

Healthcare Resource Utilization For Patients With Alzheimer’s Disease Versus Non-Alzheimer’s Disease Controls In Israel

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OBJECTIVE

- To characterize healthcare resource utilization (HCRU) for patients between 10 years pre- and 2 years post-Alzheimer’s Disease (AD) diagnosis in Israel
- To compare HCRU of patients with AD versus age- and sex-matched non-AD controls 1 year pre- and post-AD diagnosis in Israel

CONCLUSIONS

Among patients in the MHS database, patients diagnosed with AD experienced ≥1 hospitalization and increased healthcare costs compared with matched controls

Among patients diagnosed with AD, healthcare costs increased from 10 years pre-AD diagnosis to 1 year post-AD diagnosis

These data indicate that AD is associated with increased healthcare resource utilization versus non-AD controls in Israel, even 10 years before diagnosis

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INTRODUCTION

- AD is the most common cause of dementia, which affects over 46 million people worldwide¹
- In the US, the direct health costs of AD were estimated to be \$321 billion in 2022, indicating a significant burden on healthcare resources²
- There is a gap in the knowledge of the HCRU of patients diagnosed with and without AD in Israel

METHODS

- This longitudinal, retrospective cohort study analyzed de-identified data from the Maccabi Healthcare Services (MHS) database
- Date of first AD diagnosis was defined as the Index Date (ID)
- Inclusion criteria
 - ≥1 AD diagnosis as per the ICD-9 code 331.0 or corresponding MHS internal codes
 - ID between 1 January 2010, and 31 December 2019
 - Aged ≥18 years
 - Continuous enrollment for ≥1 year pre- and ≥1 year post-ID (apart from death)
- MHS members without an AD diagnosis were matched to patients with an AD diagnosis in a 1:1 ratio by age, sex, and socioeconomic status
- Outcomes included the number of patients with ≥1 hospitalization, mean number of hospitalization days, medication^a pack purchases, outpatient visits, and healthcare costs, per patient
- Univariate comparison between groups was performed using standardized mean difference (SMD)
- Time to event analysis for hospitalizations and emergency department (ED) visits were assessed using Kaplan–Meier Curves and log-rank test
- Patients with hospitalizations prior to ID were excluded in the analysis of time to first hospitalizations post-ID. The same criterion was applied when analyzing the time to first ED visit
- HCRU and cost comparison between patients diagnosed with and without AD was performed using two-part models for zero inflated data. HCRU count data had a Poisson or negative binomial regression and costs data had Gamma distribution with log link. Models were adjusted for all baseline characteristics

^aMedications included sleep medications and/or anxiolytics, antipsychotics, antidepressants, antiseizures, cholinesterase inhibitors, memantine, and hormone replacement therapy. AD, Alzheimer’s disease; ED, emergency department; ICD, International Classification of Diseases; ID, Index Date; MHS, Maccabi Healthcare Services; SMD, standardized mean difference.

RESULTS

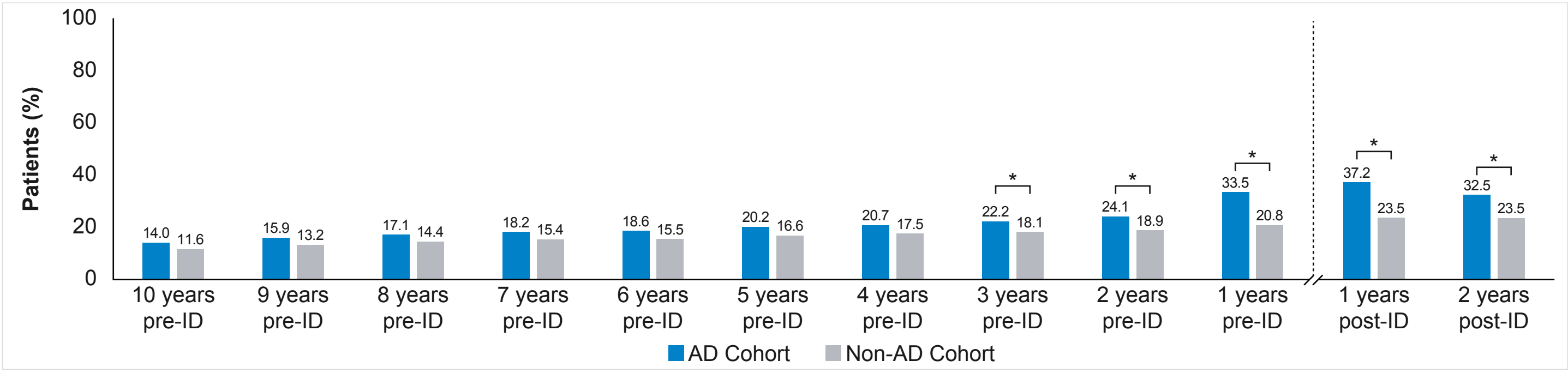
Table 1. Baseline Characteristics of AD and Non-AD Cohorts

Baseline Characteristics	AD Cohort	Non-AD Cohort	SMD
Number of patients	22,064	22,064	-
Age at ID, years			
Mean (SD)	80.12 (8.47)	80.02 (8.43)	0.01
Sex, n (%)			0.00
Female	12,708 (57.6%)	12,707 (57.6%)	
Male	9,356 (42.4%)	9,357 (42.4%)	
Socioeconomic status, n (%)			0.00
Low	5,389 (24.4%)	5,390 (24.4%)	
Medium	8,102 (36.7%)	8,099 (36.7%)	
High	8,515 (38.6%)	8,518 (38.6%)	
Missing	58 (0.3%)	57 (0.3%)	
BMI			0.17
Median (IQR)	26.78 (23.83, 30.33)	27.61 (24.75, 31.06)	
Smoking status, n (%)			0.10
Current	1,263 (5.7%)	1,061 (4.8%)	
Past	522 (2.4%)	486 (2.2%)	
Never	13,451 (61.0%)	12,633 (57.3%)	
Unknown	6,828 (30.9%)	7,884 (35.7%)	

AD, Alzheimer’s disease; BMI, body mass index; ID, Index Date; IQR, interquartile range; SD, standard deviation; SMD, standardized mean difference.

- The annual proportion of patients with ≥1 hospitalization was greater among patients diagnosed with AD than matched controls, at each year from 10 years pre-ID to 2 years post-ID, and statistically significantly greater (SMD≥0.1) from 3 years pre-ID onwards (Figure 1a)

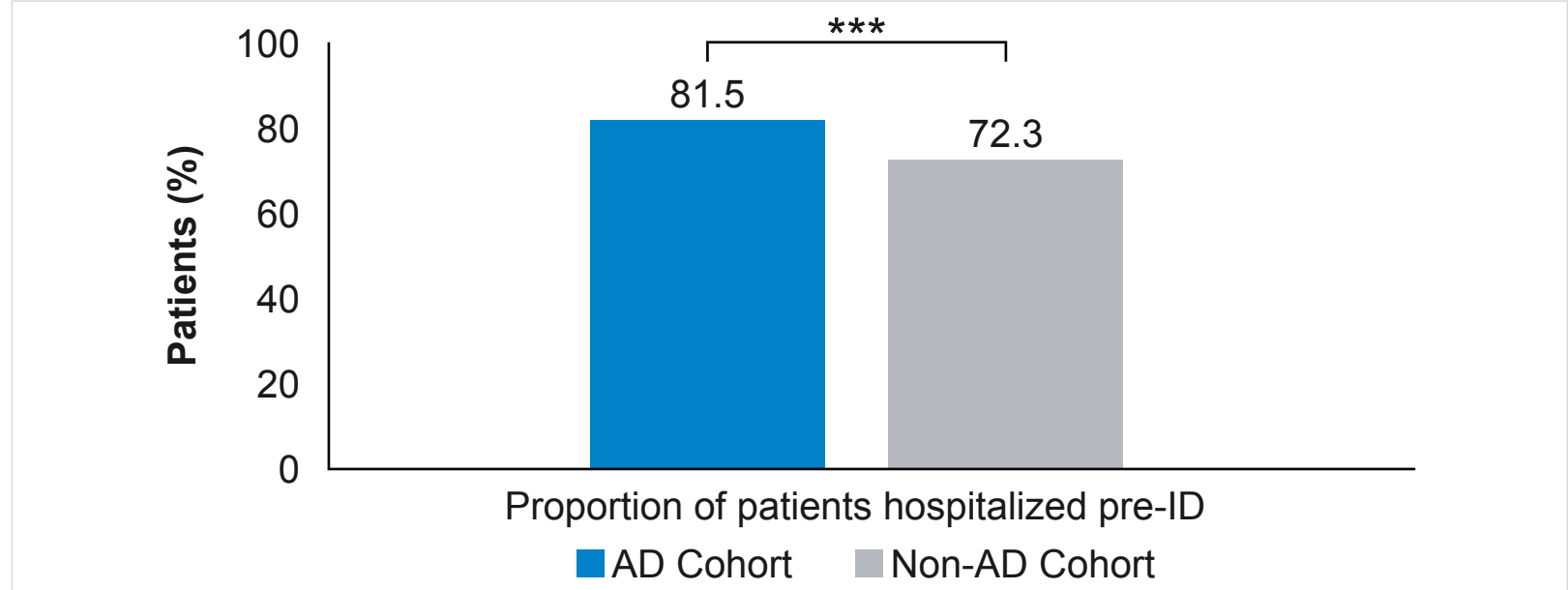
Figure 1a. Annual Proportion of Patients With ≥1 Hospitalization Among Patients Diagnosed With and Without AD, From 10 Years Pre-ID, to 2 Years Post-ID



^aSMD≥0.1
AD, Alzheimer’s disease; ID, Index Date; SMD, standardized mean difference.

- Mean hospitalization days were greater among patients diagnosed with AD than matched controls by a margin of 1.7 and 2.1 days at 1 year pre- and post-ID, respectively, or 0.8 and 0.7 days after adjustment for confounders
- A greater proportion of patients diagnosed with AD experienced their first hospitalization pre-ID than matched controls (81.5% vs 72.3%; SMD 0.22, P<0.001) (Figure 1b)

Figure 1b. Proportion of Patients Who Experienced Their First Hospitalization Pre-ID



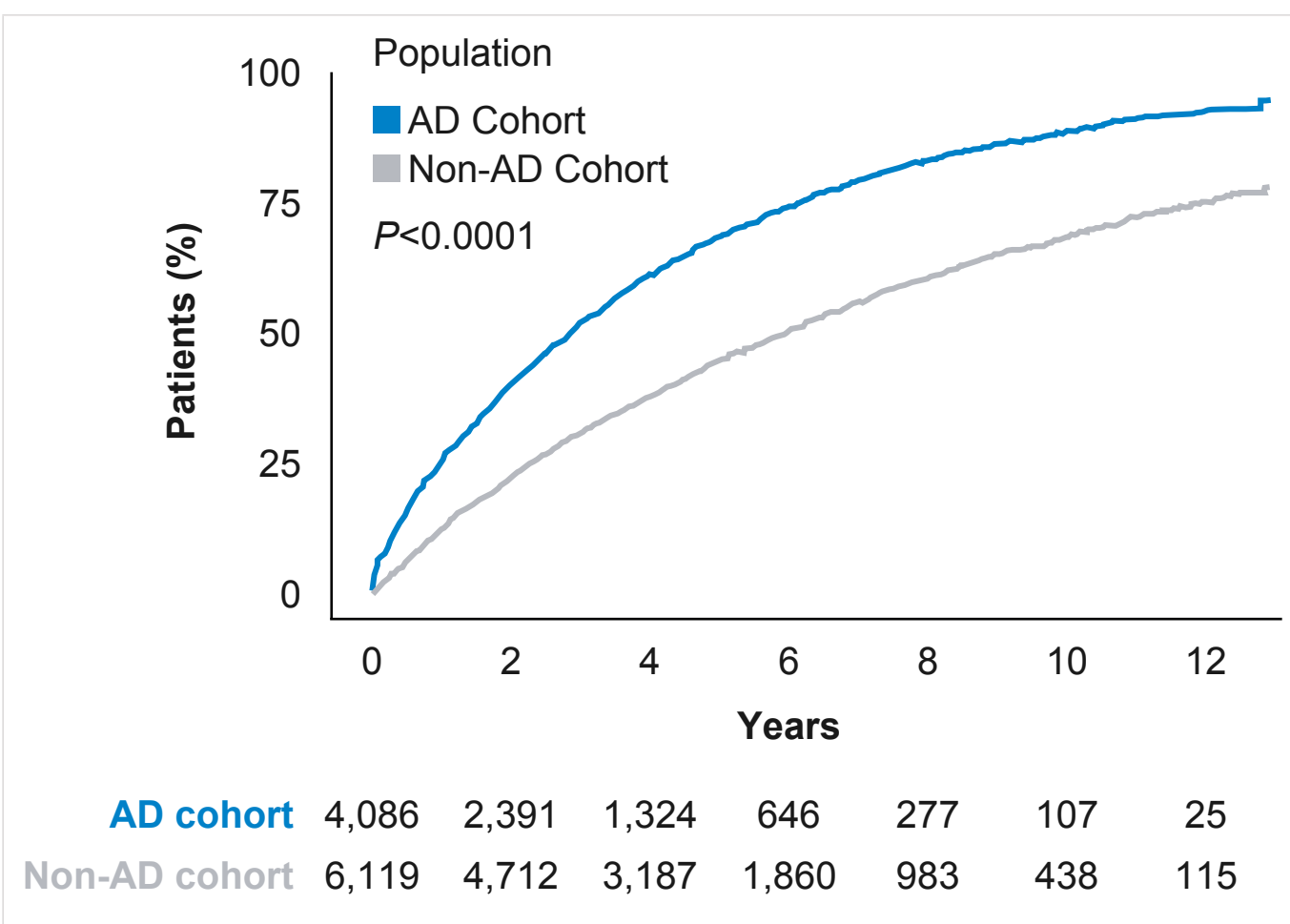
***P<0.001
AD, Alzheimer’s disease; ID, Index Date.

STUDY LIMITATIONS

- This study examines individuals diagnosed with AD, although it is possible that individuals diagnosed with AD were experiencing another dementia or condition. The objective of this study was to look not only at individuals with AD but all who experienced a diagnosis. The requirement of only one AD diagnosis given by any healthcare professional increases the sensitivity of this study and may decrease specificity.

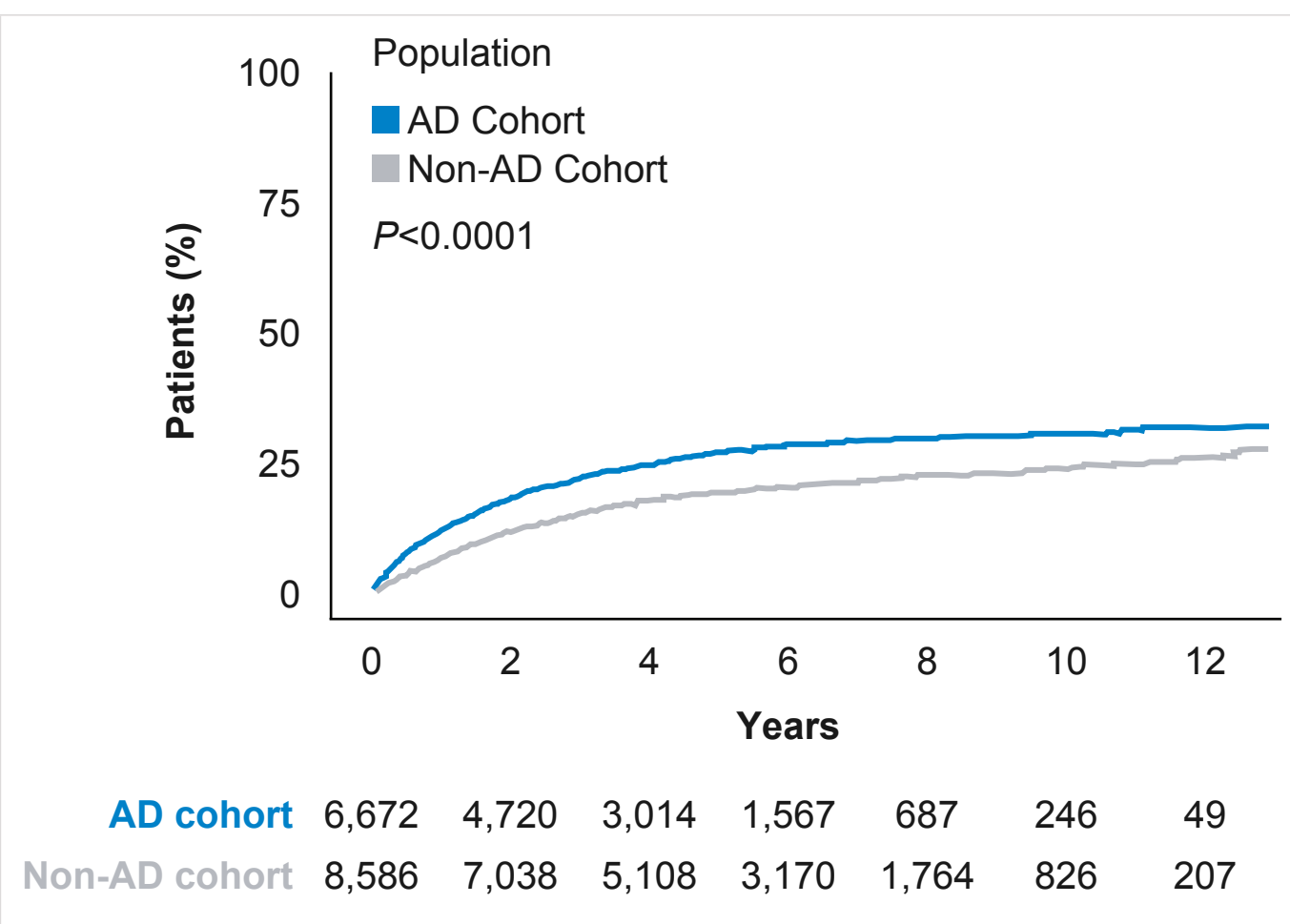
- Among patients not hospitalized pre-ID, hospitalization post-ID also occurred sooner among patients diagnosed with AD than matched controls (P<0.001) (Figure 2a)
- In addition, the first ED visit post-ID occurred sooner among patients diagnosed with AD than matched controls (P<0.001) (Figure 2b)

Figure 2a. Time to First Hospitalization Among Patients Diagnosed With and Without AD, Post-ID



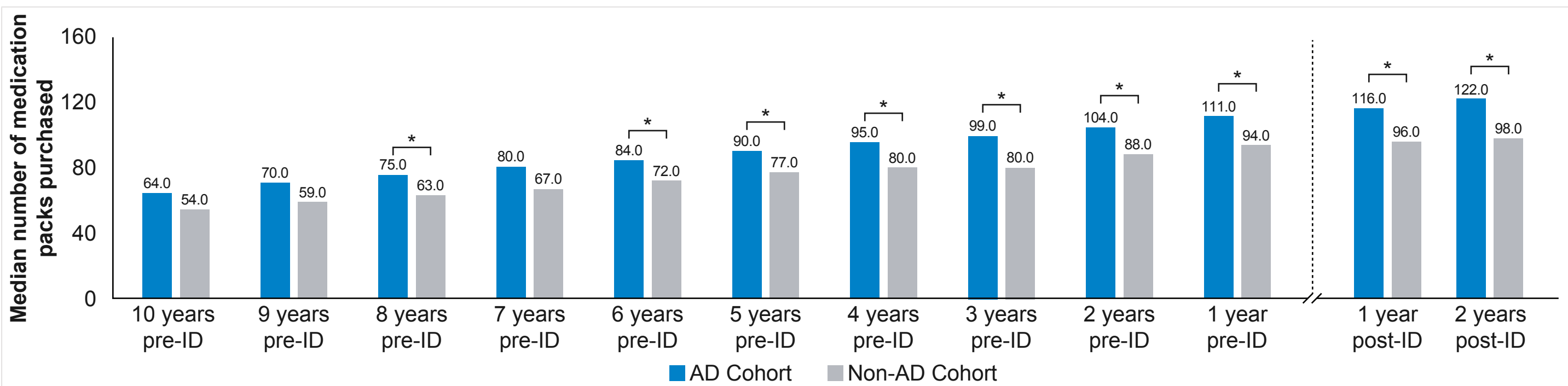
AD, Alzheimer’s disease; ED, emergency department; ID, Index Date.

Figure 2b. Time to First ED Visit Among Patients Diagnosed With and Without AD, Post-ID



- Although a high proportion (≥94%) of patients diagnosed with AD and matched controls had ≥1 medication^a purchase annually, the median number of medication packs purchased by patients diagnosed with AD was statistically significantly greater (SMD≥0.1) than that of matched controls, from 6 years pre-ID to 2 years post-ID (Figure 3)

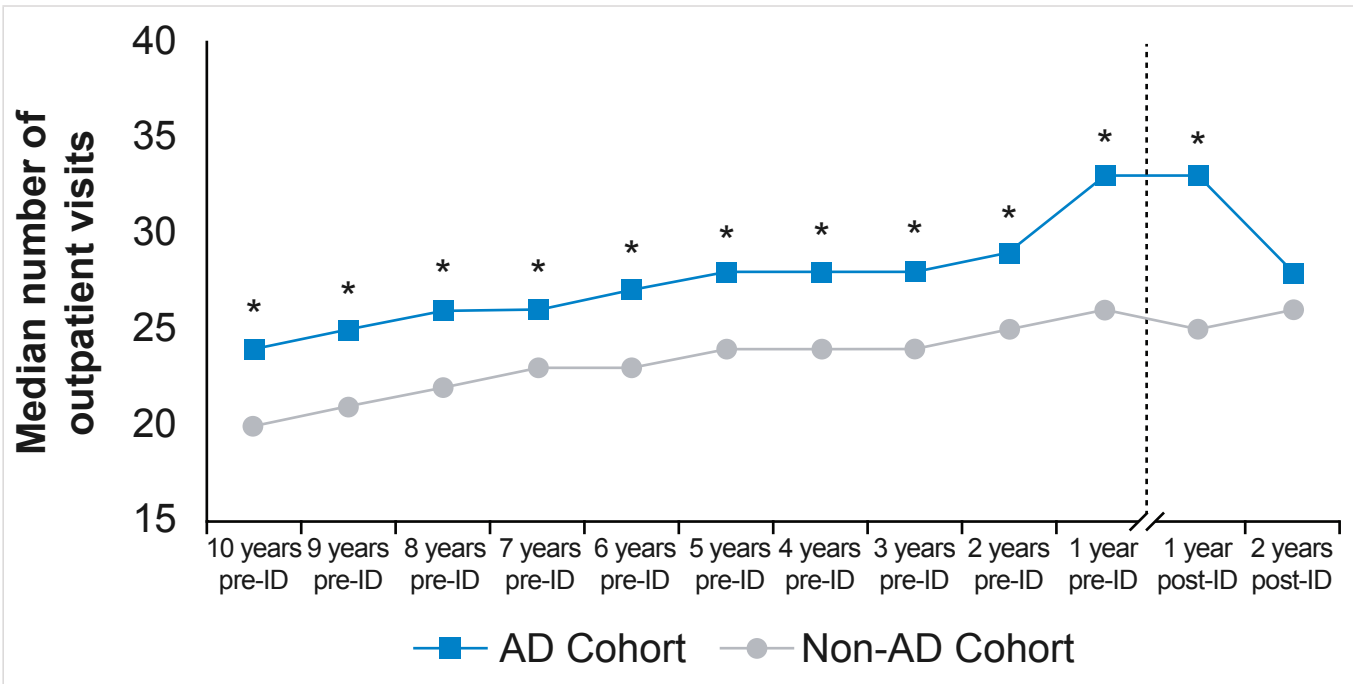
Figure 3. Median Number of Medication Packs Purchased Among Patients Diagnosed With and Without AD, From 10 Years Pre-ID, to 2 Years Post-ID, With ≥1 Purchase



^aMedications included sleep medications and/or anxiolytics, antipsychotics, antidepressants, antiseizures, cholinesterase inhibitors, memantine, and hormone replacement therapy. ^aSMD≥0.1. AD, Alzheimer’s disease; ID, Index Date; SMD, standardized mean difference.

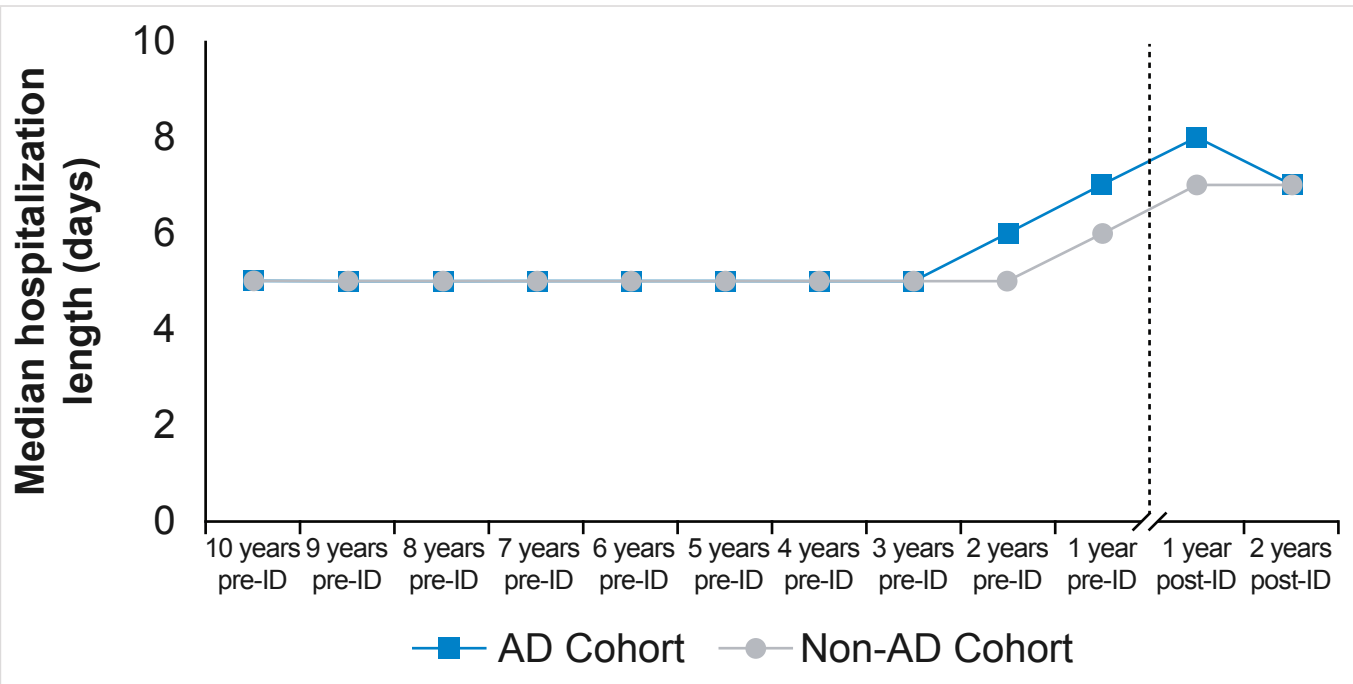
- The median number of outpatient visits for patients diagnosed with AD was significantly greater (SMD≥0.1) than that of matched controls, from 10 years pre-ID to 1 year post-ID (Figure 4)
- The median hospitalization length tended to increase from approximately 2 years pre-ID for both cohorts (Figure 5)

Figure 4. Outpatient Visits^a Among Patients Diagnosed With and Without AD, From 10 Years Pre-ID, to 2 Years Post-ID



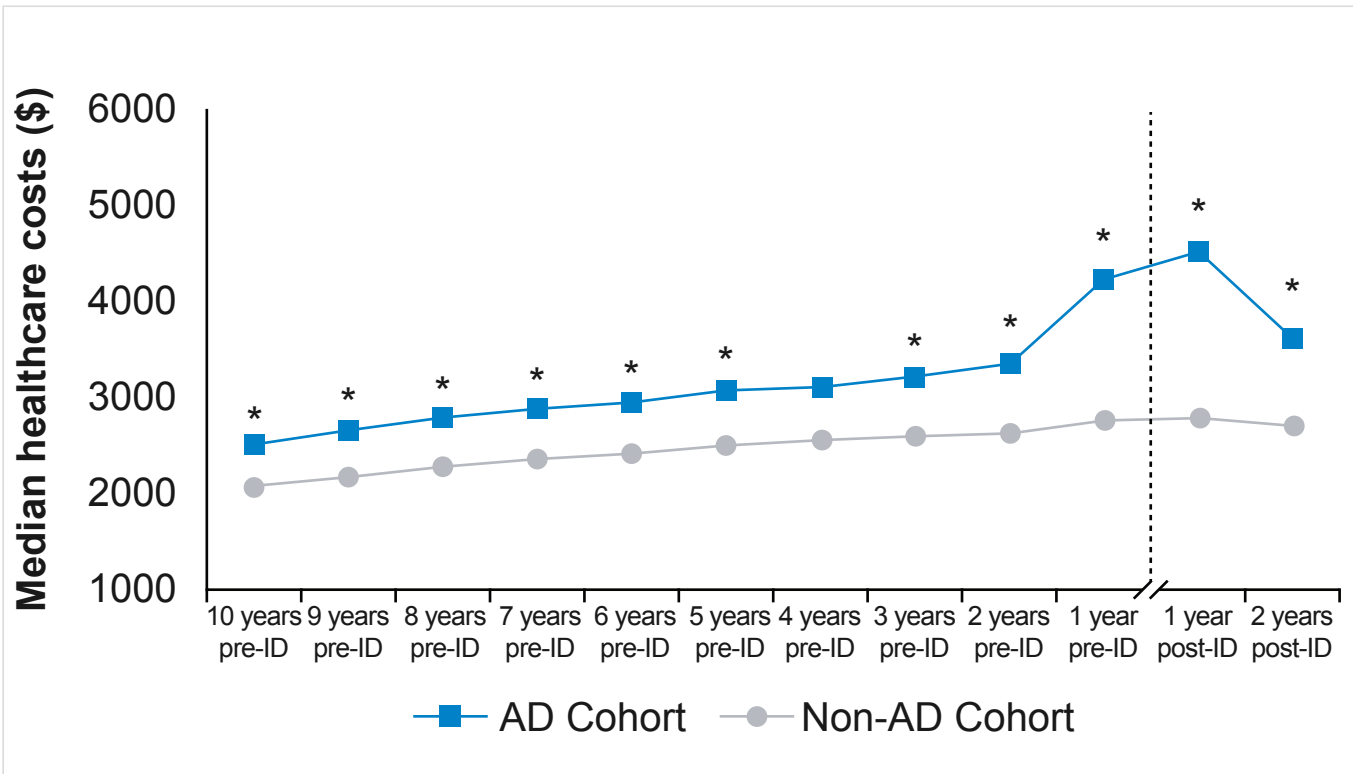
^aFor patients with at least one outpatient visit. ^bFor patients with at least one hospitalization ^aSMD≥0.1. AD, Alzheimer’s disease; ID, Index Date; SMD, standardized mean difference.

Figure 5. Hospitalization Days^b Among Patients Diagnosed With and Without AD, From 10 Years Pre-ID, to 2 Years Post-ID



- Healthcare costs were significantly higher (SMD≥0.1) among patients diagnosed with AD than matched controls at the majority of timepoints, and were at their highest 1 year post-ID (Figure 6)
- At 1 year post-ID, mean healthcare costs were \$2,647 higher among patients diagnosed with AD than controls, or \$825 after adjustment for confounders (Figure 7)

Figure 6. Median Healthcare Costs^a of Patients Diagnosed With and Without AD, From 10 Years Pre-ID, to 2 Years Post-ID



^aMedian healthcare costs included the cost of hospitalization days, emergency or outpatient visits, and medication purchases. ^bModels were adjusted for: sex, age, socioeconomic status, smoking status, alcohol/drug abuse, diabetes, Parkinson’s disease, parkinsonism, depression and anxiety, seizures, falls, psychosis, BMI (categorical), mean B12 levels (categorical) and medication use (e.g. sleep and/or anxiolytics, antipsychotics, antidepressants, antiseizures, cholinesterase inhibitors and memantine). ^cSMD≥0.1. AD, Alzheimer’s disease; BMI, body mass index; ID, Index Date; SMD, standardized mean difference.

Figure 7. Mean Healthcare Costs^a of Patients 1 Year Pre- and Post-ID

