

Diagnostic accuracy of CTseg segmentation software for dementia in Pacific peoples living in Aotearoa New Zealand

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KEY TAKE AWAY 1

CTseg showed moderate accuracy for dementia case-finding in Pacific patients, similar accuracy to that for NZ Europeans.

KEY TAKE AWAY 2

Combined volume model had the highest apparent performance: AUC 0.81

KEY TAKE AWAY 3

Could support earlier, equitable detection when combined with clinical and routine health data.

BACKGROUND & METHODS

Why this matters

- Pacific peoples in Aotearoa New Zealand experience a disproportionate dementia burden.¹
- They tend to develop dementia at a younger age and are often diagnosed later.²
- Routine CT scans are accessible; automated volumetry could make case-finding scalable.
- CTseg is an automated tool that extracts brain volumes from routine non-contrast CT scans.³
- CTseg has previously shown moderate accuracy for dementia case-finding in NZ Europeans.⁴

Objective Evaluate whether CTseg-derived total brain volume and hippocampal volume distinguish dementia from non-dementia in Pacific patients attending an NZ memory service.

Study design

- 1

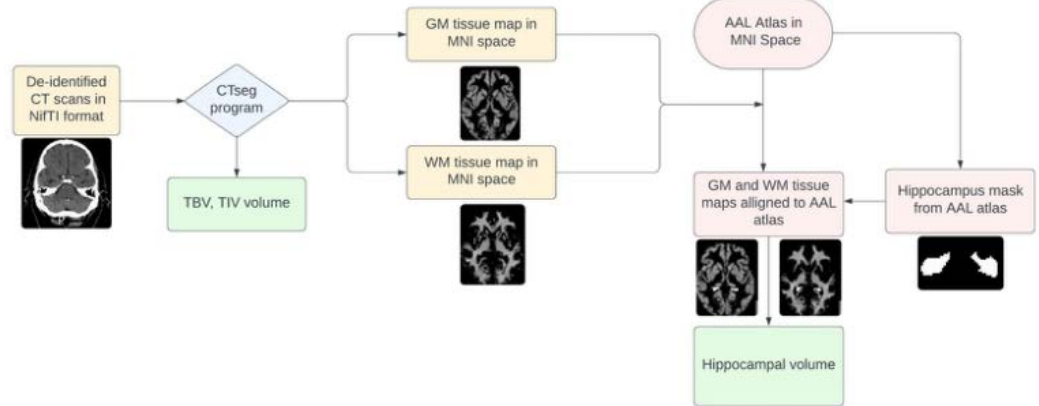
Population
204 Pacific patients aged 65yr+; consecutively selected from memory-service sample in South Auckland, 2013-2022.
- 2

Dementia classification
Based on DSM-5 criteria, subtype and severity determined by multidisciplinary clinical team consensus.
- 3

Imaging
Non-contrast routinely collected CT brain scan within six months of diagnosis
- 4

Analysis
ANCOVA and logistic regression adjusted for age and total intracranial volume; ROC/AUC and Youden thresholds.

CTseg image-processing workflow



CTseg estimates TIV/TBV and tissue maps; AAL hippocampal masks are applied after normalization.

Abbreviations

TBV = total brain volume
HV = hippocampal volume
TIV = total intracranial volume
AD = Alzheimer's disease dementia; VD = vascular dementia
MCI = mild cognitive impairment

RESULTS

Cohort and diagnostic mix

204	127	77	72%
Pacific patients with CT scans	Dementia	No dementia	High deprivation

Pacific ethnicities

Samoa	115
Cook Islands Māori	40
Tongan	37
Other Pacific	12

Dementia subtypes

AD dementia	56
Vascular dementia	56
Mixed dementia	15

Brain volumes lower in dementia

Measure	Dementia	No dementia	p
TBV (cm ³)	1002.8	1028.8	<0.001
HV (cm ³)	12.4	13.5	<0.001
Grey matter (cm ³)	799.3	821.1	<0.001
White matter (cm ³)	550.8	570.0	<0.001

Main finding
All CTseg-derived volumes were significantly lower in dementia after adjustment for age and TIV

Largest difference: hippocampal volume

ROC curves and diagnostic performance

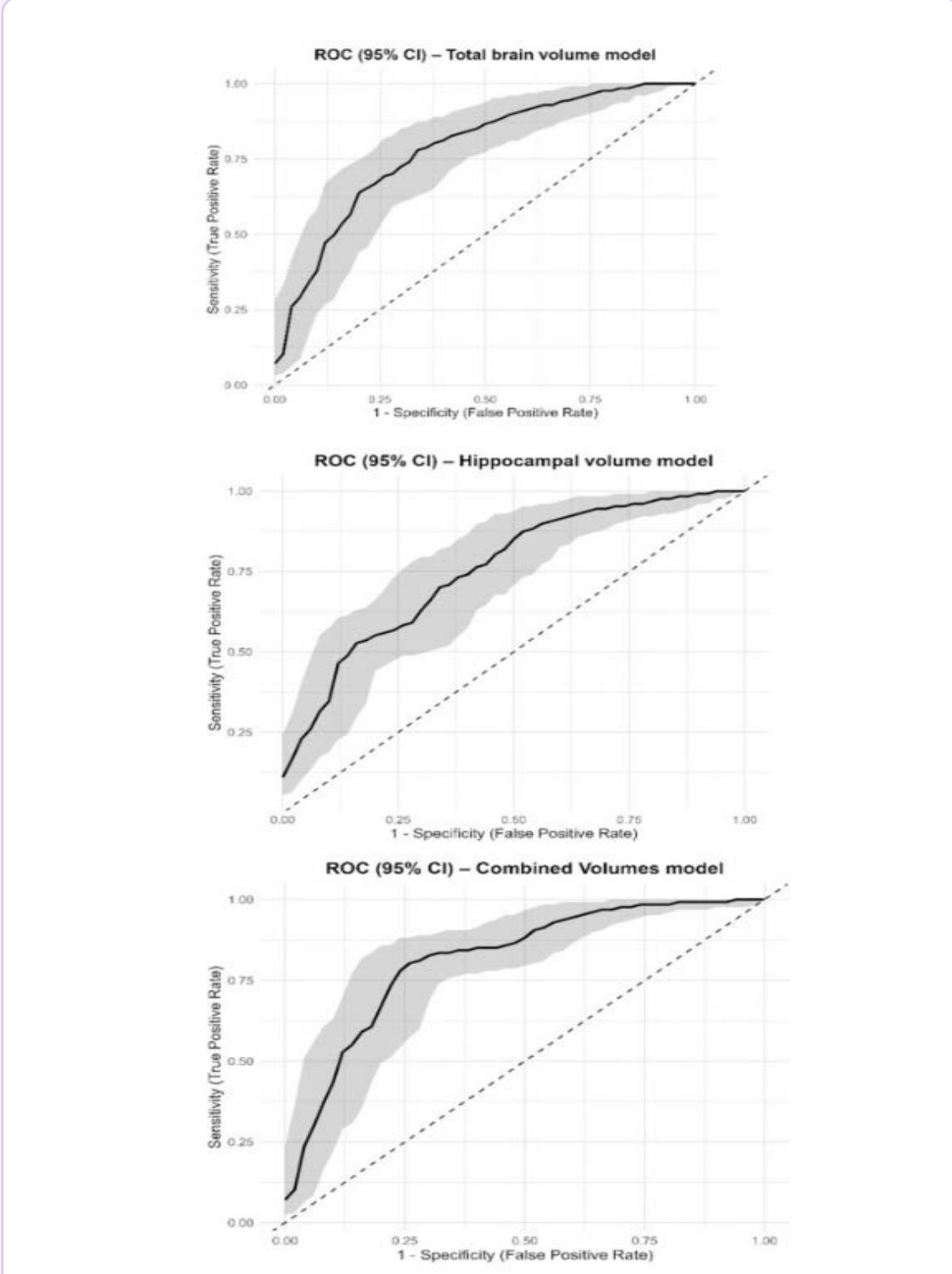


Figure 2: ROC curves with 95% confidence bands

0.78

AUC: total brain volume

0.75

AUC: hippocampal volume

0.81

AUC: combined model

Combined model = TBV + HV + grey matter + white matter volumes

Model	Acc.	Sens.	Spec.	PPV	NPV
TBV	71.6	66.9	79.2	84.1	59.2
HV	66.2	55.9	83.1	84.5	53.3
Combined model	78.9	80.3	76.6	85.0	70.2

Percentages at optimal Youden threshold; AUC shown above.

Threshold choice matters

Higher probability thresholds increased specificity and PPV, but reduced sensitivity and NPV. CTseg is therefore better positioned as a triage/case-finding support tool, not a standalone diagnostic test.

INTERPRETATION & CONCLUSIONS

What the findings mean

Moderate accuracy, real-world sample

CTseg performed comparably to the previous NZ European memory-service sample. Confidence intervals overlapped, suggesting no loss of performance in this Pacific sample.

Strengths

- First CT-based volumetry study focused on a Pacific dementia cohort.
- Consecutive, routine clinical sample.
- Diagnosis made by multidisciplinary consensus.
- Uses routinely acquired CT scans – potential for opportunistic identification of brain changes in CT scans conducted for other reasons

Limitations

- CT scans were viewed used for clinical dementia assessment so incorporation bias may have occurred.
- Small non-dementia group and class imbalance could affect specificity.
- Model performance indicates CT volumes is not ready for standalone clinical use

Conclusions

CTseg-derived brain volumes can identify dementia with moderate accuracy in Pacific peoples and may support earlier, more equitable dementia case-finding when integrated into multimodal clinical workflows.⁵

Next step: combine CTseg outputs with routinely collected electronic health data and validate against a gold standard dementia assessment.

References

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