



# Subtype-specific Differences in the Association between Alcohol Consumption and Parkinson's Disease Risk



Ja Young Choi<sup>1</sup>, Jee Hyun Suh<sup>2</sup>, Se Yun Kim<sup>3</sup>, Kyungdo Han<sup>3</sup>,  
Dongeun Kim<sup>4</sup>, Yeo Eun Yoon<sup>1</sup>, Ga Eun Nam<sup>5</sup>, Seo Yeon Yoon<sup>4,6</sup>

<sup>1</sup> Department of Physical and Rehabilitation Medicine, Chungnam National University College of Medicine, Daejeon, Korea  
<sup>2</sup> Department of Rehabilitation Medicine, College of Medicine, Seoul National University Bundang Hospital, Korea  
<sup>3</sup> Department of Statistics and Actuarial Science, Soongsil University, Seoul, Korea  
<sup>4</sup> Department and Research Institute of Rehabilitation Medicine, Yonsei University College of Medicine, Seoul, Korea  
<sup>5</sup> Department of Family Medicine, Korea University Guro Hospital, Korea University College of Medicine, Seoul, Korea  
<sup>6</sup> Yonsei Institute for Digital Health, Yonsei University, Seoul, Korea

## BACKGROUND & OBJECTIVES

The relationship between alcohol consumption and Parkinson's disease (PD) risk remains controversial, partly due to the lack of consideration for disease subtype heterogeneity in prior studies. This study investigated whether alcohol consumption is associated with PD risk, with specific focus on early-onset PD (EOPD, onset <50 years) versus late-onset PD (LOPD, onset ≥50 years) and sex-specific patterns.

## METHODS

This nationwide population-based cohort study enrolled 4,512,321 participants (2,429,683 men and 2,082,638 women) aged ≥20 years without prior PD diagnosis who underwent health examinations provided by the Korean National Health Insurance Service in 2012 (Fig. 1). Alcohol consumption was categorized by drinking status (none, mild, moderate, heavy), frequency (0, ≤3, ≥4 times/week), and amount per session (0, ≤5, >5 drinks). Participants were followed until December 31, 2022, or date of PD diagnosis or death.

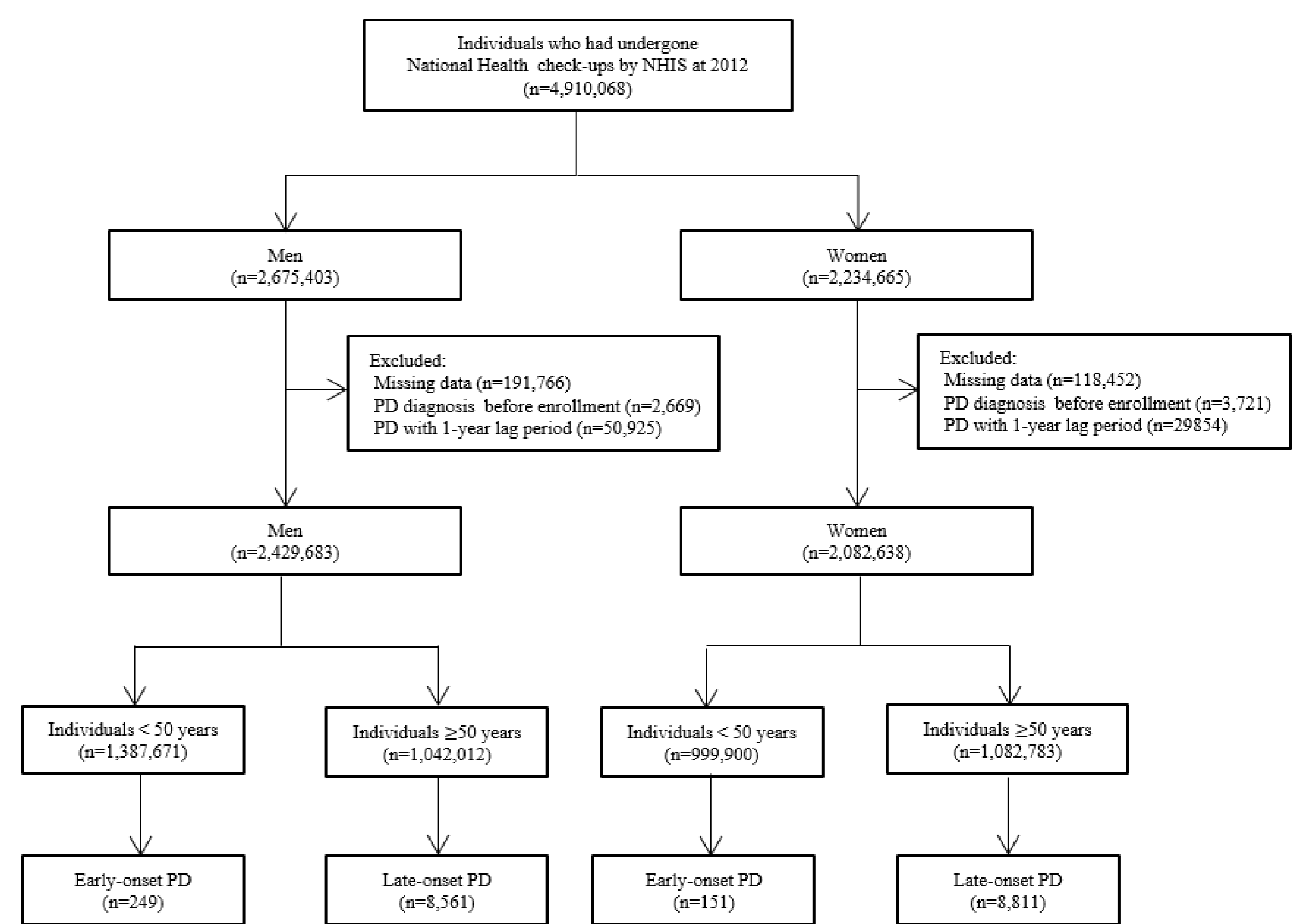
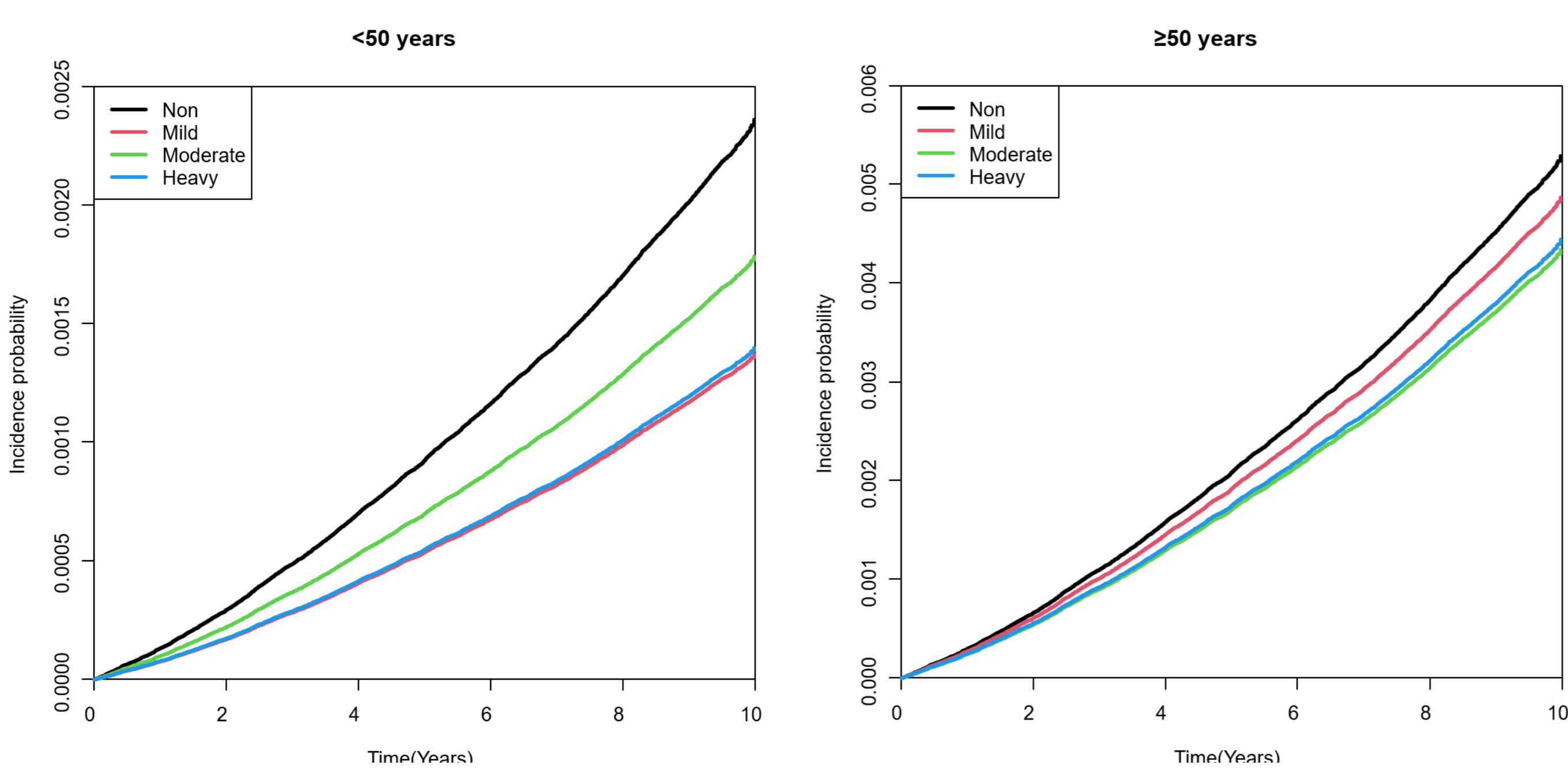


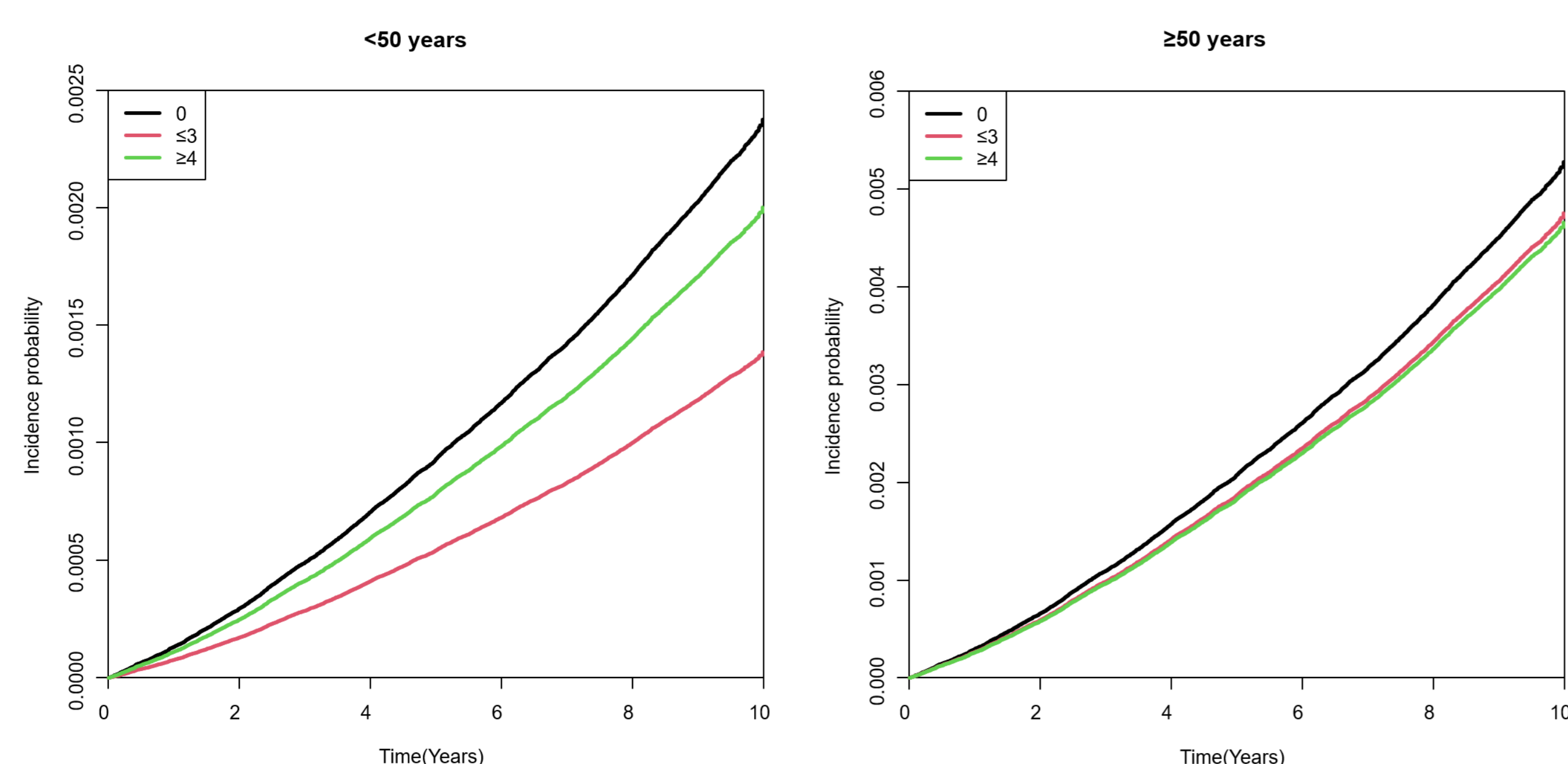
Figure 1. Flowchart for study population

## RESULTS

**Figure 2.** Adjusted Kaplan–Meier curves for cumulative incidence of Parkinson's disease according drinking status stratified by age groups in men. (a) by drinking status, (b) by the number of drinking sessions per week, and (c) by the amount of drinking per session (cup).



(a) by drinking status

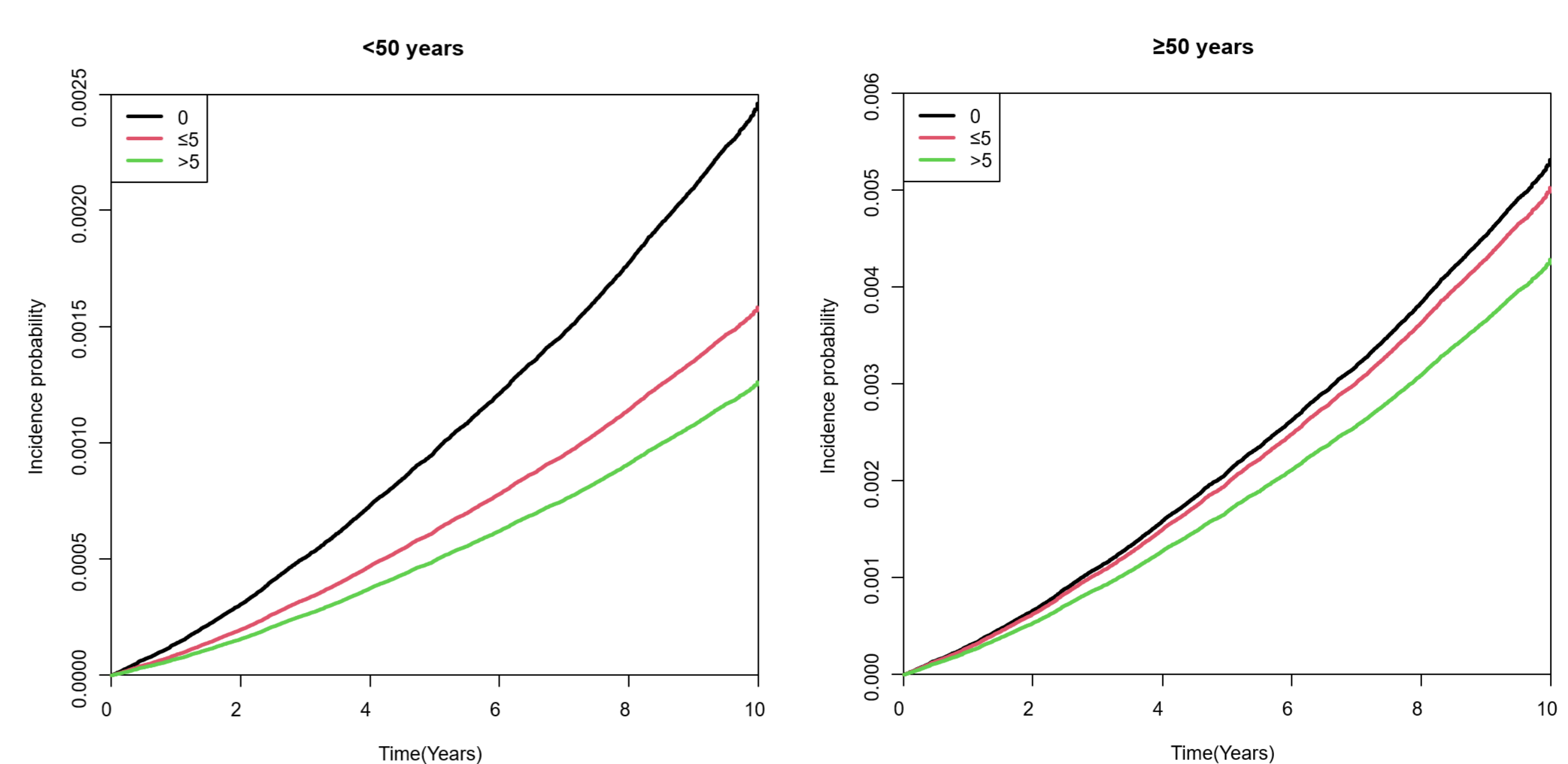


(b) by the number of drinking sessions per week

● During follow-up, 400 EOPD cases (0.02%) occurred among 2,387,571 participants aged <50 years, and 17,372 LOPD cases (0.82%) among 2,124,750 participants aged ≥50 years.

● **In the <50 age group**, light (HR 0.69; 95% CI: 0.56–0.86) and heavy drinking (HR 0.67; 95% CI: 0.45–0.99) were associated with reduced PD risk. Among participants aged ≥50 years, light (HR 0.90; 95% CI: 0.86–0.94), moderate (HR 0.79; 95% CI: 0.73–0.87), and heavy drinking (HR 0.82; 95% CI: 0.76–0.89) showed protective associations. The protective effects were observed regardless of drinking frequency or amount per session, with stronger associations in EOPD than LOPD (P for interaction < 0.05).

● Sex-stratified analyses revealed consistent inverse associations in men across both age groups, while women showed no significant associations (Fig. 2).



(c) by the amount of drinking per session (cup)

## CONCLUSIONS

Alcohol consumption was inversely associated with PD risk in both younger and older adults, with **stronger protective associations in EOPD compared to LOPD and in men compared to women**. These subtype-specific and sex-specific patterns may explain heterogeneous findings in previous studies.