Is Dementia predictable?

F. Di Filippo, E. Manfrin, E. Musiari, E. Palli

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Dataset

Dataset Dementia and Alzheimer longitudinal

Subject.ID	MRI.ID	Group	Visit	MR.Delay	M.F	Hand	Age	EDUC	SES	MMSE	CDR	eTIV	nWBV	ASF
OAS2_0001	OAS2_0001_MR1	Nondemented	1	0	M	R	87	14	2	27	0.0	1987	0.696	0.883
OAS2_0001	OAS2_0001_MR2	Nondemented	2	457	M	R	88	14	2	30	0.0	2004	0.681	0.876
OAS2_0002	OAS2_0002_MR1	Demented	1	0	M	R	75	12	*NA*	23	0.5	1678	0.736	1.046
OAS2_0002	OAS2_0002_MR2	Demented	2	560	M	R	76	12	*NA*	28	0.5	1738	0.713	1.010
OAS2_0002	OAS2_0002_MR3	Demented	3	1895	M	R	80	12	*NA*	22	0.5	1698	0.701	1.034
OAS2_0004	OAS2_0004_MR1	Nondemented	1	0	F	R	88	18	3	28	0.0	1215	0.710	1.444
OAS2_0004	OAS2_0004_MR2	Nondemented	2	538	F	R	90	18	3	27	0.0	1200	0.718	1.462
OAS2_0005	OAS2_0005_MR1	Nondemented	1	0	M	R	80	12	4	28	0.0	1689	0.712	1.039
OAS2_0005	OAS2_0005_MR2	Nondemented	2	1010	M	R	83	12	4	29	0.5	1701	0.711	1.032

where SES is Socioeconomic Status, MMSE is Mini Mental State Examination, CDR is Clinical Dementia Rating, eTIV is Estimated Total Intracranial Volume, nWBV is Normalize Whole Brain Volume and ASF is Atlas Scaling Factor.

Source: Kaggle

Problem of Correlation

We tried to solve the problem of correlation using the PCA method.

VARIABLE TAKEN INTO CONSIDERATION
$[Age, EDUC, MMSE, eTIV, nWBV, ASF]$

$$H_0 : \mathbf{Y}_{female} \overset{d}{=} \mathbf{Y}_{male} \ vs \ H_1 : \mathbf{Y}_{female} \overset{d}{\neq} \mathbf{Y}_{male}$$

$pvalue = 0$

Demented VS Nondemented (1)

$$H_0 : \mathbf{Y}_{Demented} \stackrel{d}{=} \mathbf{Y}_{NonDemented} \ vs \ H_1 : \mathbf{Y}_{Demented} \stackrel{d}{\neq} \mathbf{Y}_{NonDemented}$$

$pvalue = 0.9$

Demented VS Nondemented only Male(2)

$$H_0 : \mathbf{M}_{Demented} \overset{d}{=} \mathbf{M}_{NonDemented} \ vs \ H_1 : \mathbf{M}_{Demented} \overset{d}{\neq} \mathbf{M}_{NonDemented}$$

$$pvalue = 0$$

Demented VS Nondemented only Female (3)

$$H_0 : \mathbf{F}_{Demented} \overset{d}{=} \mathbf{F}_{NonDemented} \ vs \ H_1 : \mathbf{F}_{Demented} \overset{d}{\neq} \mathbf{F}_{NonDemented}$$

$pvalue = 0.37$

$$EDUC = \mu + \alpha_i + \beta_j + \gamma_{ij} + \epsilon$$

$i = male, female$ $j = Demented, NonDemented$

$$\alpha = sex$$

$$\beta = diagnostic$$

$$\gamma = interaction$$

$$H_0 : \gamma_{ij} = 0 \ \ vs \ H_1 : \gamma_{ij} \neq 0$$

TEST STATISTIC: $T0 = F - STATISTICS$ $p - value = 0.082$ at level of confidence 95% there's no evidence to reject H_0 so we reduce the model

$$EDUC = \mu + \alpha_i + \beta_j + \epsilon$$

$$H_0 : \beta_j = 0 \ \ vs \ H_1 : \beta_i \neq 0$$

$p - value = 0.069$ at level of confidence 95% there's no evidence to reject H_0 there's no evidence to reject H_0

$$MMSE = \mu + \alpha_i + \beta_j + \gamma_{ij} + \epsilon$$

$i = male, female$ $j = Demented, NonDemented$

$$H_0 : \gamma_{ij} = 0 \ \ vs \ H_1 : \gamma_{ij} \neq 0$$

TEST STATISTIC: $T0 = F - STATISTICS$ $p - value = 0.875$ there's no evidence to reject H_0 so we reduce the model

$$EDUC = \mu + \alpha_i + \beta_j + \epsilon$$

$$H_0 : \beta_j = 0 \ \ vs \ H_1 : \beta_j \neq 0$$

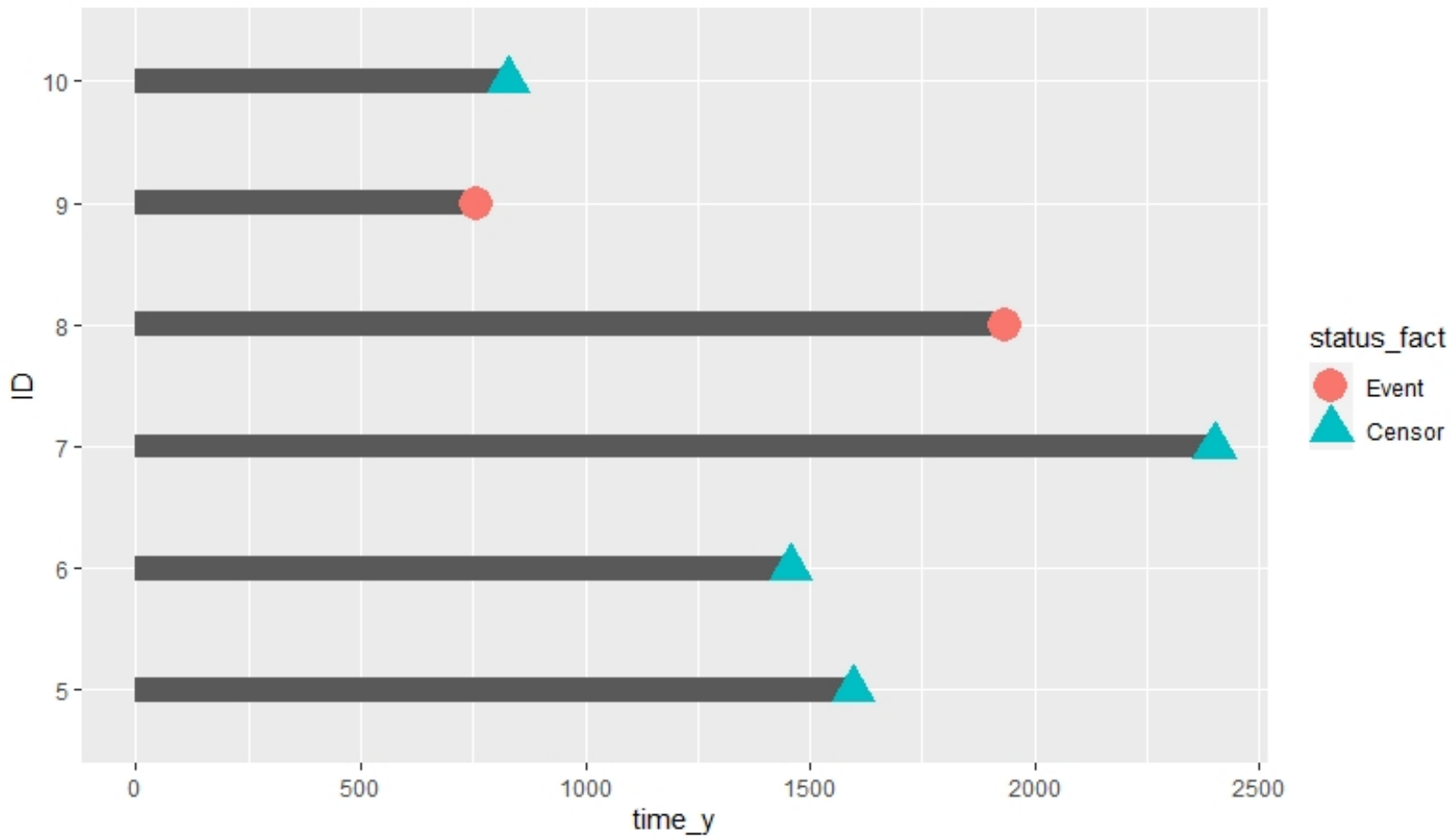
$p - value = 0.446$ a there's no evidence to reject H_0 there's no evidence to reject H_0

$$EDUC = \mu + \alpha_i$$

$$H_0 : \alpha_i = 0 \ \ vs \ H_1 : \alpha_i \neq 0$$

Prediction

Event: disease occurred



Future questions