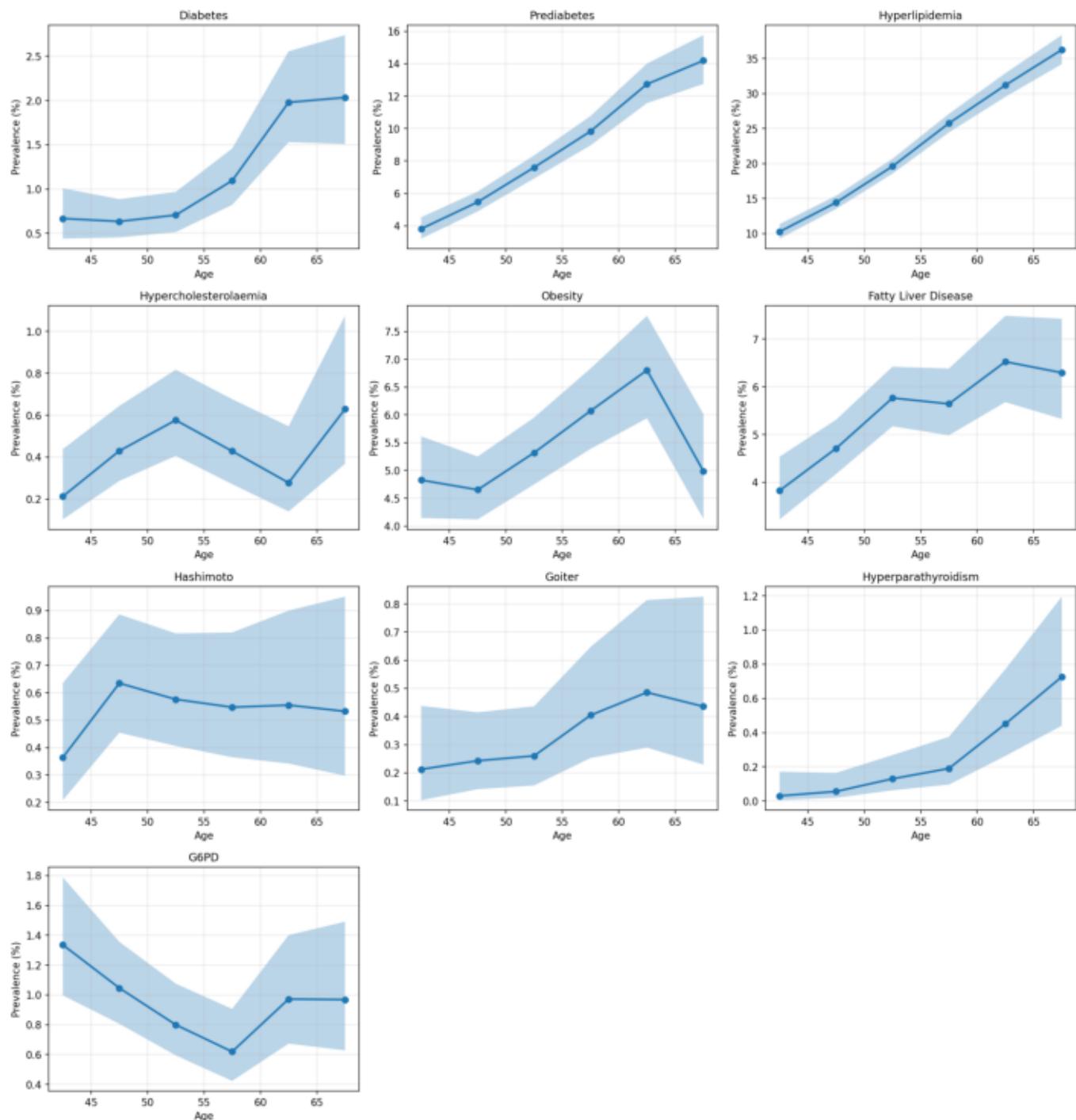
Cardiovascular: Prevalence by Age

Cardiovascular - Prevalence by Age



Metabolic_Endocrine: Prevalence by Age

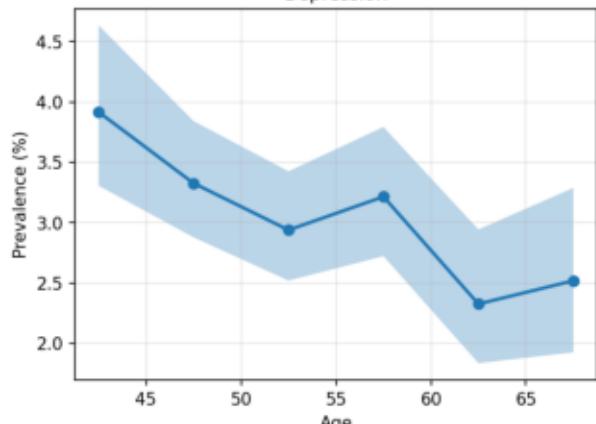
Metabolic/Endocrine - Prevalence by Age



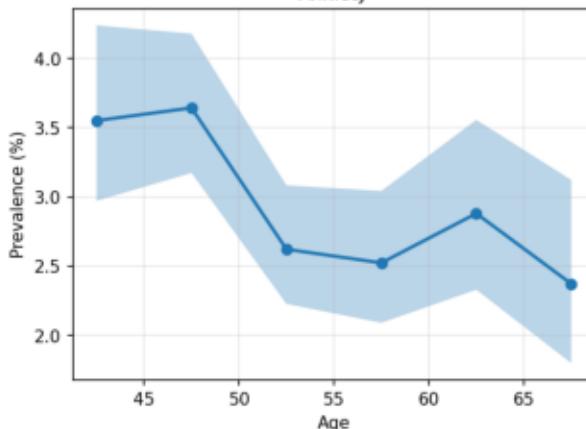
Mental Health: Prevalence by Age

Mental Health - Prevalence by Age

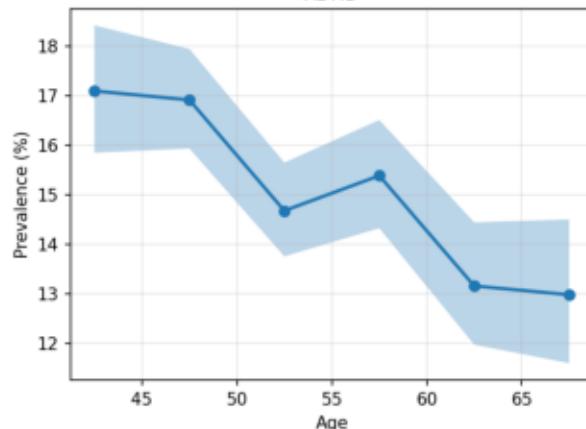
Depression



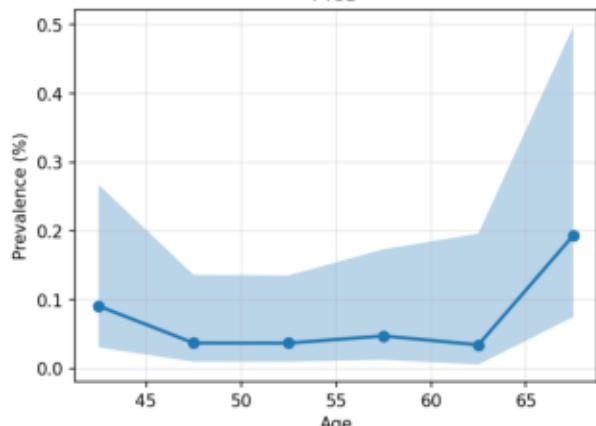
Anxiety



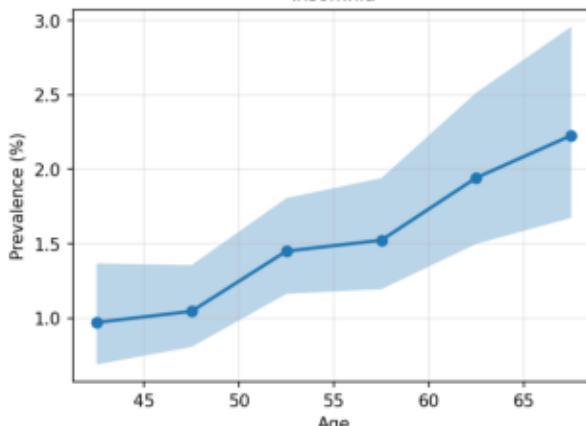
ADHD



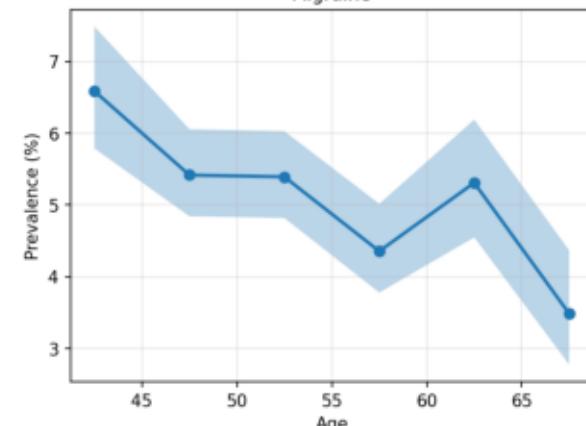
PTSD



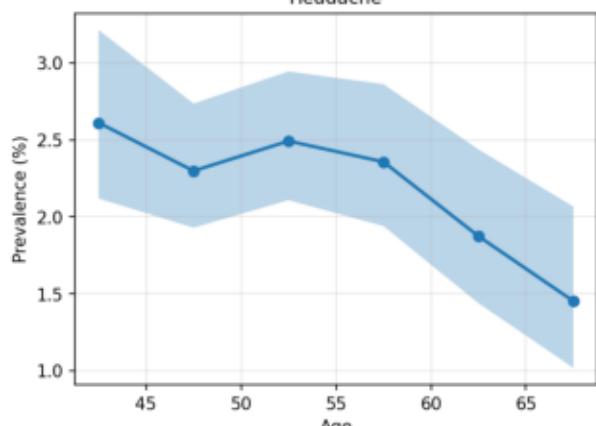
Insomnia



Migraine



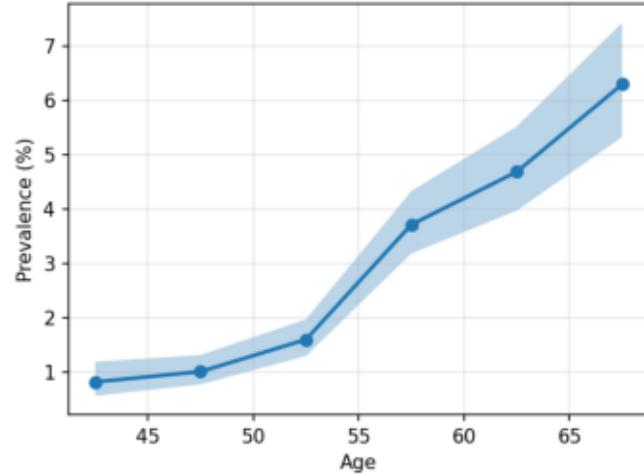
Headache



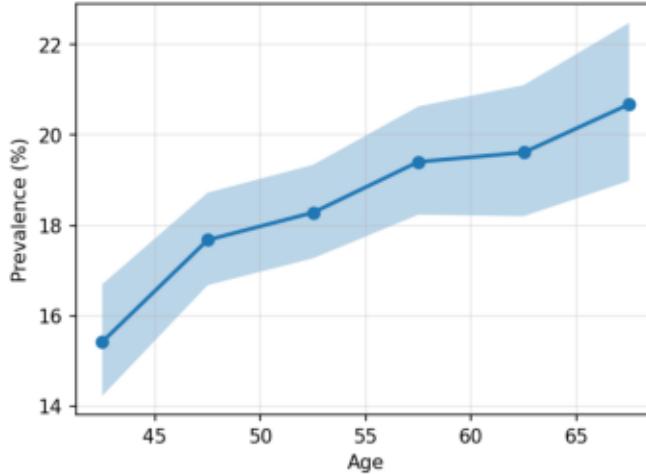
Musculoskeletal: Prevalence by Age

Musculoskeletal - Prevalence by Age

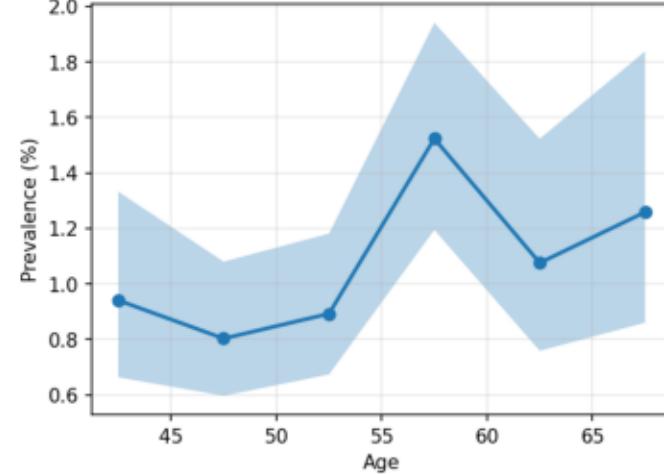
Osteoarthritis



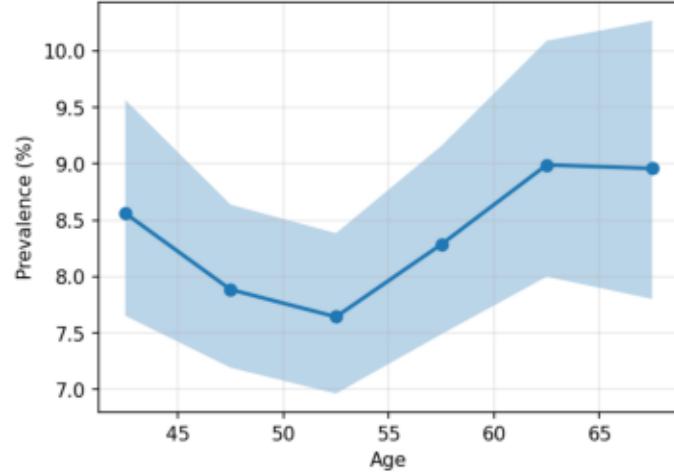
Back Pain



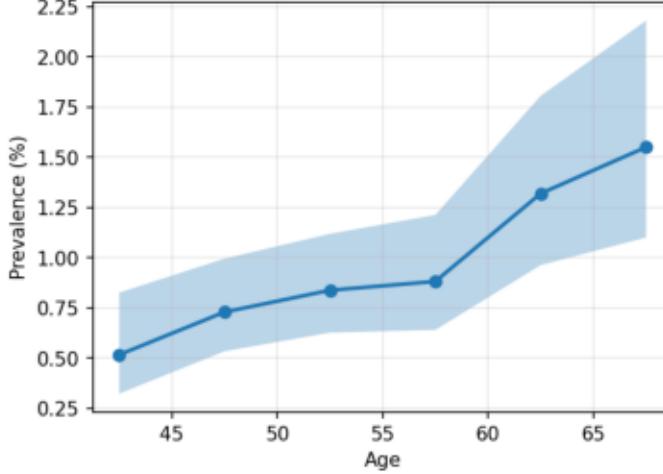
Fibromyalgia



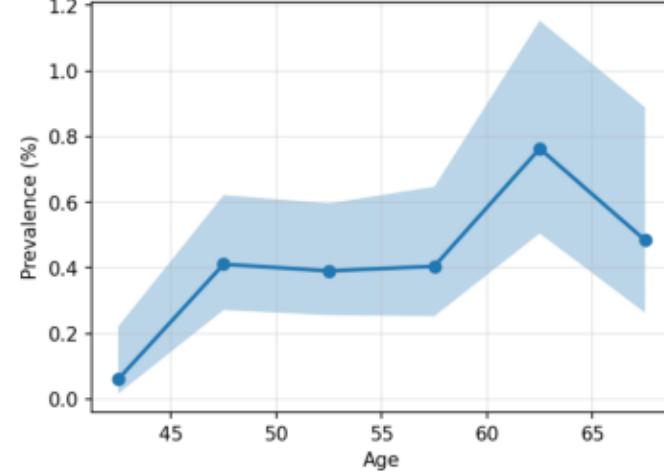
Fractures



Gout



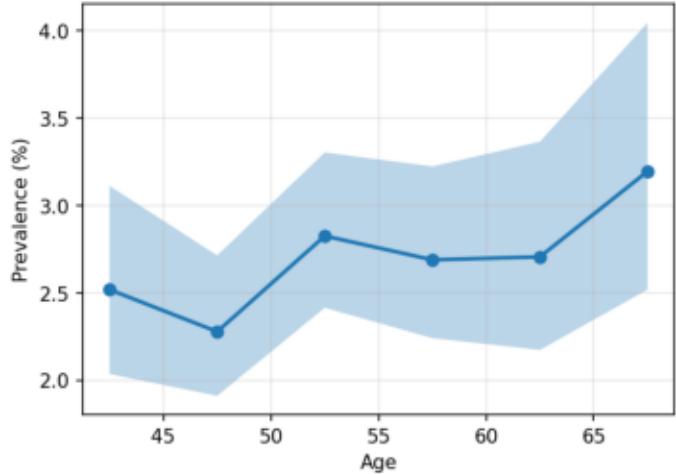
Meniscus Tears



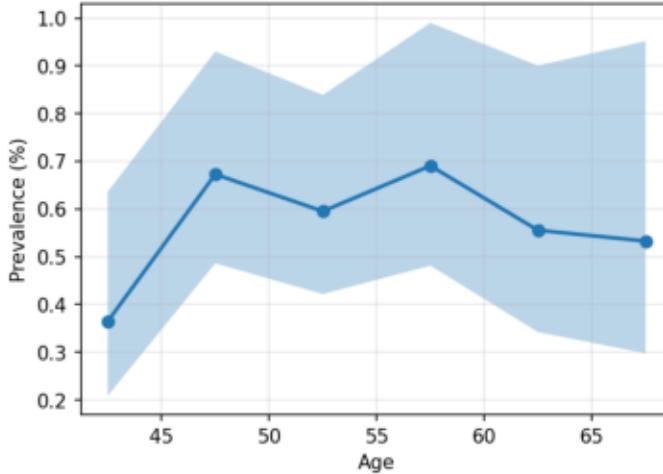
Autoimmune: Prevalence by Age

Autoimmune - Prevalence by Age

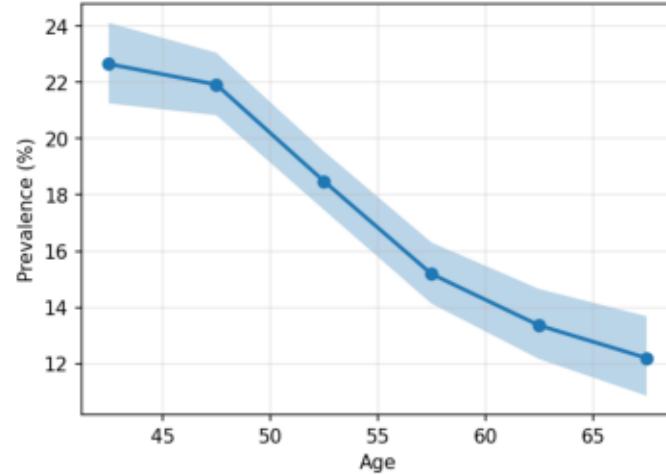
Psoriasis



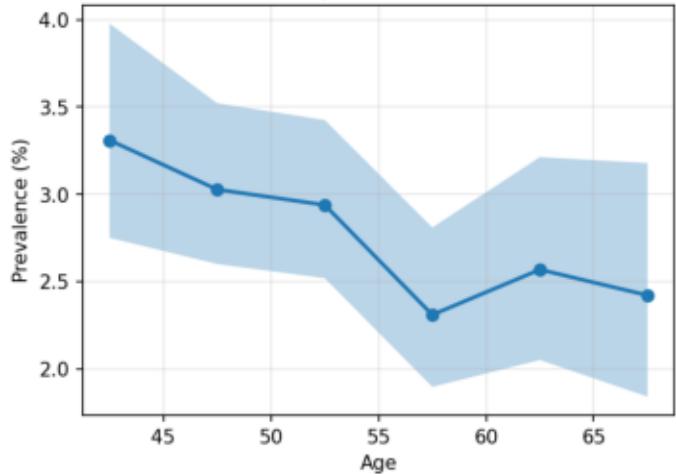
Vitiligo



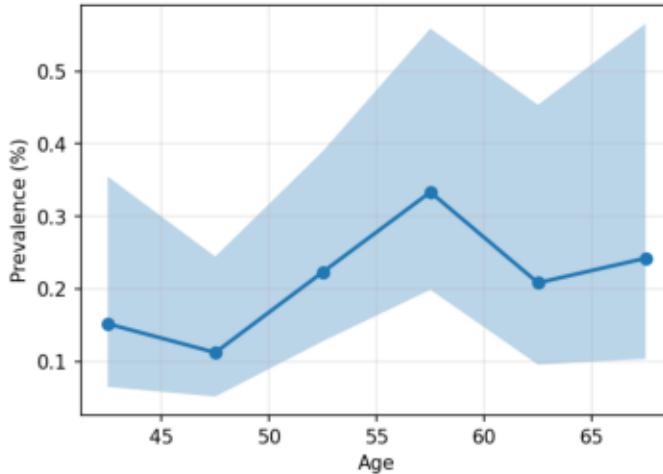
Allergy



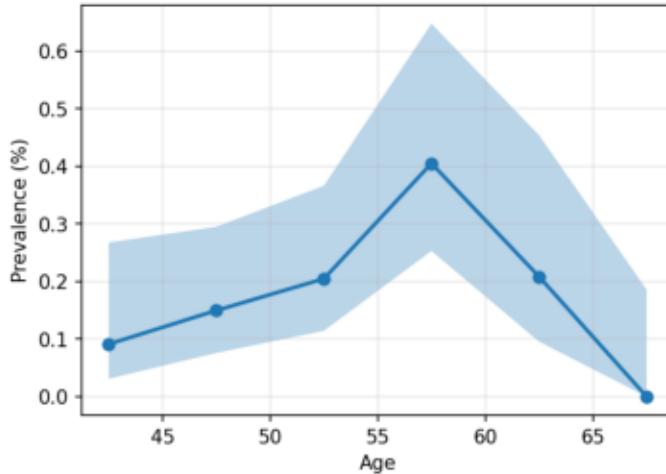
Atopic Dermatitis



Uveitis



FMF



LIMITATIONS AND CRITICAL ANALYSIS

1. SURVIVAL BIAS

Severe conditions may cause earlier death, reducing apparent prevalence in older age groups. This biases results toward finding conditions that "decrease" with age.

2. COHORT/GENERATION EFFECTS

Different generations have different diagnosis rates:

- ADHD was not diagnosed in older generations as children
 - Allergies may reflect increased environmental allergens
- These are NOT true age effects but generational differences.

3. DETECTION BIAS

Older adults may seek more medical care, leading to more diagnoses. Younger adults may underreport symptoms.

4. CROSS-SECTORIAL DESIGN

Cannot establish causality or track individual trajectories. We observe associations, not causes.

5. CONFOUNDERS NOT CONTROLLED

This analysis did NOT adjust for:

- Gender (many conditions are sex-specific)
- BMI (major metabolic confounder)
- Socioeconomic status
- Smoking, alcohol, medications

6. SAMPLE SIZE CONSIDERATIONS

Analysis limited to conditions with $n \geq 100$ cases to ensure stable estimates.

RECOMMENDATIONS FOR INTERPRETATION

- Cardiovascular findings (\uparrow) align with known epidemiology
- Mental health findings (\downarrow) likely reflect cohort effects
- Reproductive conditions (\downarrow) reflect natural resolution
- Consider these results as hypothesis-generating

METHODOLOGY

{ '='*50}

STATISTICAL MODEL

- Logistic regression: $\log(p/(1-p)) = \beta_0 + \beta_1 \times \text{Age}$
- β_1 = change in log odds per year of age
- Odds Ratio per decade = $\exp(\beta_1 \times 10)$

INTERPRETATION GUIDE

- OR = 2.0: Condition is 2x more likely per decade of age
- OR = 0.5: Condition is 2x less likely per decade of age
- OR = 1.0: No association with age

INCLUSION CRITERIA

- Age: 40-70 years
- Minimum positive cases: 100
- Complete data for condition

WHAT THE PLOTS SHOW

Log Odds Plot:

- Y-axis: Log odds of having condition at each age
- Points: Observed log odds per age bin
- Line: Fitted regression trend
- Upward slope = increases with age

Prevalence Plot:

- Y-axis: Percentage with condition
- Shows raw proportions (easier to understand)
- Does not show statistical uncertainty

Odds Ratio Plot:

- Shows multiplicative change per decade
- $OR > 1$ = more likely with age
- $OR < 1$ = less likely with age
- Error bars = 95% confidence interval

DATA SOURCE

Human Phenotype Project (HPP) 10K Dataset

Medical conditions from clinical records

Top 20 Conditions Increasing with Age

Condition	N	OR/Decade	Log OR/Year	P-value
Osteoarthritis	611	2.5	0.0916	1.25e-64
Glaucoma	161	2.42	0.0882	1.12e-17
Ischemic Heart Disease	285	2.39	0.0873	2.57e-29
Hypertension	2494	2.36	0.086	4.07e-204
Retinal detachment	200	2.23	0.0804	1.84e-18
Hyperlipidemia	5013	1.91	0.0646	4.08e-206
Diabetes	247	1.88	0.0632	8.70e-15
Prediabetes	1953	1.77	0.0569	2.13e-78
Hearing loss	822	1.7	0.0532	4.98e-32
Gout	212	1.48	0.0389	8.40e-06
Sleep Apnea	613	1.46	0.0378	3.60e-13
Peptic Ulcer Disease	428	1.41	0.0342	3.21e-08
Insomnia	336	1.39	0.0326	2.83e-06
Gallstone Disease	885	1.35	0.0297	9.15e-12
Fatty Liver Disease	1269	1.25	0.0226	8.43e-10
Breast Cancer	157	1.24	0.0219	0.0322
Urinary Tract Stones	659	1.22	0.0199	7.83e-05
Fibromyalgia	245	1.19	0.0175	0.0333
Back Pain	4307	1.14	0.0128	4.56e-09
Obesity	1269	1.13	0.0124	8.72e-04

Top 15 Conditions Decreasing with Age

Condition	N	OR/Decade	Log OR/Year	P-value
Polycystic Ovary Disease	582	0.53	-0.064	6.46e-25
Endometriosis and Adenomyosis	278	0.67	-0.0404	1.72e-06
Allergy	4220	0.71	-0.0349	4.88e-51
Sinusitis	752	0.79	-0.0238	1.98e-06
B12 Deficiency	1110	0.79	-0.0236	1.39e-08
Anemia	1047	0.8	-0.0225	1.30e-07
Anxiety	695	0.81	-0.0208	5.99e-05
Migraine	1213	0.82	-0.0202	3.28e-07
Oral aphae	809	0.83	-0.0192	6.27e-05
Depression	725	0.83	-0.0188	1.93e-04
Headache	533	0.85	-0.0162	0.0055
IBS	694	0.86	-0.0155	0.0025
ADHD	3580	0.86	-0.0154	1.69e-10
Atopic Dermatitis	656	0.88	-0.0133	0.0115
Asthma	1105	0.88	-0.0123	0.0025