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A Model of Cognitive Decline Using Data from a Longitudinal Study of Aging: The Variable of Difficulty in Managing Money as a Function of Typical Alzheimer's Disease Risk Factors

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Abstract: We used data from four bi-yearly interviews, from 1984 to 1990, in a longitudinal study of aging (LSOA) to build a model where the dependent variable, difficulty in managing money, was used as a proxy for cognitive decline. We analyzed its multiple correlation with a set of independent risk factors: age, presence of coronary heart disease (CHD), history of myocardial infarction (MI), history of stroke, diabetes status, history of Alzheimer's disease, and body mass index. The data was analyzed with the statistical software R, and empty fields were imputed with the last observation carried forward (LOCF). We also removed the people at baseline who had difficulty managing their money, leaving a population of $N = 4994$ individuals older than 70 years of age. The only significant variables found in our stepwise regression were age and diabetes status. We did not attempt a cross validation of this model, but instead generated the receiver operation characteristic (ROC) curve and its area under the curve (AROC). The value found for AROC was 0.63. A practical application of the model is provided. The author and his collaborators are currently applying the methodology presented in this paper to data bases more suited for cognitive-decline.

Keywords: Cognitive Decline, Money Management, Logit Model

Introduction

THE RISE OF Alzheimer's disease (AD) throughout the world poses great concerns in terms of health care as well as the actual cost to manage the disease¹. In the case of the United States, a recent report from the Alzheimer's Association shows an average annual cost of \$42,072.00 per patient with AD and other dementias (Alzheimer's Association 2011). The same report shows that approximately 50% of this cost comes from Medicare, that is, from the US taxpayer. With an average of 5.4 million patients over 65 years of age, who already have a diagnosis of AD, and using the annual cost above as an approximation for AD annual costs, one can do a straightforward calculation showing that the financial impact of AD on Medicare would be in the order of 100 billion dollars for the year 2011. This can only be expected to increase with the swelling of Medicare enrollment by retiring Baby Boomers.

A health condition strongly linked with Alzheimer's disease is mild cognitive decline (MCI). Research reported in July 2011, at the Alzheimer's Association International Conference (AAIC) in Paris, France, emphasized the importance of mild cognitive impairment

¹ In this paper we do not discuss the devastating effects produced by AD on the patient's family. For information on these subjects the reader should check references in the bibliography, i.e. (Alzheimer's Association 2011).