

MACHINE LEARNING FOR TIME SERIES OF ABSENCES AND RETURN TO WORK WITH READAPTATION OF PUBLIC EMPLOYEES

Dias A¹, Nunes HRC², Ruiz-Frutos C³, Gómez-Salgado J³, Alonso MS¹, Bernardes JM¹, Lacalle-Remigio JR⁴

¹Public/Collective Health Graduate Program, Botucatu Medical School, São Paulo State University (UNESP), Botucatu, Brazil, ²Graduate Program in Nursing, Botucatu Medical School, São Paulo State University (UNESP), Botucatu, Brazil, ³Department of Sociology, Social Work and Public Health, Faculty of Labour Sciences, University of Huelva, Huelva, Spain, ⁴Department of Preventive Medicine and Public Health, Faculty of Medicine, University of Sevilla, Sevilla, Spain

Changes in the classification of the main condition between repeated medical examinations and diseases related to mental health were associated with returning to work with readaptation in workers of a Brazilian public university, in the sense that a history of changes in the ICD-10 chapters reduces the chances of the outcome, and that mental health conditions more than double its chance of occurrence, regardless of the estimation method used. **This allows concluding that there were no advantages in the use of TMLE,** given the difficulties in access, use, and the assumptions of the technique.

BACKGROUND

Absenteeism is a significant marker in work trajectory, impacting the health and productivity of the worker. The objectives of this study were to investigate whether changes in the classifications of main complaints during absences and whether mental health-related illnesses are associated with returning to work with adaptation in employees of a Brazilian public university. Additionally, to estimate the magnitude of these associations by comparing two predictive models, Targeted Machine Learning, and Logistic Regressions

METHODS

A historical cohort study was conducted based on work absences of statutory public servants from a university campus in the interior of the State of São Paulo, Brazil. The exposures studied were modifications to the chapter of the main complaints of ICD-10 between absences and having had at least one episode related to mental illness with or without modification of the ICD-10 chapter over time. The outcome was the return to work with adaptation. The causal model was established a priori and tested by multiple logistic regression considering the effects of various confounders, then compared to the same estimators obtained through Targeted Machine Learning techniques.

RESULTS

Among 5600 workers, 738 were readapted, 64% were health professionals, 34% had changes in the ICD-10 chapter during the series of absences, and 62% had diagnoses of mental health impairment. Additionally, they had less time working at the university and were absent for longer periods. Having a modification in the chapter of the complaint reduced the chance of returning to work in another role by more than 30%, while having at least one absence due to a condition classified among mental and behavioral disorders more than doubled the chance of not returning to work in the same previously developed activity, regardless of the analysis technique used.

TABLE 1 Exploratory data analysis between the group of workers who returned to work without readaptation (NR) and those who returned after passing through readaptation (R).

		NR		R		p-value**
		n (511)	%	n (227)	%	
Sex	Female	319	62.4	153	67.4	0.194
	Male	192	37.6	74	32.6	
Presence of partner	No	223	43.6	110	48.5	0.225
	Yes	288	56.4	117	51.5	
Work unit	General administration	24	4.7	5	2.2	0.063
	Agricultural sciences	31	6.1	11	4.8	
	Human health	397	77.7	196	86.3	
	Animal health	27	6.1	9	4.8	
Type of work	Biological sciences	32	6.3	6	2.6	0.063
	Health worker	216	42.3	146	64.3	
	Other	295	57.7	81	35.7	
ICD chapter changes in the follow-up	No	1,689	58.5	1,754	65.9	<0.001
	Yes	1,200	41.5	906	34.1	
Presence of mental health codes (ICD V) in the follow-up	No	326	63.8	87	38.3	<0.001
	Yes	185	36.2	140	61.7	
		Median	IQR	Median	IQR	p-value**
Age at start of sick leave process		50.30	45.3-54.6	49.29	45.4-54.5	0.371
Time working at the university (in years)		22.24	16.9-26.1	19.14	17.2-24.9	0.014
Total time absent (in days)	64	26-215		438	130-1,180	<0.001

*Chi-square test.
**Mann-Whitney U-test.

RESULTS (CONT.)

TABLE 2 Predictive models for changes in the ICD-10 chapter and returning to work with readaptation.

	OR	CI 95% (OR)		p-value
		L	U	
TMLE				
ICD chapter changes in the follow-up (ref. no)	0.66	0.40	0.93	<0.001
MLR				
ICD chapter changes in the follow-up (ref. no)	0.64	0.42	0.97	0.036
Sex (ref. female)	1.23	0.83	1.81	0.303
Marital status (ref. no)	0.84	0.60	1.17	0.312
Type of work (ref. other)	2.56	1.73	3.79	<0.001
Time working at the university (in years)	1.03	1.00	1.06	0.072
Age at start of sick leave process (in years)	0.99	0.96	1.01	0.341
Work unit (ref. Biological sciences)				0.753
Animal health	1.77	0.55	5.68	0.338
General administration	0.96	0.26	3.56	0.946
Agricultural sciences	1.59	0.51	5.00	0.424
Human health	1.56	0.61	3.98	0.355

TABLE 3 Predictive models for the diagnosis of diseases included in chapter V of ICD-10 and returning to work with readaptation.

	OR	CI 95% (OR)		p-value
		L	U	
TMLE				
Mental health codes (ICD V) involved in the follow-up (ref. no)	2.46	1.66	3.27	<0.001
MLR				
Mental health codes (ICD V) involved in the follow-up (ref. no)	2.61	1.86	3.66	<0.001
Sex (ref. female)	1.41	0.94	2.09	0.095
Marital status (ref. no)	0.89	0.64	1.26	0.516
Type of work (ref. other)	2.33	1.56	3.46	<0.001
Time working at the university (in years)	1.03	1.00	1.06	0.055
Age at start of sick leave process (in years)	0.99	0.96	1.02	0.495
Work unit (ref. Biological sciences)				0.762
Animal health	1.62	0.50	5.27	0.425
General administration	0.83	0.22	3.14	0.782
Agricultural sciences	1.48	0.47	4.68	0.506
Human health	1.46	0.57	3.76	0.435

TABLE 4 Comparison of predictive models for the exposures regarding ICD-10 chapter changes and diseases included in ICD-10 chapter V adjusted for the covariates and the return to work with readaptation outcome.

Exposure	Methodology		LR/TMLE variation (%)
	Adjusted by LR	Programmed TMLE	
	OR (CI 95%)	OR (CI 95%)	
ICD-10 chapter changes	0.65 (0.43-0.98)	0.66 (0.40-0.93)	-1.53 (7.5-5.3)
ICD-10 chapter V	2.61 (1.86-3.66)	2.46 (1.66-3.27)	7.41 (12.04-11.92)

CONCLUSIONS

Changes in the classification of the main condition between repeated medical examinations and diseases related to mental health were associated with returning to work with readaptation in workers of a Brazilian public university, in the sense that a history of changes in the ICD-10 chapters reduces the chances of the outcome, and that mental health conditions more than double its chance of occurrence, regardless of the estimation method used. This allows concluding that there were no advantages in the use of TMLE, given the difficulties in access, use, and the assumptions of the technique.

ADDITIONAL KEY INFORMATION

Author Contact Information: dias.adriano@unesp.br

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