

## **Cerebral Metabolic Pattern of Glucose Uptake Consistent with Frontotemporal Dementia in Baseline FDG-PET Scans of ADNI AD Subjects**

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## Summary

The University of Utah component of the PET Core uses Neurostat (<http://128.95.65.28/~Download/>) as the basis for image analysis. Neurostat provides individual metabolic and statistical maps in addition to regional values of average surface metabolic values relative to a reference region.

During our analysis of ADNI 18F-fluorodeoxyglucose (FDG-PET) scans, we noticed that metabolic and statistical maps of some ADNI subjects with a clinical diagnosis of Alzheimer's Disease (AD) had a cerebral hypometabolic pattern that was not typical for AD. Some subjects had hypometabolism that predominantly affected frontal and anterior temporal regions suggesting that they might have frontotemporal dementia (FTD). It is not uncommon for patients with FTD to meet NINCDS-ADRDA criteria and thus represent clinical mimics of AD<sup>1</sup>. Furthermore, FDG-PET appears to be a reliable biomarker of FTD pathology. In our autopsy confirmed case series, we found FDG-PET had a specificity of 97.6%, sensitivity of 86% and positive likelihood ratio of 36.5 for FTD<sup>2</sup>.

To assist in further research, we are providing documentation of 15 out of 97 baseline AD subjects with an atypical FDG-PET pattern, by cataloguing in this document their stereotactic surface projections (SSP) created with the Neurostat suite of functions and transaxial images. The composite images we created show the glucose metabolic uptake and the Z-scores compared to a normal elderly population, so that the metabolic patterns can be quickly and easily visualized.

## Methods

### *Stereotactic Surface Projection (SSP) maps*

97 baseline FDG-PET scans from subjects enrolled in the AD group, were processed using Neurostat. We downloaded the LONI "Coreg, Avg, Std Img and Vox Siz, Uniform Resolution" pre-processed scans. The FDG-PET scans were then AC-PC aligned, warped into Talairach space and the peak metabolic glucose uptake values were identified and projected onto the brain surface. This produces a 3D SSP surface map. Glucose metabolic uptake rates were normalized relative to the averaged regional pons value. The corresponding Z-score surface maps were calculated pixel-wise by comparing to CACIR's 27 cognitively normal subjects (14 men, 13 women, mean age 69.6). These two sets of SSP images were combined to create a composite image of glucose metabolism and Z-scores used in the consensus process.

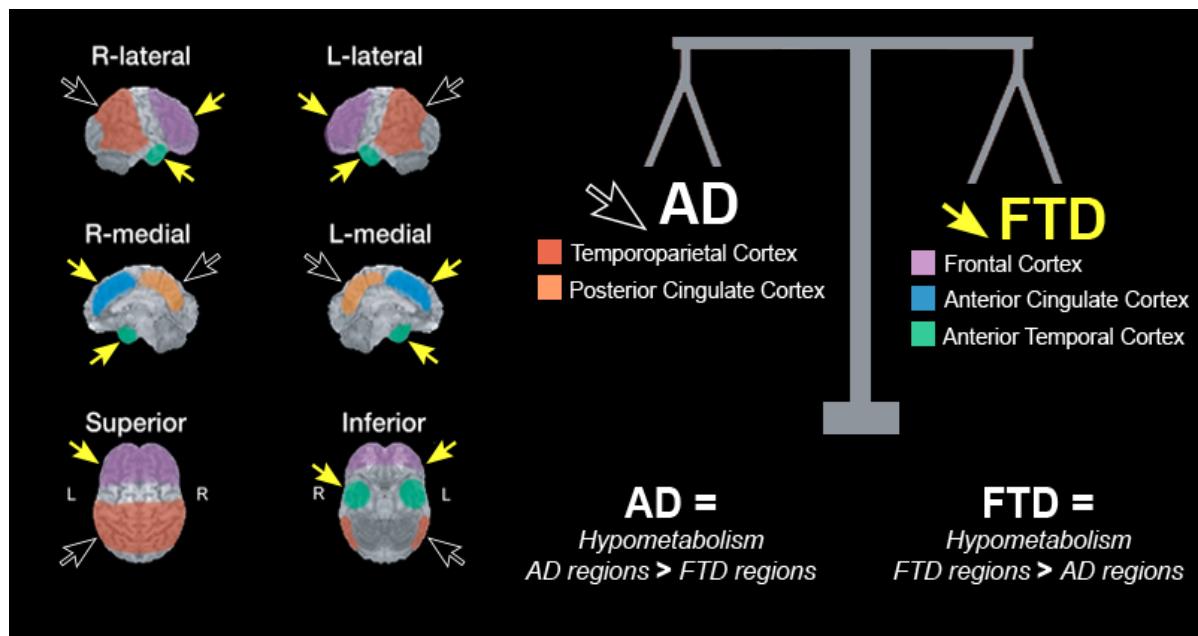
### *Consensus Process*

Two neurologists, at the University of Utah, with experience in dementia care and FDG-PET imaging, served as raters to visually classify the 3D SSP images, in a modified Delphi process. First, the raters separately examined and classified all the individual scans into two categories - FTD-like or not FTD-like. Then, if there is disagreement on the classification of an individual scan, discussions are carried out weighing the classification criteria. The goal is to create a final convergence of opinions for that scan. 15 of the 97 AD subjects were categorized as FTD-like (10 men, 5 women, mean age 80) and 82 were categorized as not FTD-like (48 men, 34 women, mean age 75).



### *Criteria for FTD-like/not FTD-like hypometabolic*

Scans are classified indicating whether the glucose hypometabolic pattern is FTD-like or not FTD-like using the criteria validated in a previous study (Foster et al., 2007). When hypometabolism appears greater in the frontal association cortex, anterior temporal cortex and anterior cingulate gyrus than in posterior regions (Fig 1), it is classified as FTD-like. All other metabolic profiles are classified as not FTD-like.



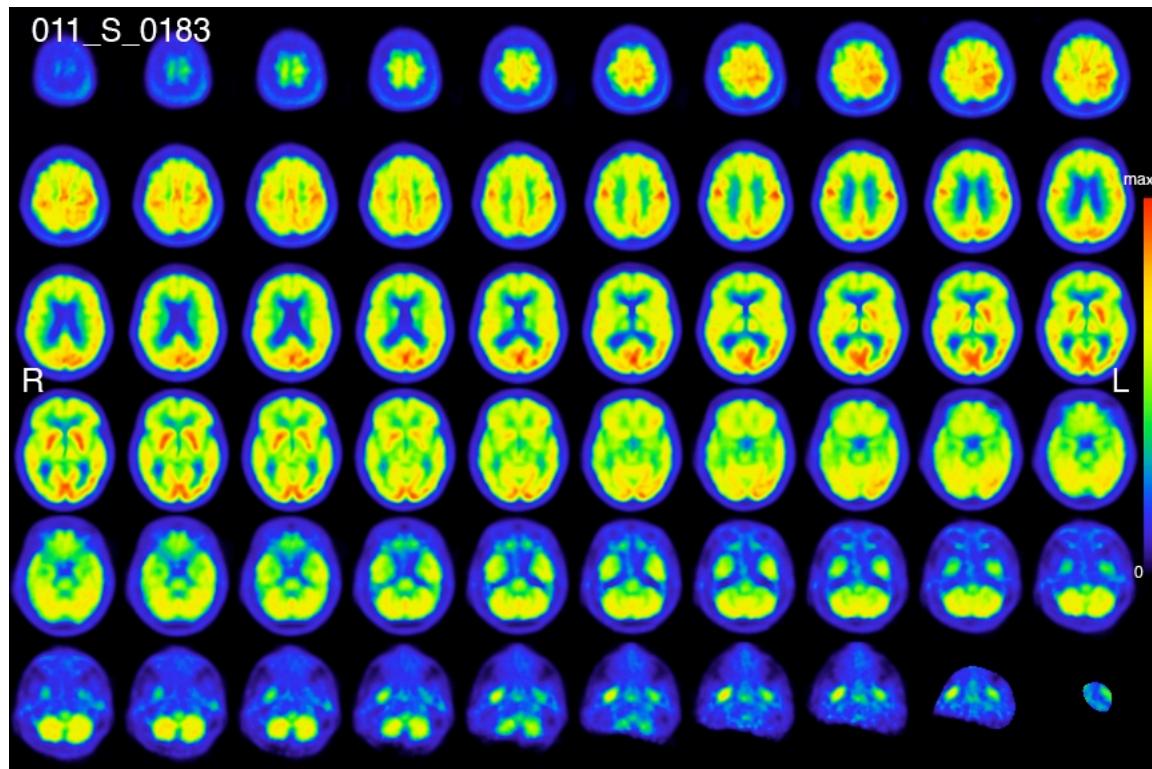
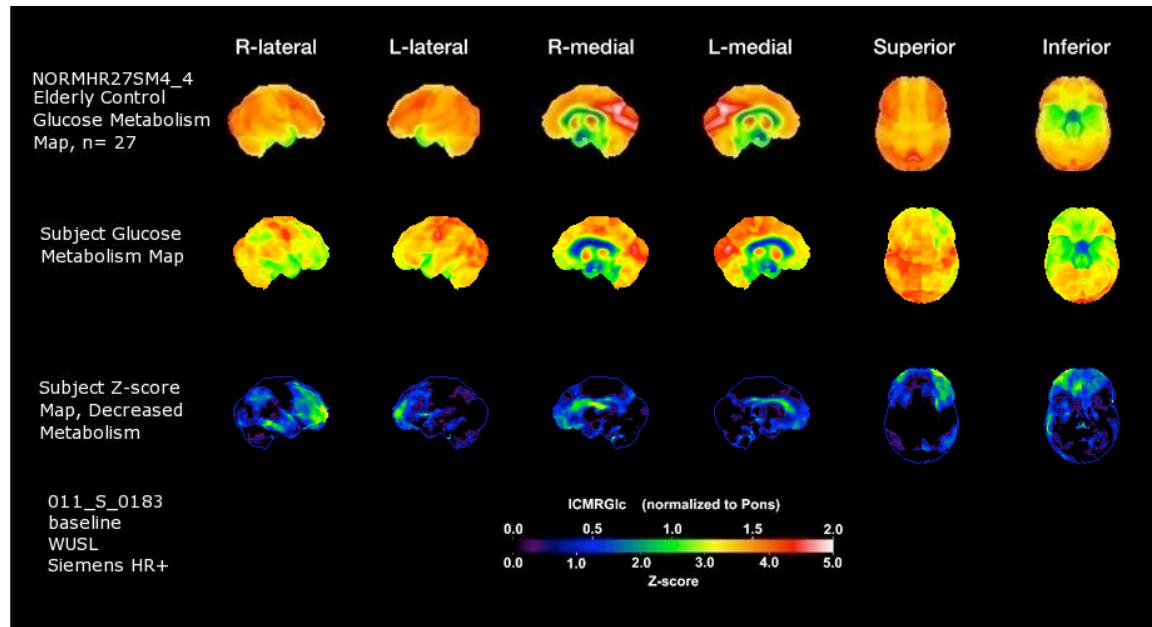
## FTD-like subjects

The consensus process identified the following ADNI subjects as having a FTD-like profiles at their baseline scan visit:

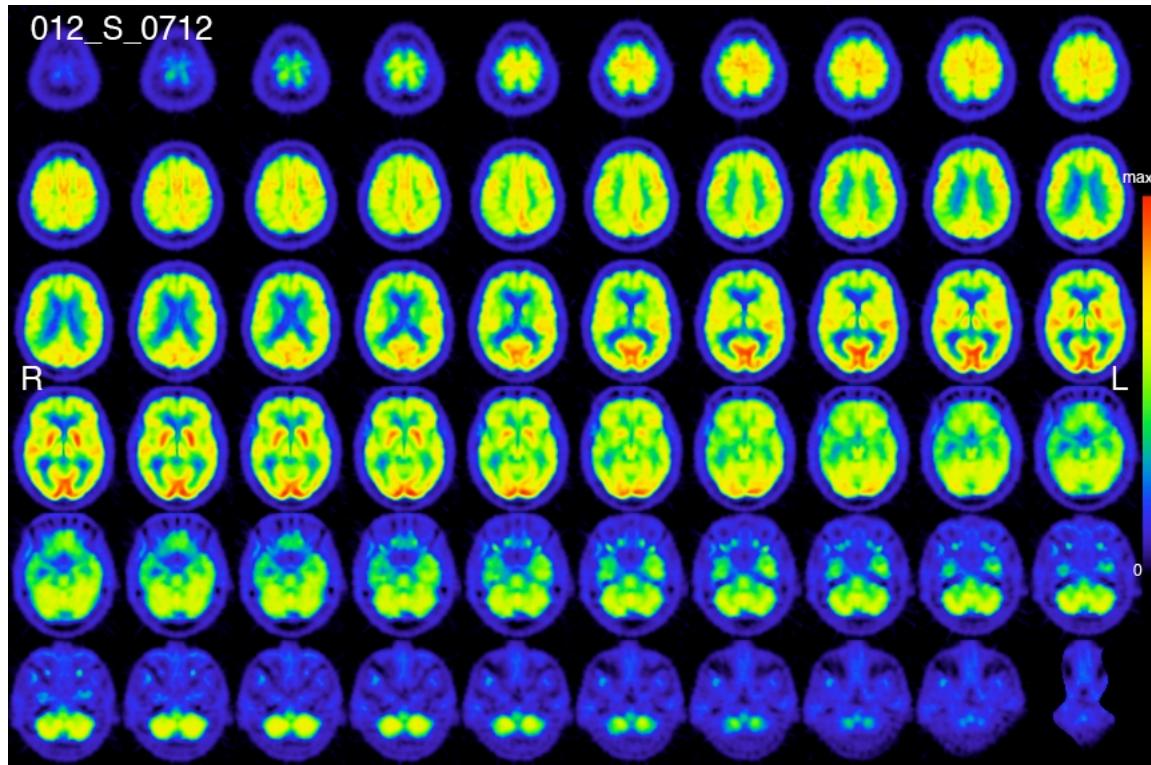
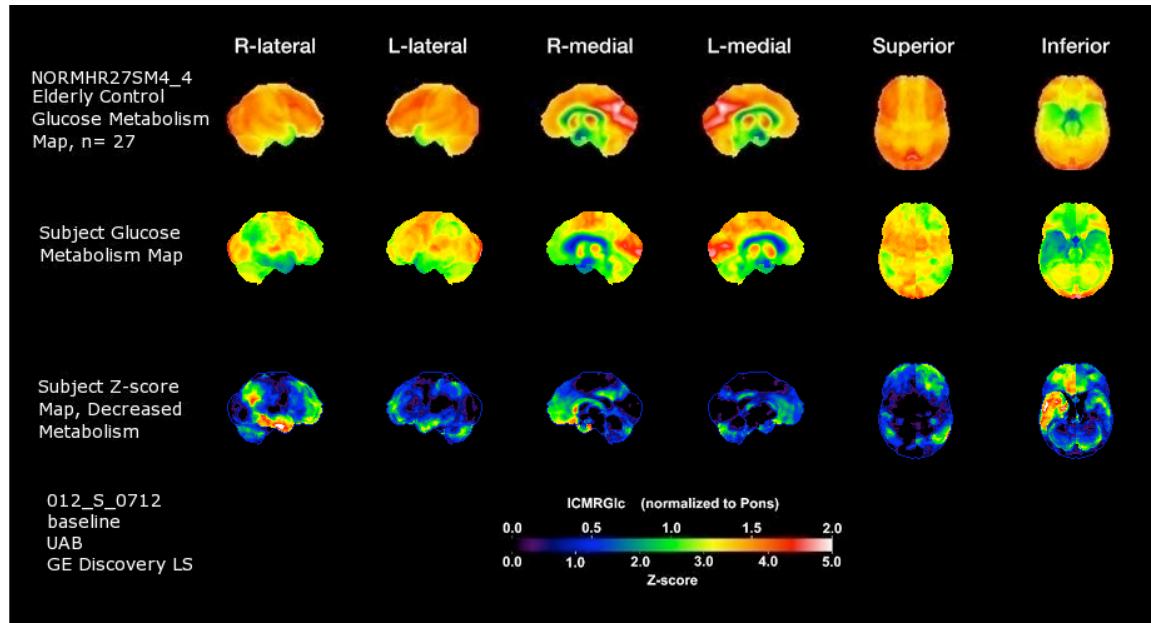
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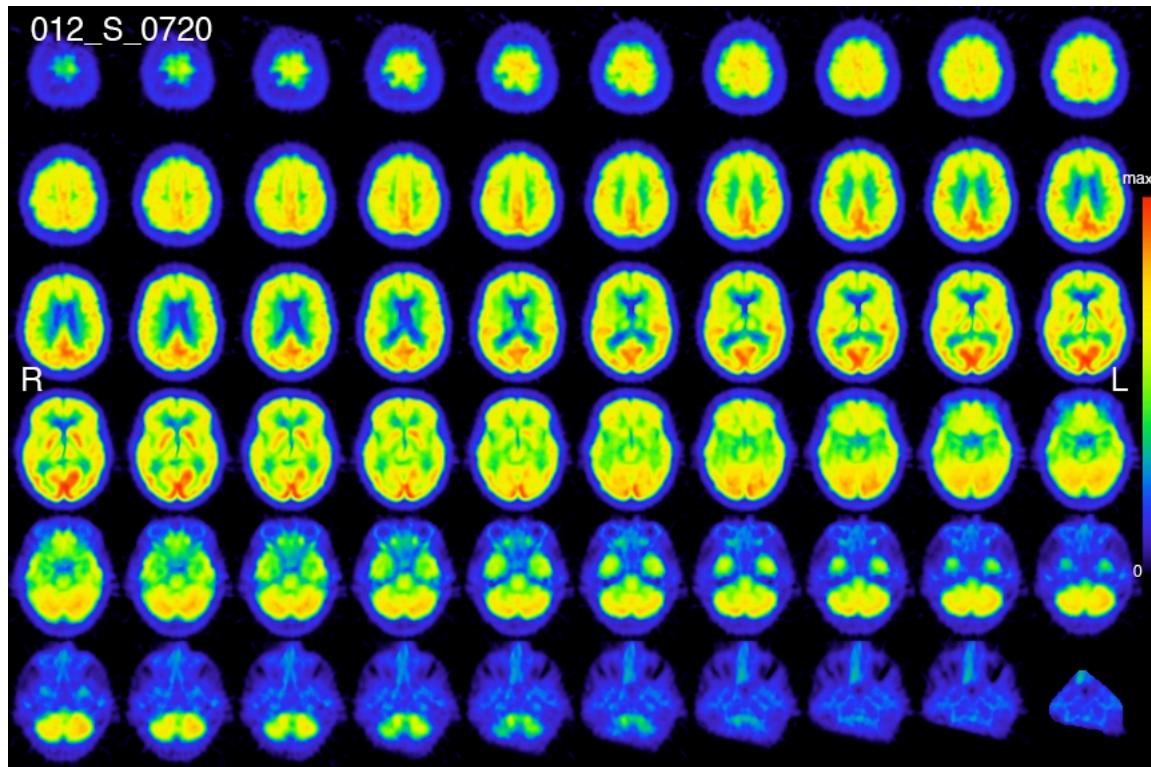
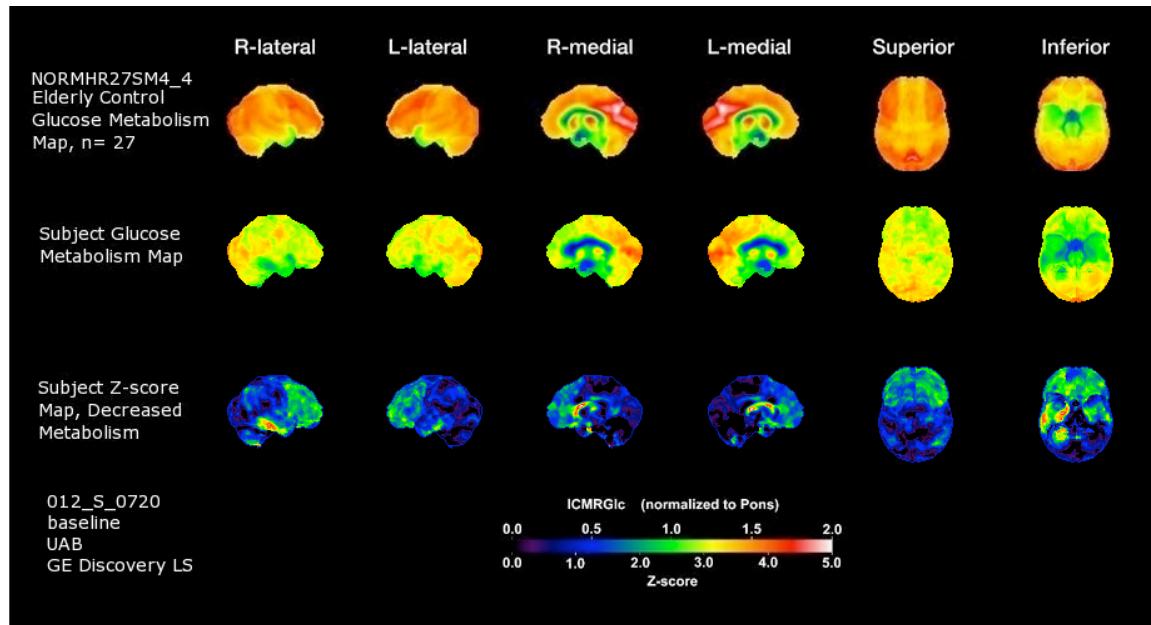


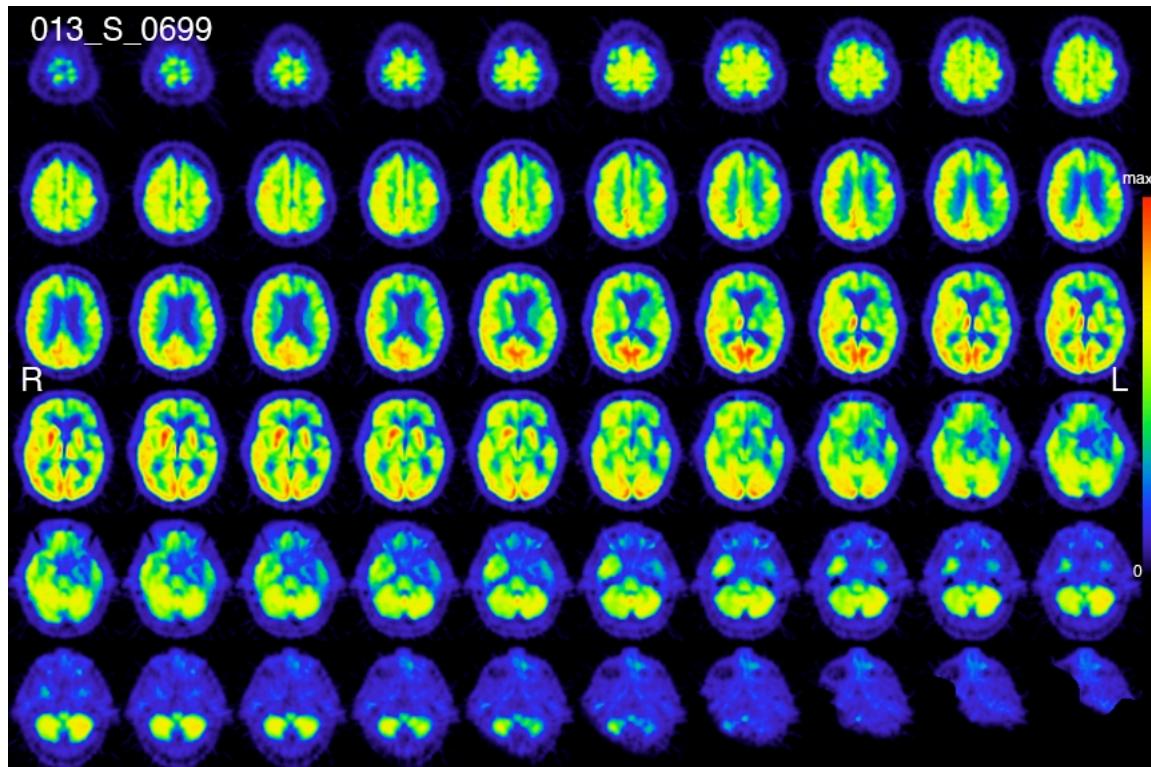
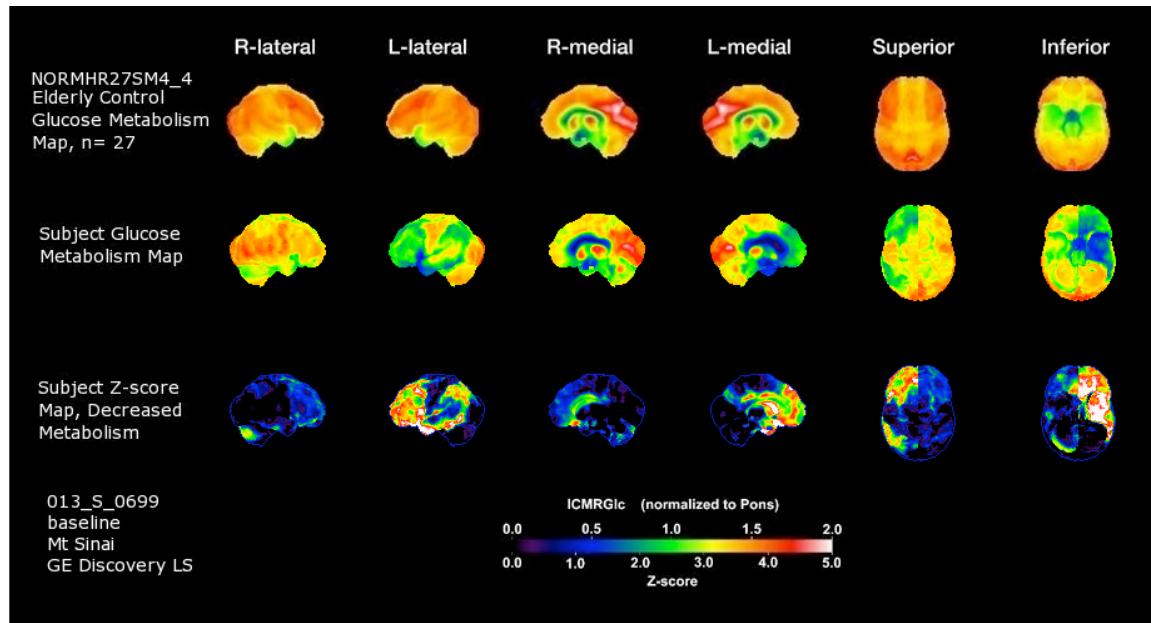
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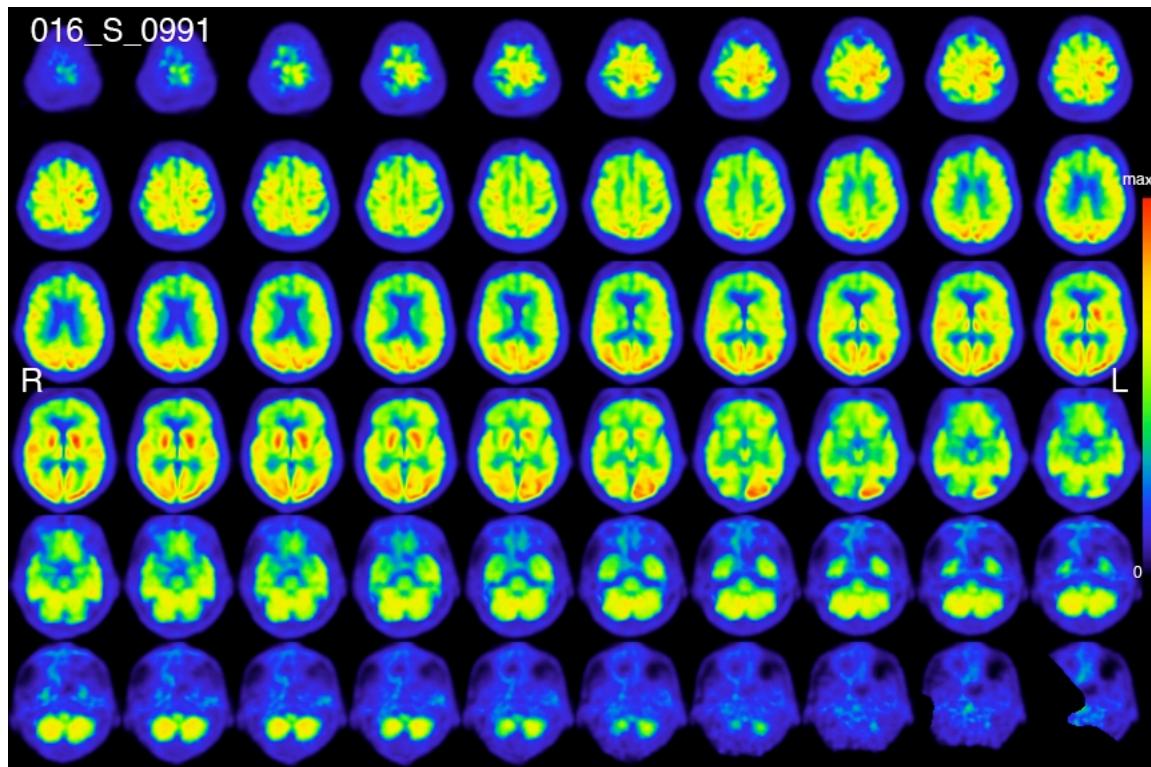
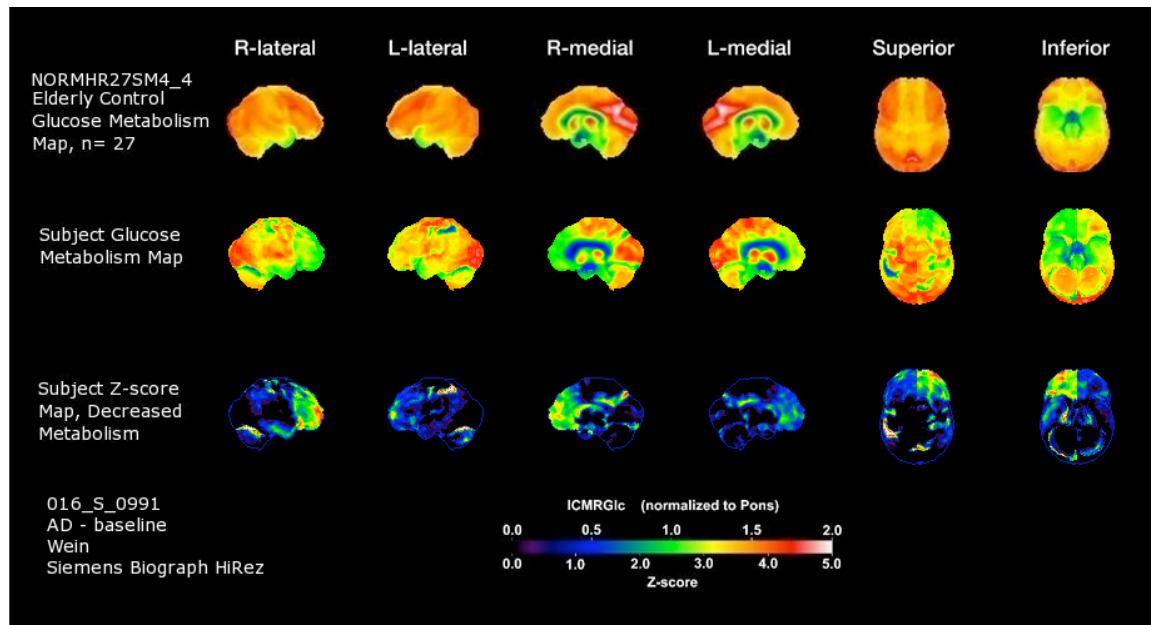
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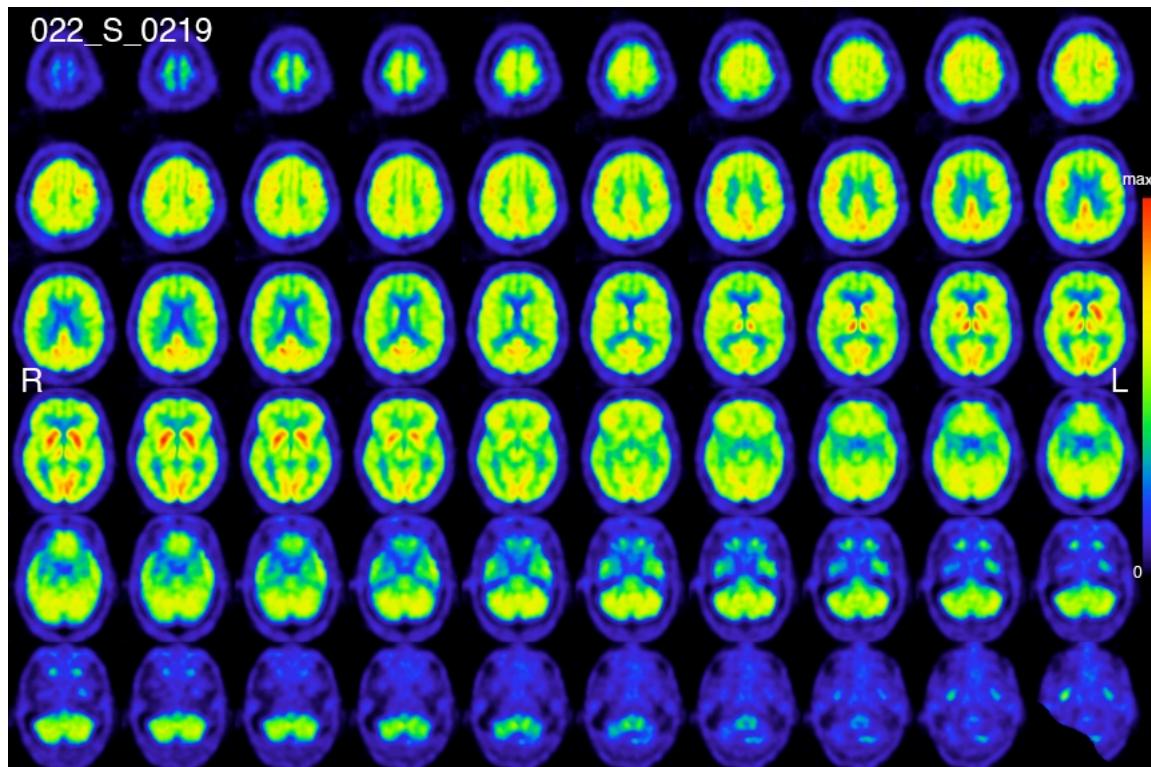
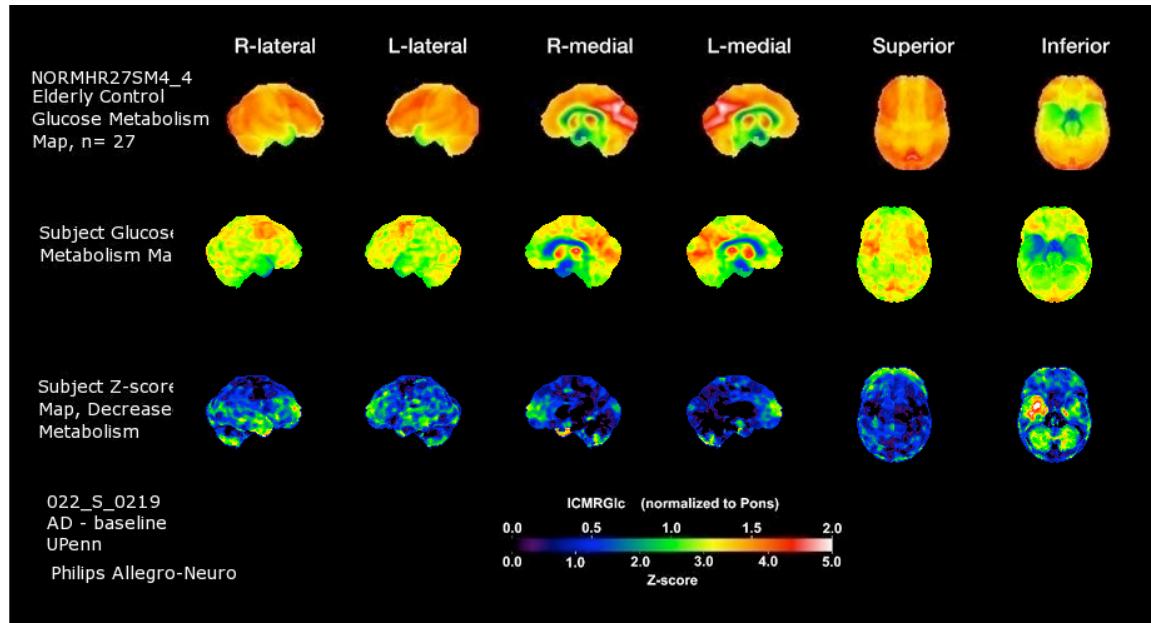




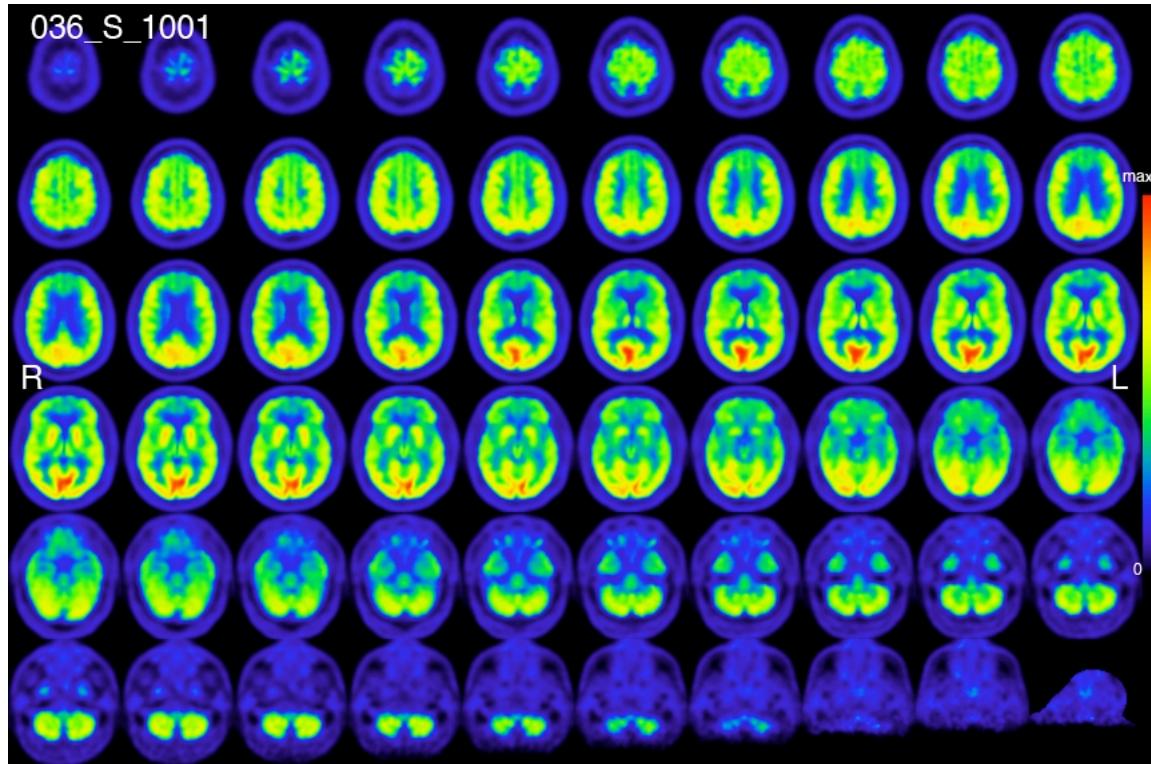
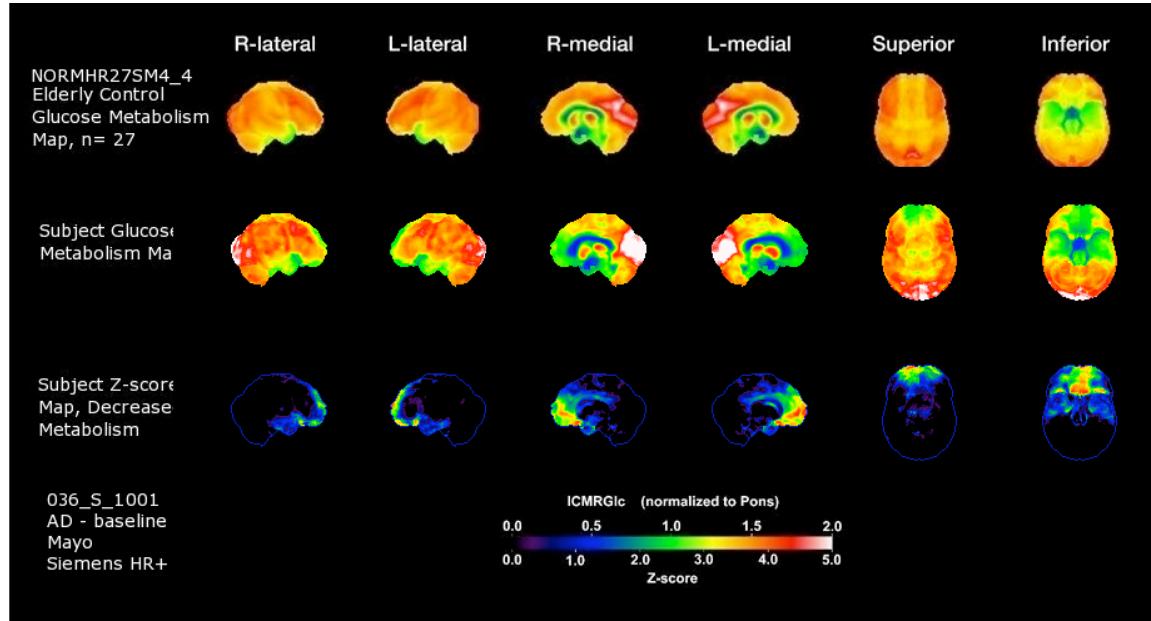
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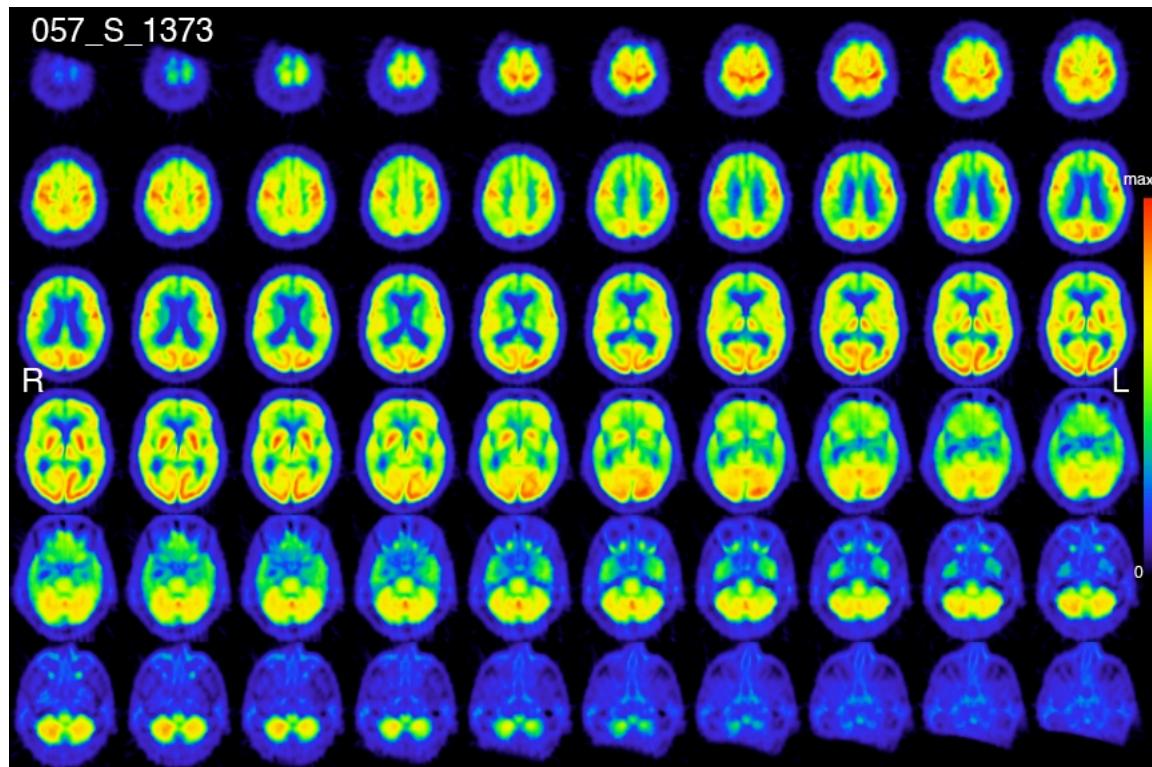
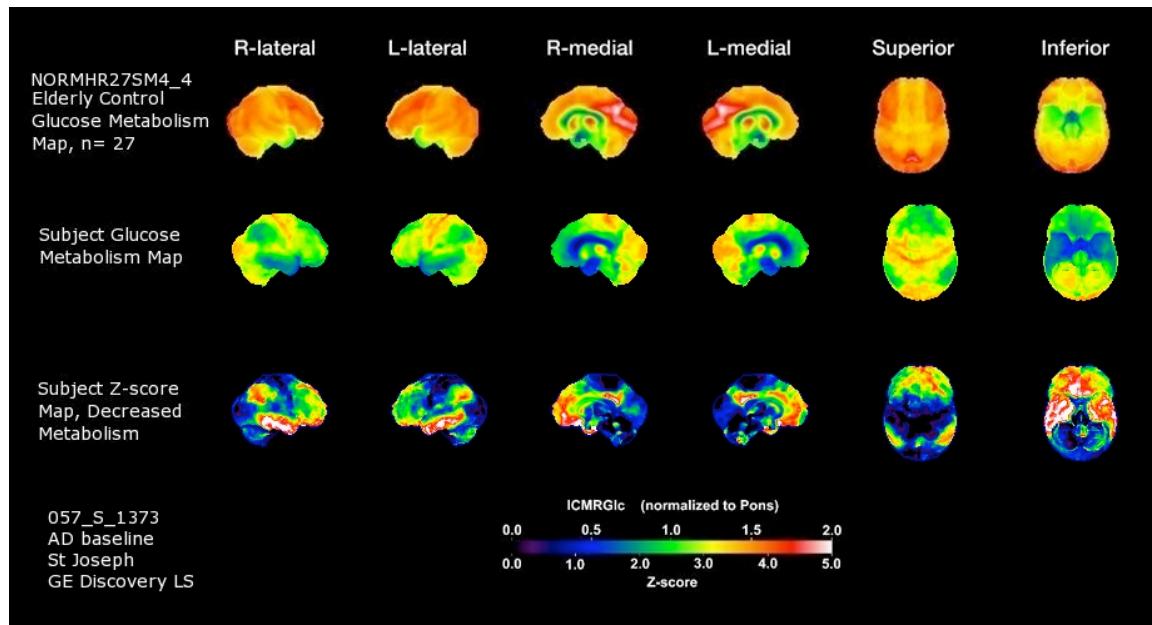
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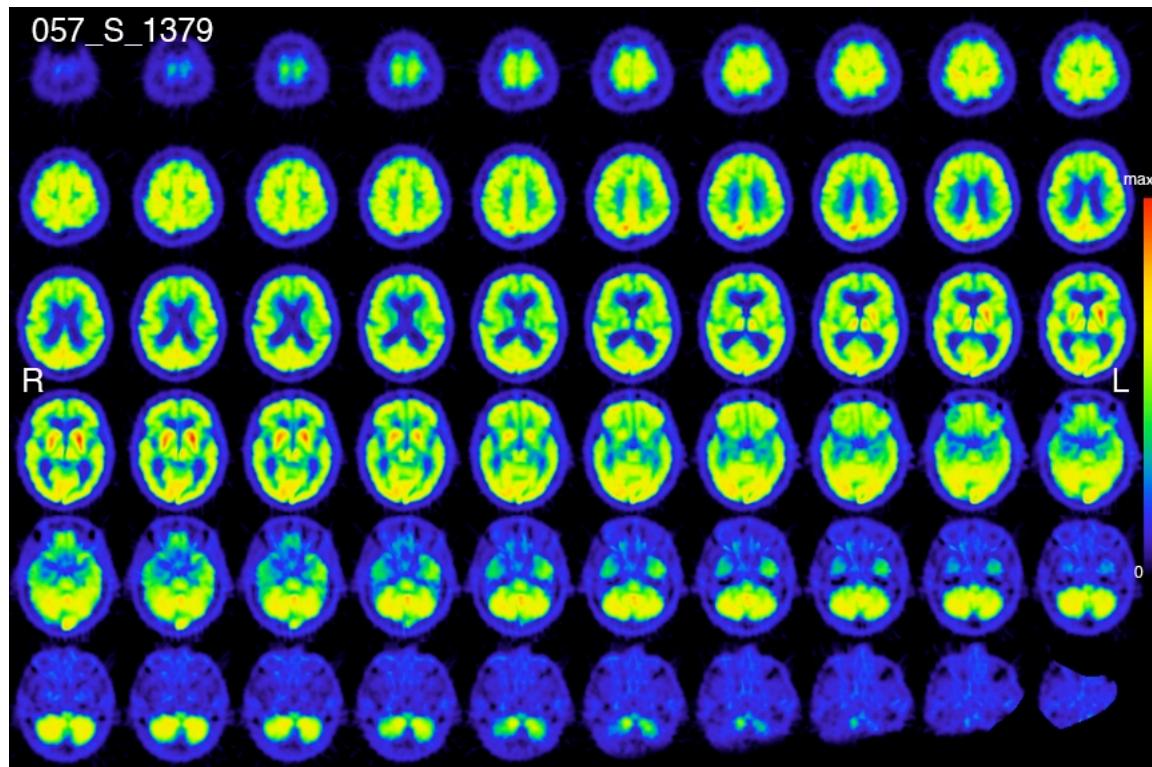
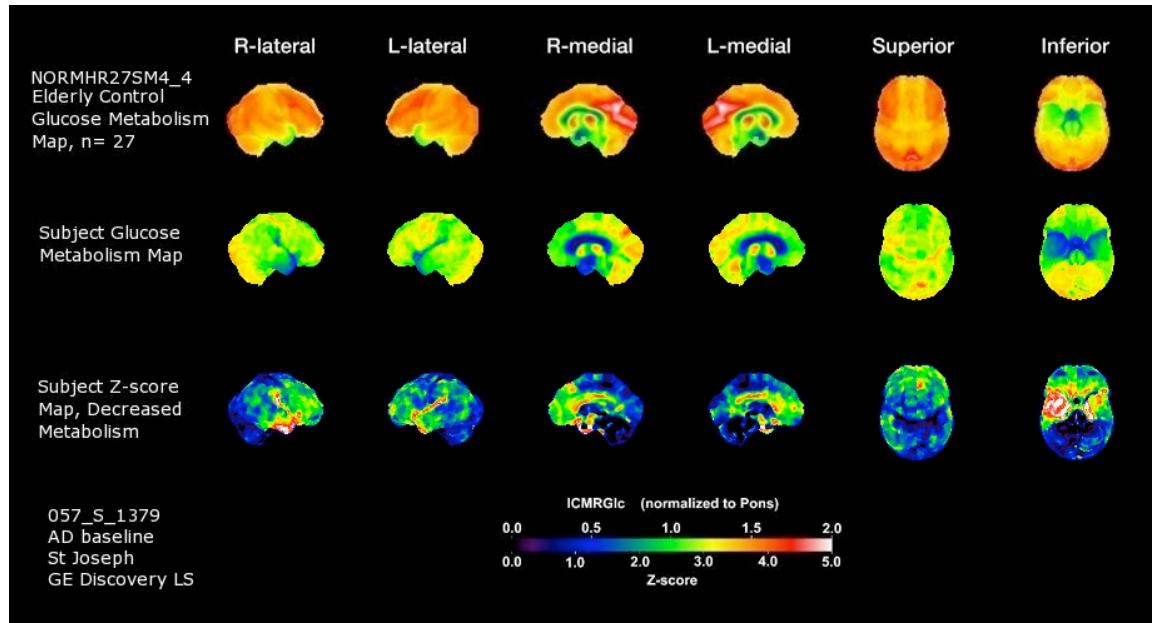
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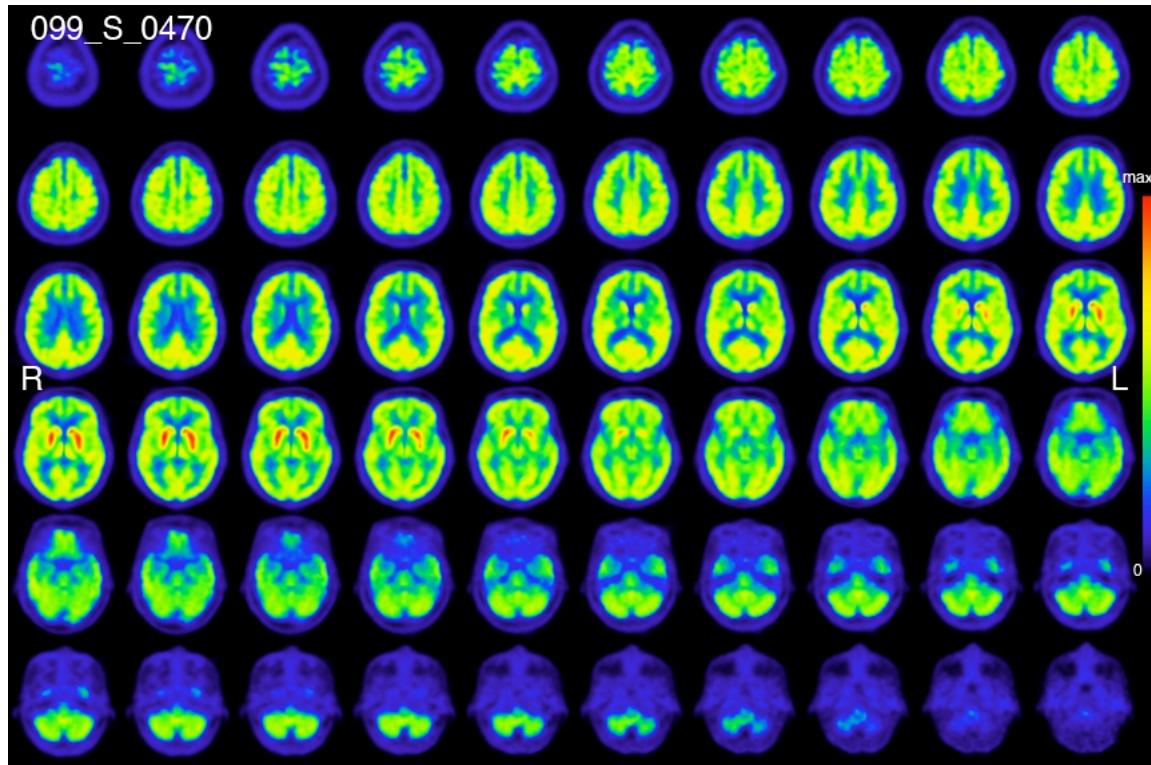
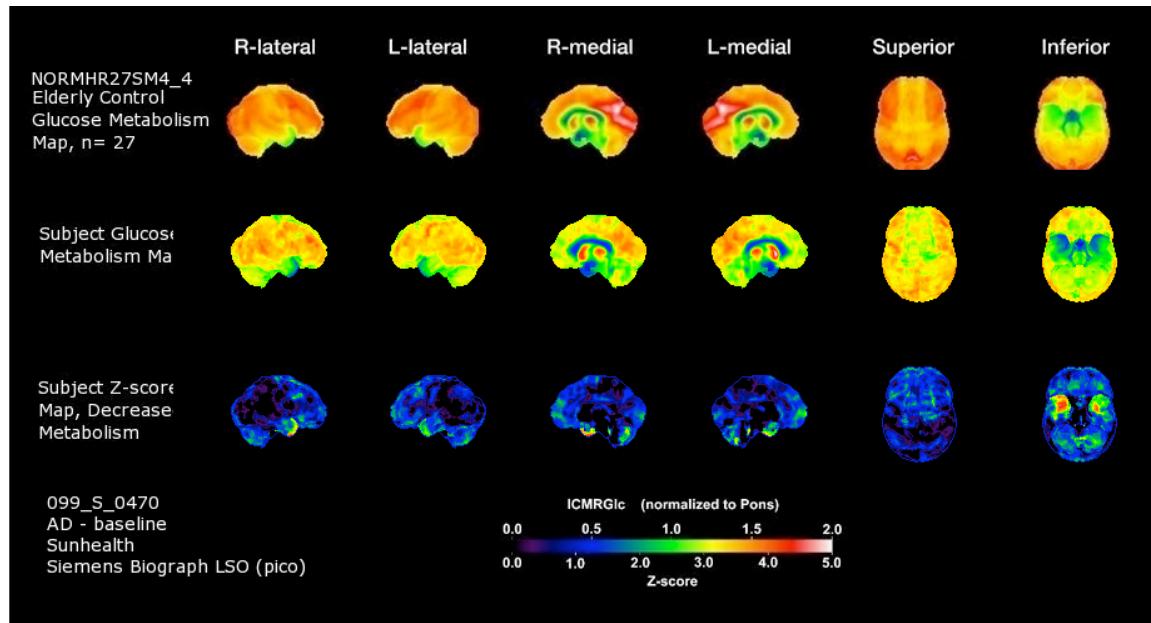
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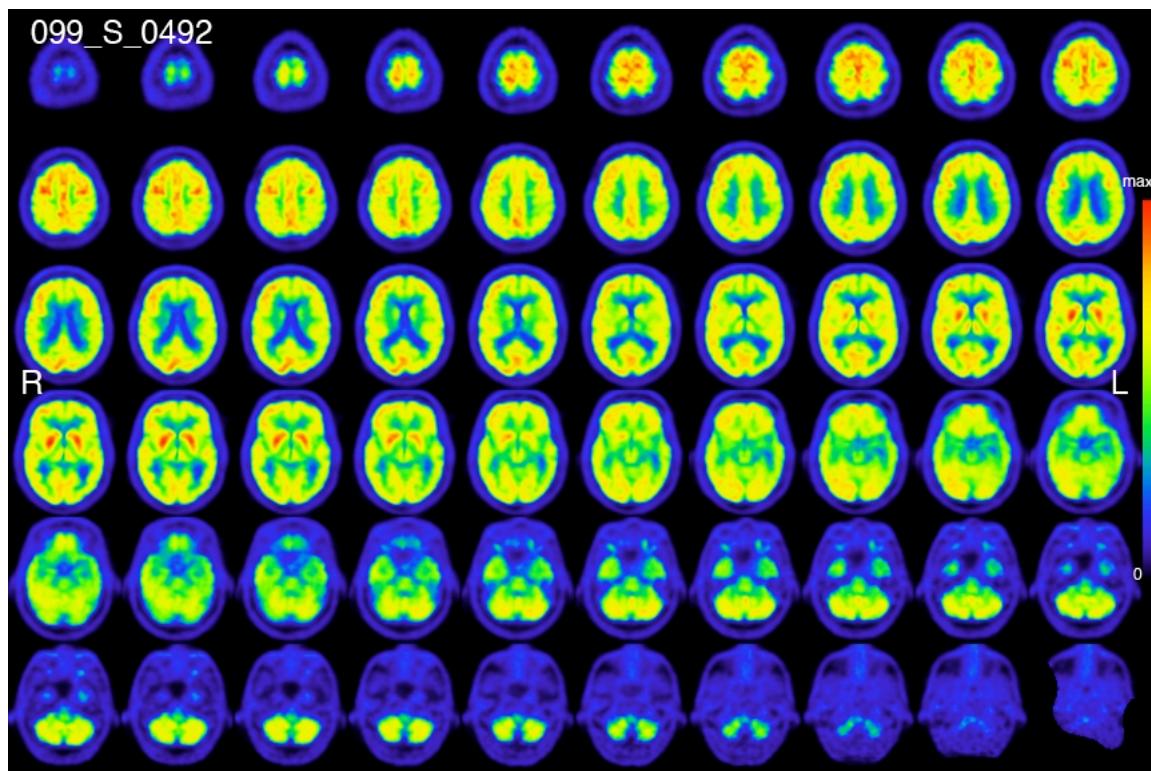
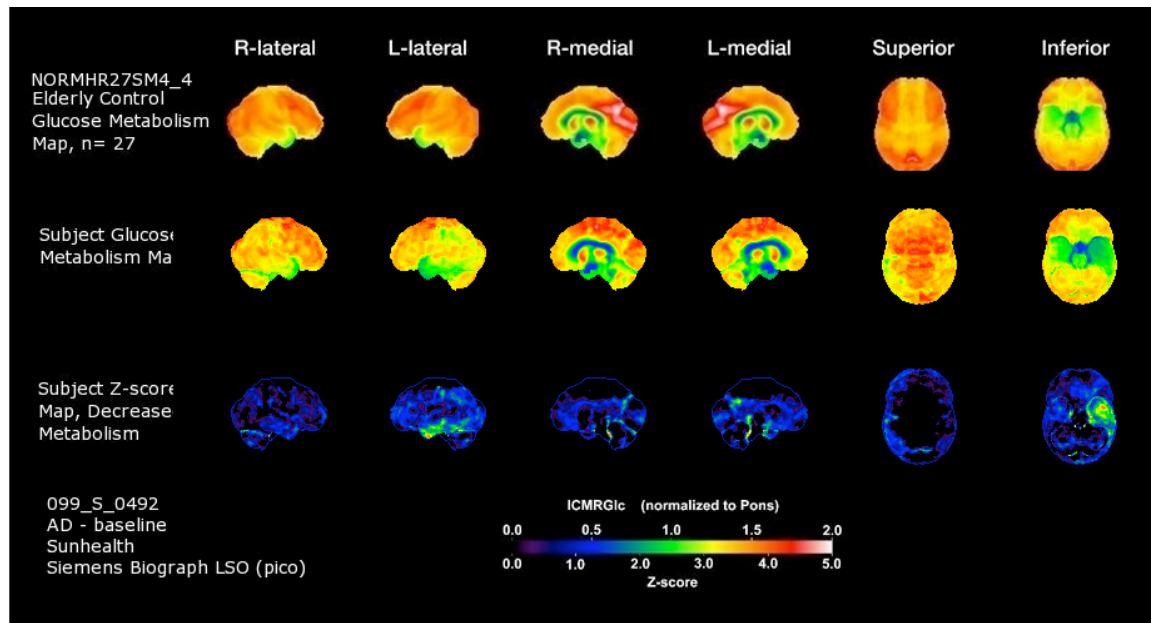
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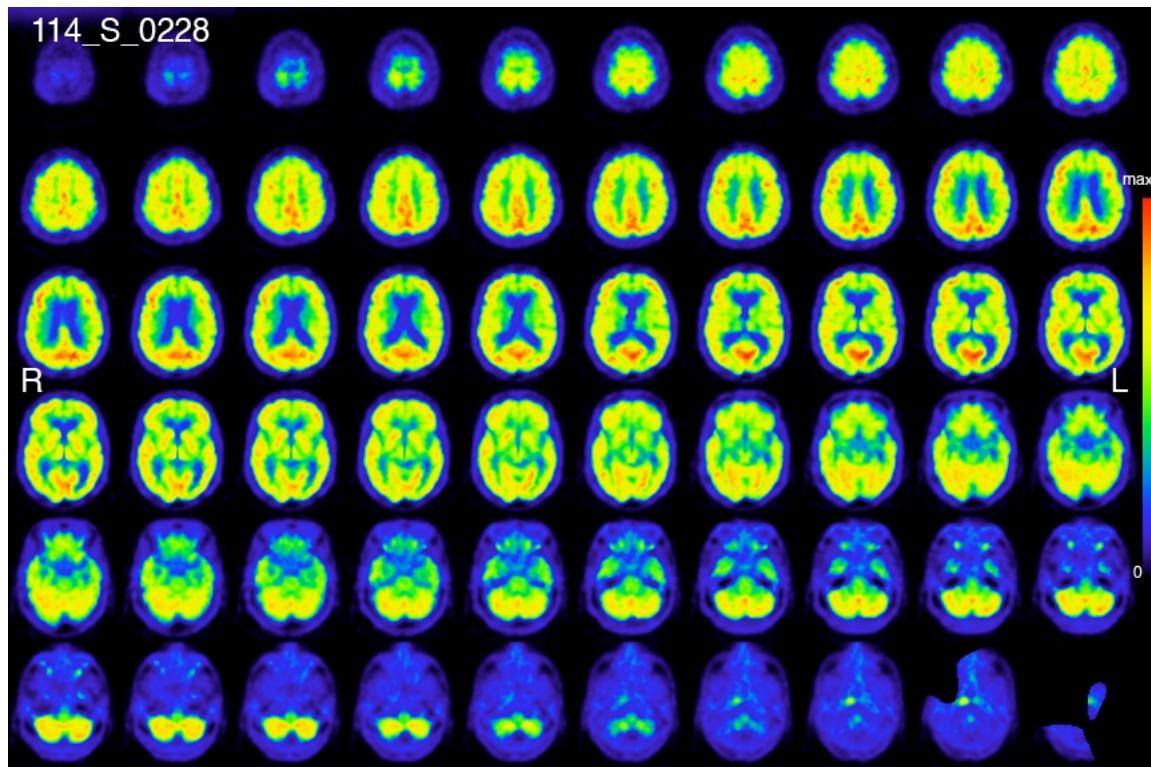
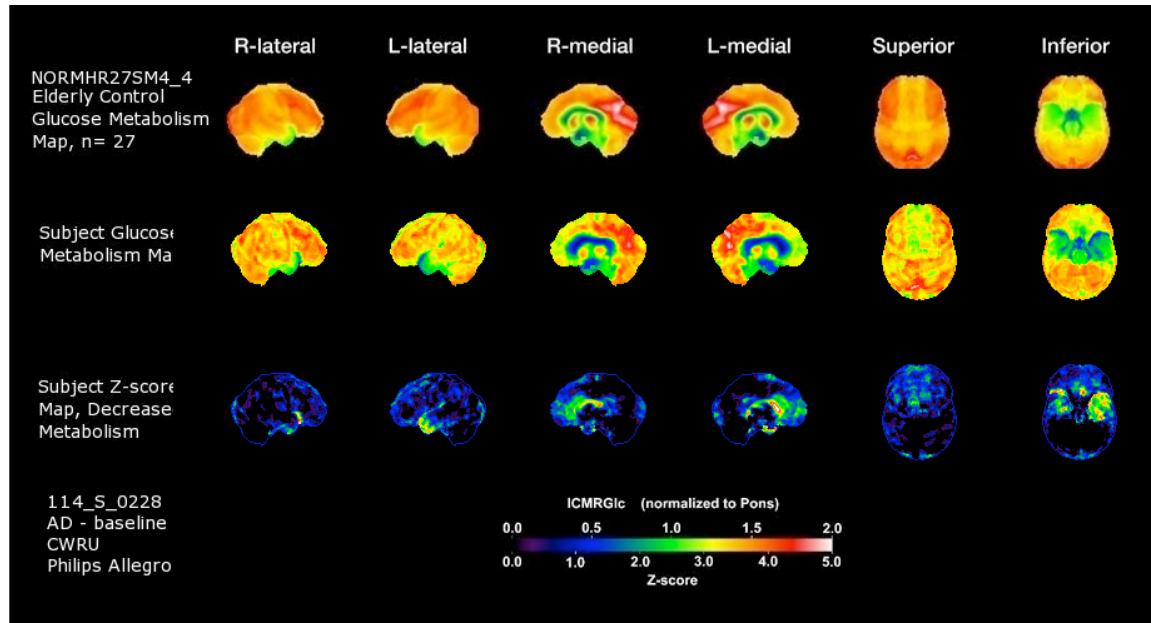
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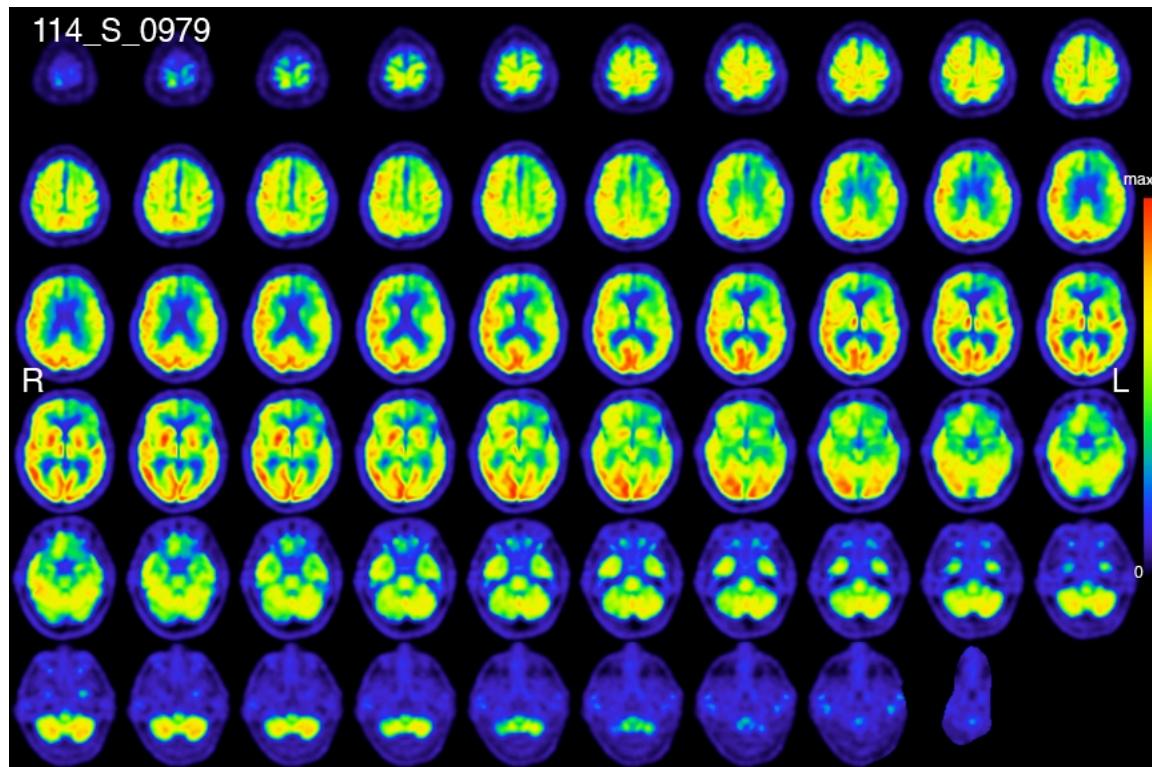
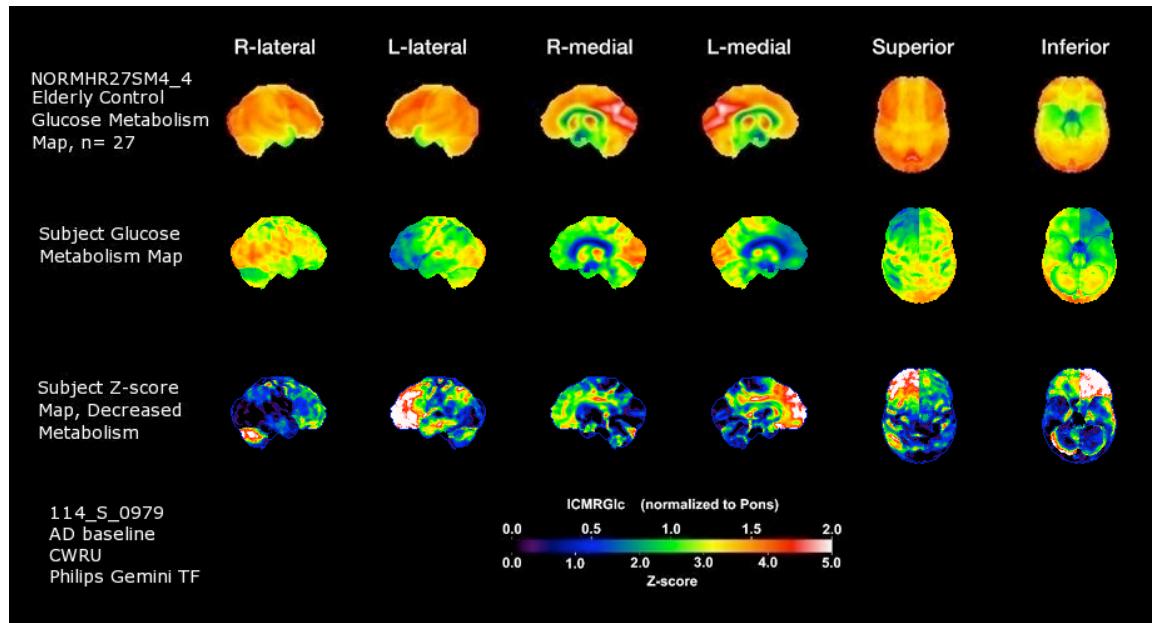


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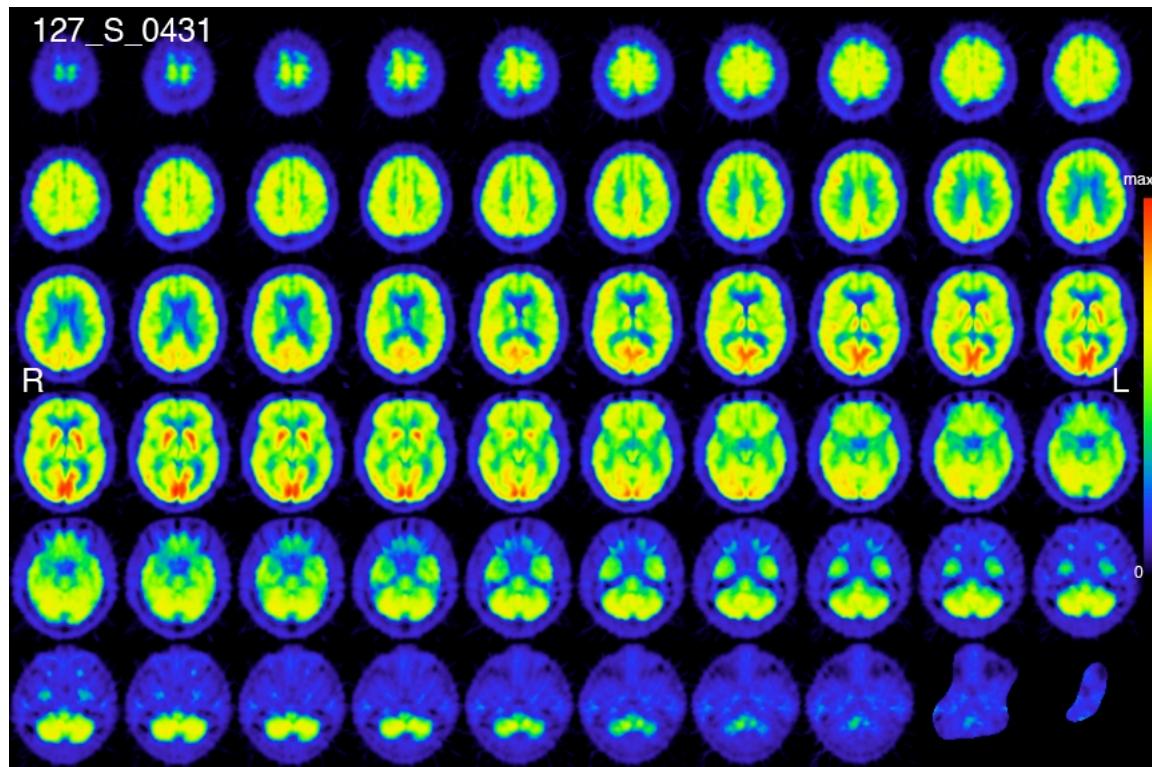
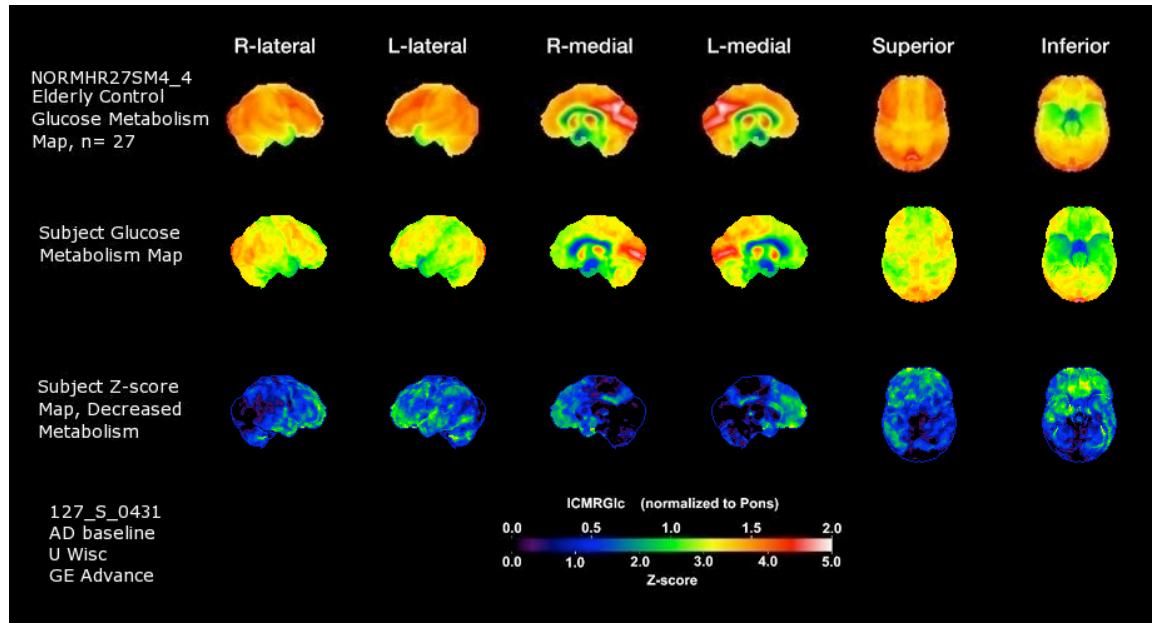


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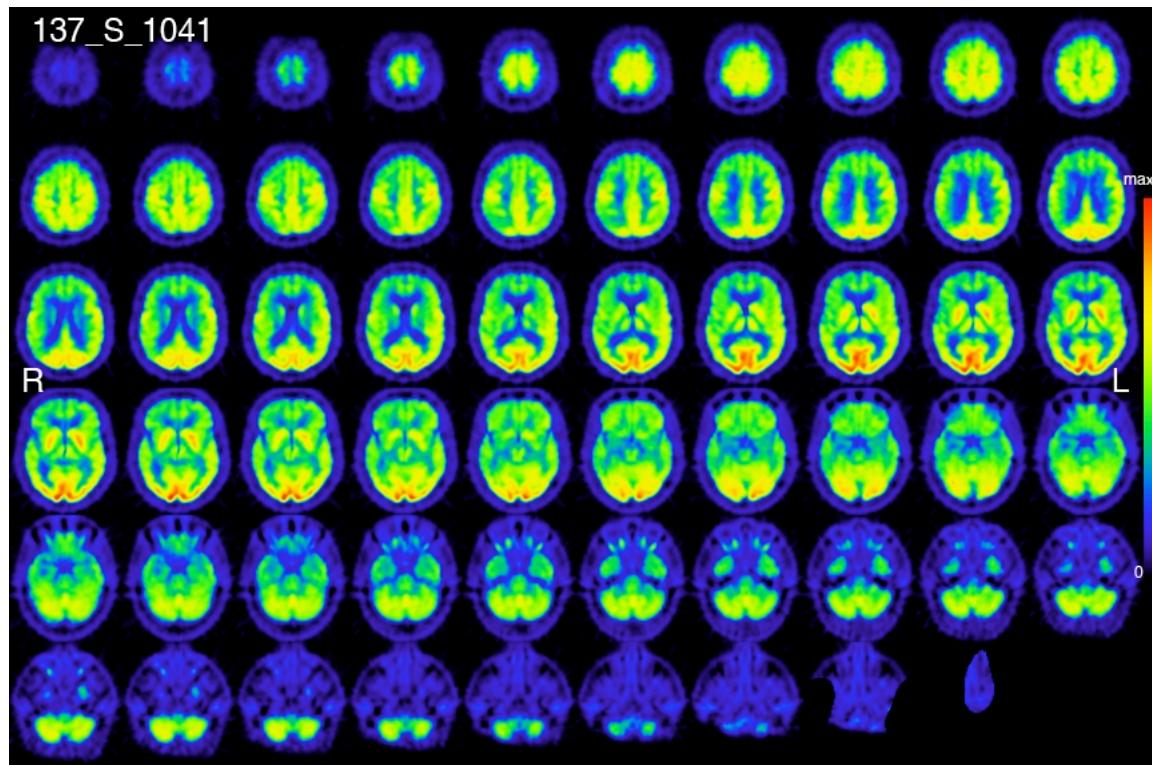
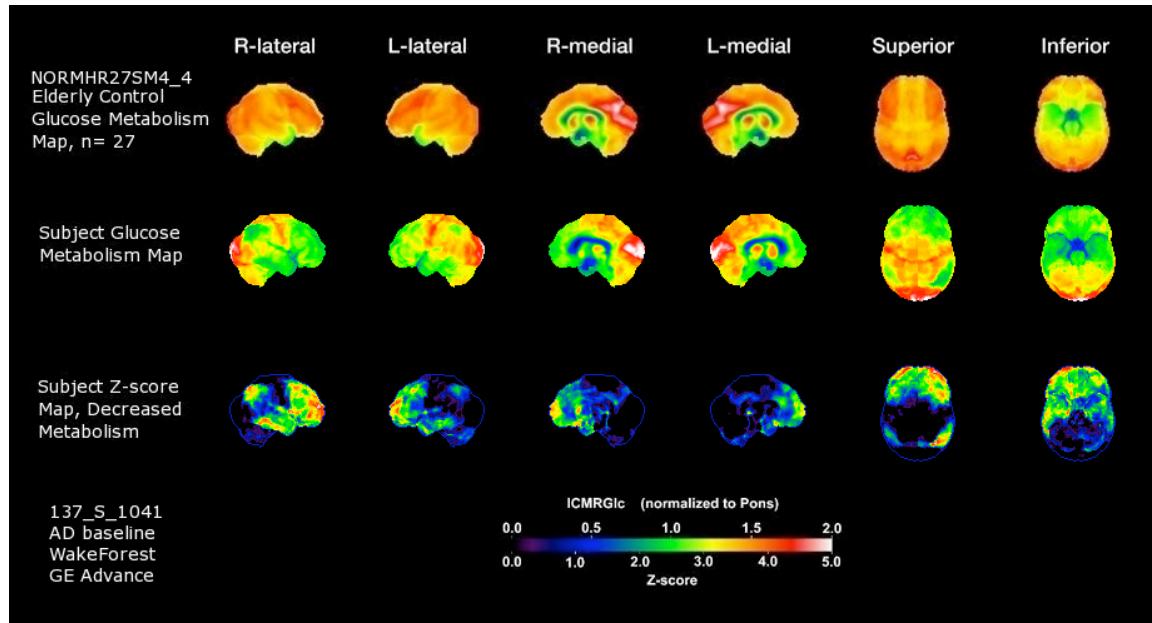




**127\_S\_0431**



**137\_S\_1041**



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2. Foster NL, Heidebrink JL, Clark CM, et al. FDG-PET improves accuracy in distinguishing frontotemporal dementia and Alzheimer's disease. *Brain* 2007;130:2616-2635

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