

Understanding brain aging in India: neuroimaging in the LASI-DAD study

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INTRODUCTION

Up to 70% of the 8.8 million dementia cases in India are attributable to modifiable risk factors. These factors may contribute to dementia through accelerated brain aging.

OBJECTIVE

Investigate how older Indians’ modifiable risk factor exposures relate to MRI-based brain age gap (BAG). **We hypothesized that these exposures increase BAG.**

METHODS

1. We trained a ridge regression-based brain age prediction model using **T1-weighted MRI** from 465 cognitively normal (CN) participants from the Alzheimer’s Disease Neuroimaging Initiative (ADNI) study plus 137 CN participants from Wave 2 of the Longitudinal Aging Study in India–Diagnostic Assessment of Dementia (LASI-DAD). We used 158 Freesurfer-based features, including cortical and subcortical volumes, cortical thicknesses and cortical surface areas, with chronological age as the dependent variable. We used 10-fold cross-validation to select the optimal ridge regularization parameter (lambda).
2. We computed **brain age gap (BAG)** as “predicted brain age minus chronological age” in 473 held-out (out-of-sample) LASI-DAD participants. We associated these BAGs with modifiable dementia risk factors using linear regressions, controlling for chronological age and FDR correcting for multiple comparisons.

KEY TAKE AWAY: We found no associations between any of the 14 Lancet Commission modifiable dementia risk factors and brain age gap in 473 older Indians.

RESULTS

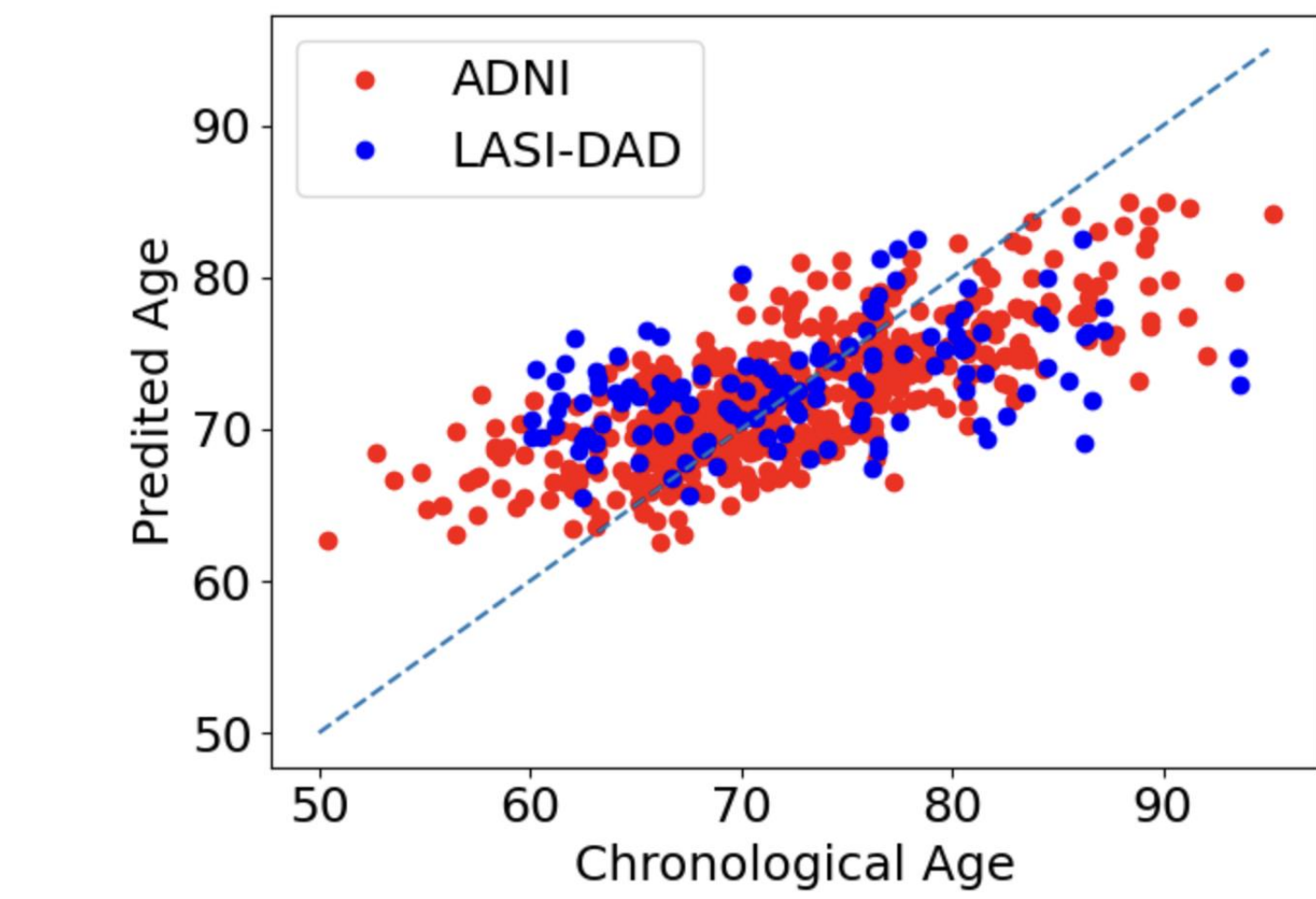


Fig 1: Training (in-sample) fit of brain age prediction model. Mean absolute error (MAE) overall: 4.5 years (n = 602), ADNI: 4.2 years (n = 465), LASI-DAD: 5.5 years (n = 137).

Table 1 Testing (out-of-sample) LASI-DAD cohort characteristics.

Sample Size	473
Age, mean (SD) years	69.4 (5.9)
Female, n (%)	258 (55%)
Urbanicity, n (%)	277 (59%)
No Education, n (%)	227 (41%)
Diagnosis, n (%)	CN: 224 (47%) MCI: 249 (53%)

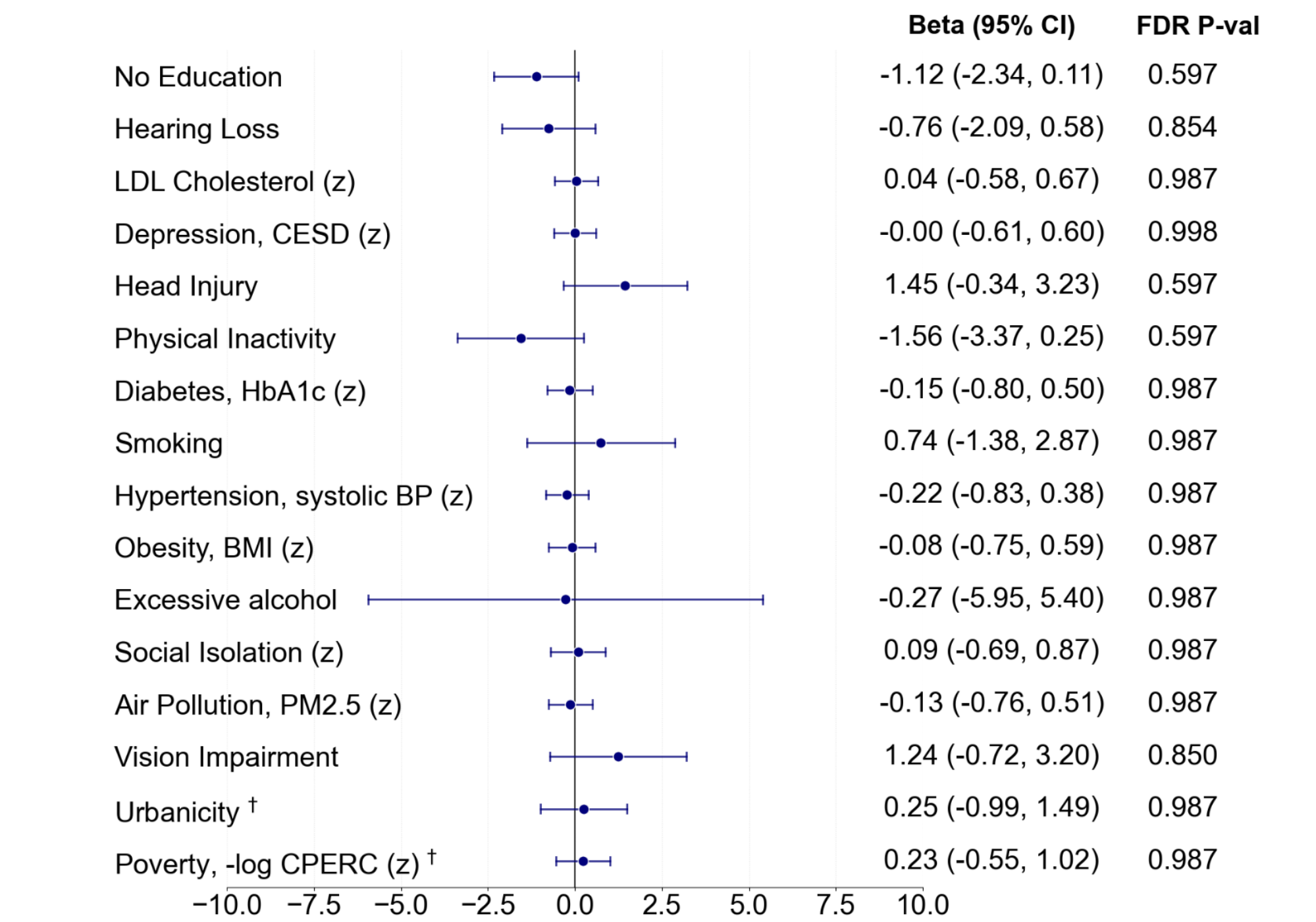


Fig 2: Forest plot of associations between brain age gap (BAG) and modifiable risk factors for held-out LASI-DAD participants. (z) indicates the factor is a continuous z-scored exposure; all other risk factors are binary exposures. CPERC: economic consumption per capita in rupees.

DISCUSSION

Brain age prediction error was lower in ADNI compared with LASI-DAD (Fig 1), which may be due to the LASI-DAD training set being smaller and the cohort being more socioeconomically heterogeneous (Table 1). We found no associations between modifiable exposures and BAG in LASI-DAD participants (Fig 2). **Higher statistical power may be needed to detect these associations in India and similar low- or middle-income country (LMIC) contexts.**

Questions, comments, potential collabs:
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