

Sleep Disorders Preceding Dementia Diagnosis: Temporal Patterns in a Large Electronic Health Record Cohort



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Introduction

- ◆ Sleep disorders are linked to higher dementia risk.
- ◆ **Their timing before dementia onset remains unclear.**
- ◆ We examined eight ICD-based sleep disorder categories across three pre-diagnostic windows in large-scale EHR data.

Method

Retrospective nested case–control study using incidence density sampling; electronic health record (EHR) data from Massachusetts General Hospital (1993–2025).

- ◆ Among nearly 4 million patients, 38,046 with dementia were identified using ICD-9/ICD-10 codes

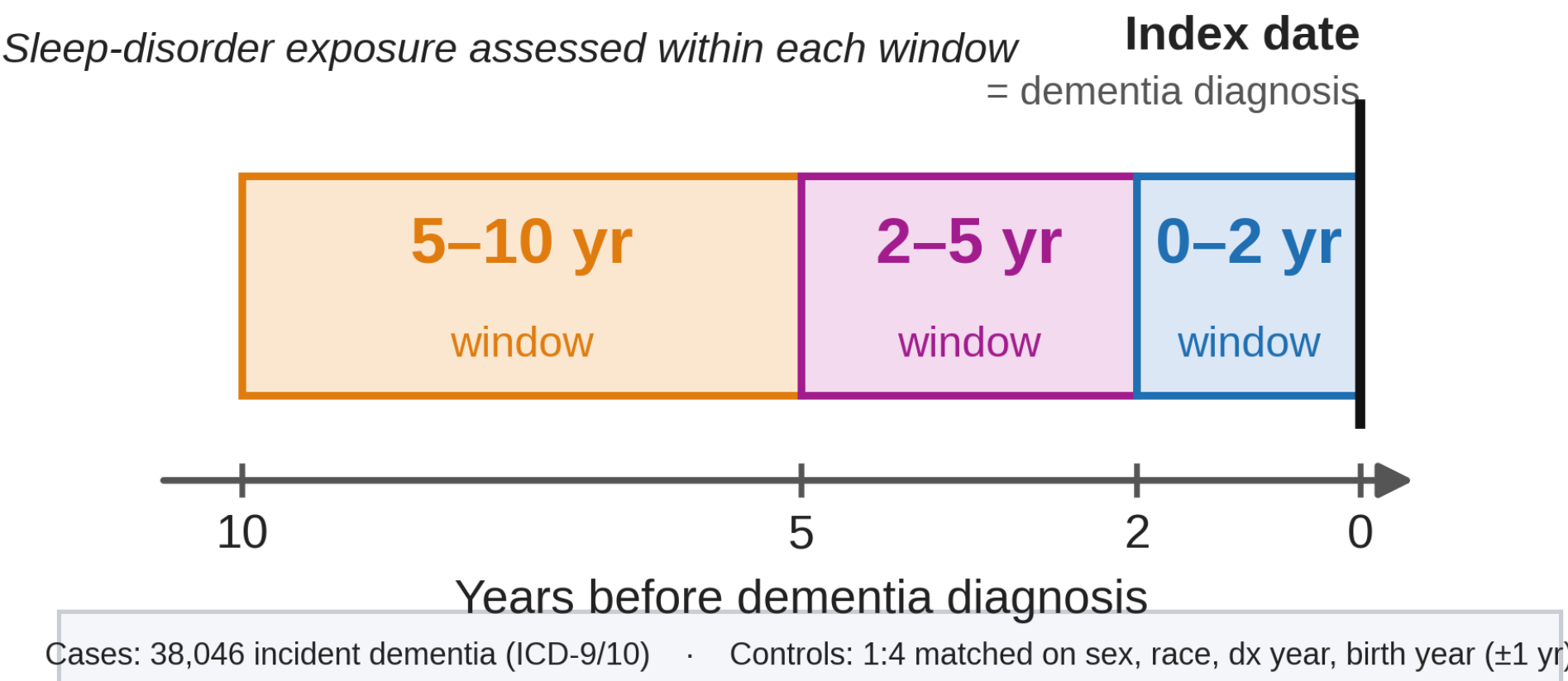
- ◆ Controls matched 1:4 on sex, race, diagnosis year, and birth year (± 1 year), and assigned the case index date

- ◆ SMD < 0.01 for all matched variables; pre-index visit counts differed between groups and were adjusted for

- ◆ Three pre-diagnostic windows examined: 0–2, 2–5, and 5–10 years before diagnosis

- ◆ Conditional logistic regression estimated odds ratios, adjusted for healthcare utilization (number of pre-index clinical visits)

Study design



Study population

- ◆ **38,046 incident dementia cases** (ICD-9/ICD-10); matched 1:4 to controls, all SMD < 0.01
- ◆ Age at index **79.7 yr** (SD 10.8); **59.1% female**
- ◆ Race: **90.2% White**, 4.1% Black, 2.2% Asian, 3.6% other
- ◆ Pre-index visits: **31.0** (cases) vs **23.7** (controls)
- ◆ Any sleep disorder (pre-index): **10.8% of cases vs 6.7% of controls**
- ◆ Cases analyzed: **37,991** (0–2 yr), **16,780** (2–5 yr), **6,140** (5–10 yr)

Result

Sleep disorder Odds ratio (log scale) OR (95% CI)

5–10 years before diagnosis n = 6,140 cases / 23,676 controls

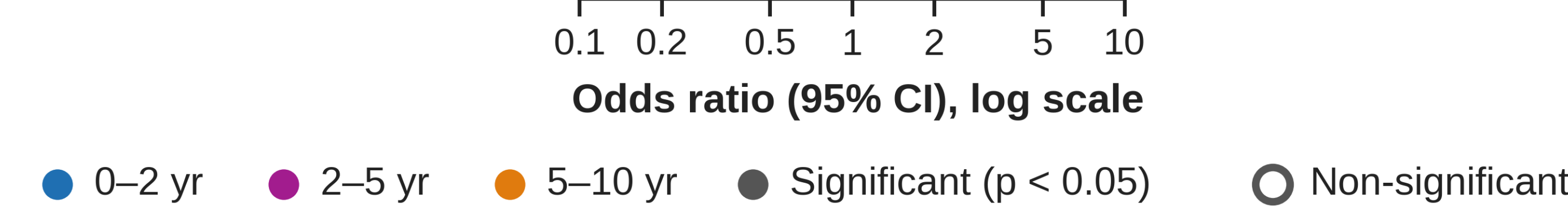
REM sleep behavior disorder	4.58 (2.05–10.24)
Other parasomnias	2.52 (0.57–11.09)
Hypersomnia / narcolepsy	1.15 (0.73–1.82)
Circadian rhythm disorder	0.31 (0.09–1.10)
Insomnia	0.87 (0.75–1.02)
RLS / PLMD	1.10 (0.71–1.72)
Sleep apnea	0.97 (0.84–1.12)
Other / unspecified	0.85 (0.69–1.04)
All sleep disorders (combined)	0.96 (0.86–1.07)

2–5 years before diagnosis n = 16,780 cases / 66,414 controls

REM sleep behavior disorder	6.57 (4.42–9.78)
Other parasomnias	2.81 (1.70–4.65)
Hypersomnia / narcolepsy	1.44 (1.17–1.78)
Circadian rhythm disorder	0.76 (0.45–1.28)
Insomnia	1.09 (1.01–1.18)
RLS / PLMD	0.93 (0.72–1.20)
Sleep apnea	1.04 (0.96–1.12)
Other / unspecified	1.19 (1.08–1.30)
All sleep disorders (combined)	1.14 (1.08–1.21)

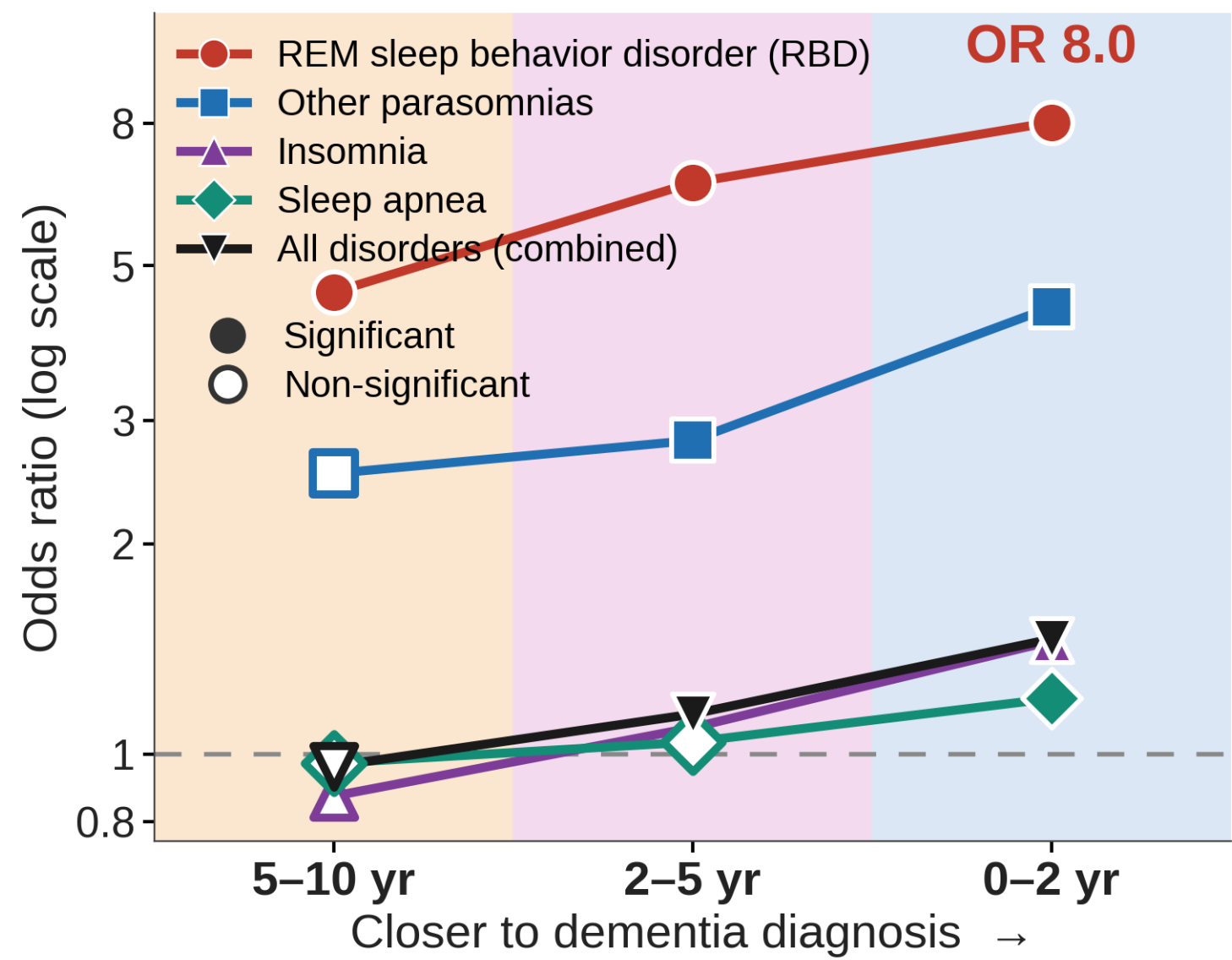
0–2 years before diagnosis n = 37,991 cases / 151,771 controls

REM sleep behavior disorder	8.02 (6.15–10.44)
Other parasomnias	4.36 (3.02–6.27)
Hypersomnia / narcolepsy	2.04 (1.76–2.37)
Circadian rhythm disorder	1.73 (1.21–2.46)
Insomnia	1.45 (1.37–1.53)
RLS / PLMD	1.39 (1.13–1.71)
Sleep apnea	1.20 (1.13–1.27)
Other / unspecified	1.54 (1.44–1.64)
All sleep disorders (combined)	1.46 (1.40–1.52)



Filled markers: 95% CI excludes OR = 1.0 (dashed line); open markers non-significant.

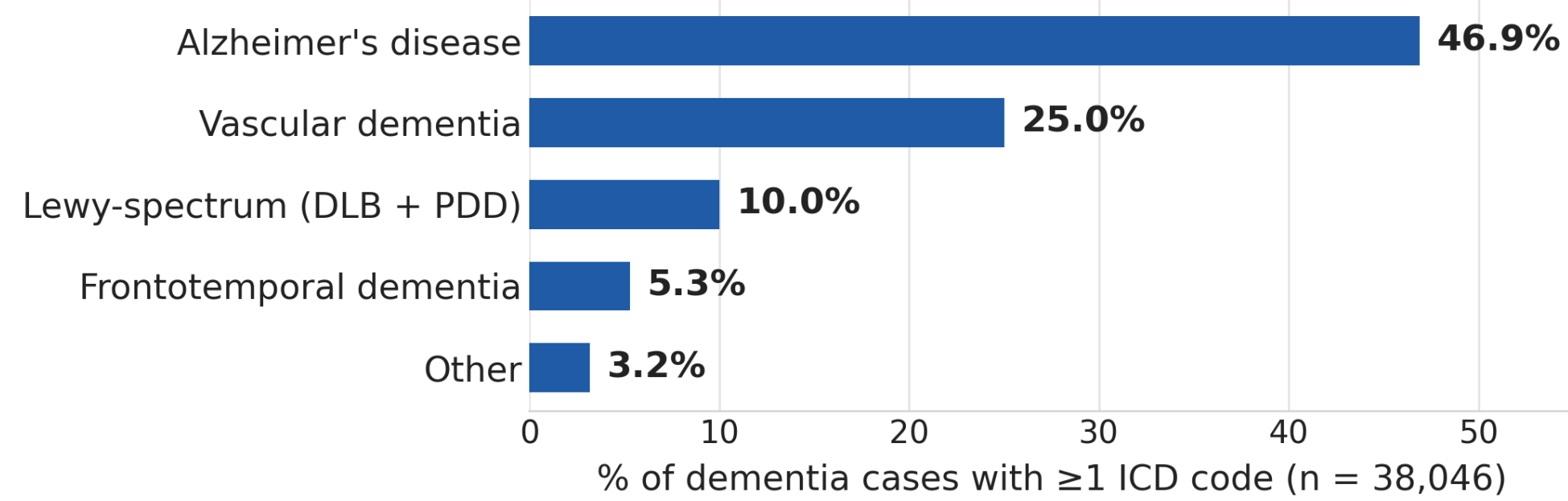
Conditional logistic regression stratified by matched set, adjusted for number of pre-index clinical visits.



OR trajectory across pre-diagnostic windows (key disorders)

- ◆ **RBD showed the strongest association in every window — and was the only disorder still significant at 5–10 years before diagnosis**
- ◆ At 2–5 years, RBD, other parasomnias, hypersomnia/narcolepsy, insomnia, and other/unspecified disorders remained significant
- ◆ **Within 0–2 years before diagnosis, all eight disorders were significantly associated with dementia, with RBD strongest**

Dementia subtype composition



ICD-based; subtypes not mutually exclusive, so % do not sum to 100%. Non-specific codes excluded.
Lewy-spectrum = DLB (4.3%) u PDD (7.7%), 725 overlap. Other = NPH (1.9%) + alcohol (1.0%) + CJD (0.2%) + senile (0.2%).

Conclusion

Sleep disorders in clinical records showed distinct temporal associations with dementia before diagnosis.

- ◆ **Associations were strongest 0–2 years before diagnosis and attenuated earlier — sleep disorders and dementia may evolve in parallel during the prodrome.**
- ◆ RBD's association persisted up to 10 years before diagnosis, supporting it as an early marker of neurodegeneration.
- ◆ Given RBD's link to synucleinopathies, mechanistic studies are warranted.

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