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A Study of Stress Level of Married Men and Women Using Multinomial Logistic Regression

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Abstract- Today major issue and a matter of concern for the all human being and the organizations is Stress. It has become a part of life for the men and women employees and housewives as life today has become so complex at home as well as outside that it is impossible to avoid stress. This research is devoted towards finding the factors affecting on stress level of married men and women of Rajkot (INDIA) to furnish with further details to arrive at a better result.

Index Terms- Married Men and Women, Stress Level, Goodness of Fit, Likelihood Ratio Test, Multinomial Logistic Regression.

I. INTRODUCTION

Nowadays stress becomes universal phenomenon. Dr. J. Vijayadurai (2012) discussed about Stress Management among Women College Teachers in Tamilnadu. We live in stressful environment. We are holding down two or more jobs. We are putting up with heavy job loads and unreasonable demands. We are swallowing outrage and frustration with unfair situations and irrational superiors because we cannot afford to be laid off or fired. Or we have already been laid off and we are struggling to find another job. Or we have given up and are coping with unemployment. Outside strains like these are called stressors. Stressors are the barely-tolerable pressures that bring us unhappiness and, eventually, disease. Some people hardly seem to be affected by stressors. They maintain a sense of perspective and a sense of humour. They remain calm in the midst of adversity and catastrophe. The physiological and psychological responses to situations or events that disturb the equilibrium of an organism constitute stress. N. Parveen (2009) discussed about Occupational Stress among Married and Unmarried Working Women in Hyderabad City".

The main causes are work related stress, value conflict, type of work, standard of living, nutrition, lack of physical exercise. Aditi and Kumari (2005) discussed in their research women teachers facing lot of problems like overweight, body ache, and psychosomatic effect etc. These women working in under stress because of they have to perform various roles. The expectation are high from women's if they working as college teachers. They have the pressure of balancing work and family. The status of women in India has been changing due to growing industrialization, urbanisation, spatial mobility and social legislation. Tripathi and Bhattacharjee (2012) Studied about Psychological Stress of working women.

Research Tools

1. Descriptive Statistics
2. Multinomial Logistic Regression
3. Using Statistical Software – SPSS

II. RESEARCH METHODOLOGY

Our study includes statistical research on the concerned areas relating to married men and women and the stress levels that are constantly being felt by them. We have tried to use the latest concepts in statistics to highlight the situation in context of such problem and tried to suggest some of them for correcting the situation.

III. DATA COLLECTION

The primary data was collected on the basic of the questionnaire which was answered by peopleof Rajkot City. For collection of data we visited the married men and women in different area of the Rajkot. Our sample size of study is 400.

IV. RESEARCH STUDY

1. Descriptive Statistics

In this study score of stress level of married male & female is dependent variable .We have given ten questions to Respondents to calculate stress level, which is show in questionnaire. Each Question of about stress is coded Never (0) , Almost Never (1), Some-times (2), Fairly Often (3), Very Often (4).

We have summarized score of ten questions about stress then form dependent variable score of stress level which is coded as below average (1), average (2), medium-high (3), high (4). Here range for below average is 0 to 10, for average 11 to 14, for medium high 15 to 18, for high more than 19.

We have taken 25 independent variable for study. In these 25 independent variables 14 are categorical and 11 are continuous variables. Score of stress is categorized in four categories and Frequency of each independent variable is given category wise of stress level in given table 1.1. For categorical variables gender, in below average stress level 43(38.7%) female and 68(61.3%) male, in average stress level 41(47.1%) female and 46(52.9%) male, in medium high stress level 64(51.2%) female and 61(48.8%) male, in high stress level 49(63.6%) female and 28 (36.4%) male. Score of stress level for other categorical variables is shown in table 1.1 respectively.

Table 1.1 Descriptive statistics of categorical variables.

Variables		Below average (111)		Average (87)		Medium-High (125)		High (77)	
		n	%	n	%	n	%	n	%
Gender	Female	43	38.7	41	47.1	64	51.2	49	63.6
	Male	68	61.3	46	52.9	61	48.8	28	36.4
Occupation	Business	20	18.0	15	17.2	18	14.4	4	5.2
	Government Job	24	21.6	14	16.1	15	12.0	2	2.6
	House wife	30	27.0	29	33.3	45	36.0	45	58.4
	Private Job	37	33.3	29	33.3	47	37.6	26	33.8
Family Type	Joint	51	45.9	37	42.5	36	28.8	17	22.1
	Separate	60	54.1	50	57.5	89	71.2	60	77.9
Family Status	Middle class	58	52.3	68	78.2	105	84.0	71	92.2
	Upper middle class	36	32.4	16	18.4	15	12.0	3	3.9
	High Class	17	15.3	3	3.4	5	4.0	3	3.9
Marriage Type	Arrange marriage	96	86.5	82	94.3	111	88.8	69	89.6
	Love marriage	15	13.5	5	5.7	14	11.2	8	10.4
Education	Primary	7	6.3	5	5.7	2	1.6	0	0
	Secondary	15	13.5	17	19.5	13	10.4	18	23.4
	Higher Secondary	12	10.8	11	12.6	29	23.2	17	22.1
	Graduation	47	42.3	30	34.5	52	41.6	34	44.2
	Post-Graduation	30	27.0	24	27.6	29	23.2	8	10.4
Running Study	No	107	96.4	83	95.4	123	98.4	74	96.1
	Yes	4	3.6	4	4.6	2	1.6	3	3.9
History of Dieses	No	106	95.5	77	88.5	120	96.0	75	97.4
	Yes	5	4.5	10	11.5	5	4.0	2	2.6
Health	Bad	2	1.8	1	1.1	2	1.6	2	2.6
	Medium	18	16.2	20	23.0	28	22.4	33	42.9
	Good	55	49.5	54	62.1	81	64.8	40	51.9
	Best	36	32.4	12	13.8	14	11.2	2	2.6
Freedom of Decision Power	No	13	11.7	11	12.6	9	7.2	7	9.1
	Yes	98	88.3	76	87.4	116	92.8	70	90.9
Office Environment	Normal	5	4.5	10	11.5	8	6.4	0	0
	Good	71	64.0	39	44.8	58	46.4	29	37.7
	Nice	6	5.4	2	2.3	1	.8	0	0
	Not mentioned	29	26.1	36	41.4	58	46.4	48	62.3
Income Source	Farming	2	1.8	1	1.1	3	2.4	0	0
	Pension	3	2.7	2	2.3	3	2.4	1	1.3
	Job	64	57.7	44	50.6	56	44.8	26	33.8
	Business	16	14.4	17	19.5	17	13.6	4	5.2

	Not mentioned	26	23.4	23	26.4	46	36.8	46	59.7
Smoking	No	95	85.6	74	85.1	111	88.8	77	100.0
	Yes	16	14.4	13	14.9	14	11.2	0	0
Permanent Job	No	78	70.3	80	92.0	109	87.2	76	98.7
	Yes	33	29.7	7	8.0	16	12.8	1	1.3

For continuous variable age**,** in below average stress level mean age is 38.02 and S.D is 11.597, in average stress level mean age is 38.10 and S.D is 11.441, in medium high stress level mean age is 39.01 and S.D is 11.079, in high stress level mean age is 36.23 and S.D is 9.396. Score of stress level for other continuous variables is shown in table 1.2 respectively.

Table 1.2

Variables	**Below average (111)**		**Average (87)**		**Medium-High (125)**		**High (77)**	
	Mean	**S.D**	**Mean**	**S.D**	**Mean**	**S.D**	**Mean**	**S.D**
Age	38.02	11.597	38.10	11.441	39.01	11.079	36.23	9.396
Weight	57.77	11.476	60.52	10.542	58.47	8.010	58.16	8.240
Height	164.996	8.17191	164.3057	9.28449	162.7488	7.65719	160.24	8.67513
Monthly Income	39914.4	149061.044	15000.00	14089.415	16608.00	17257.956	7448.05	10900.44
Yearly Income Of Family	663234.2	1762848.34	349459.77	192260.34	310120.0	189690.86	232298.7	155159.2
Monthly Outcome Of Family	28027.03	35412.815	24724.14	43771.789	17120.00	7194.980	14077.92	5686.471
Age at Marriage	24.74	3.124	24.86	3.748	23.54	3.153	22.05	3.296
Age Difference	2.77	1.559	2.38	1.832	2.08	1.794	1.86	1.421
No of Children's	1.53	.961	1.33	.972	1.44	.874	1.34	.821
Sleeping Hours	7.58	1.180	7.41	1.196	7.02	1.004	6.94	.937
Exercise	27.03	18.615	16.55	20.732	14.24	19.146	7.79	13.438

2. Multinomial Logistic Regression

In statistics, multinomial logistic regression is a classification method that generalizes logistic regression to multi class problems, i.e. with more than two possible discrete outcomes. That is, it is a model that is used to predict the probabilities of the different possible outcomes of a categorically distributed dependent variable, given a set of independent variables (which may be real-valued, binary-valued, categorical-valued, etc.).

Multinomial logistic regression is used when the dependent variable in question is nominal and for which there are more than two categories.

Multinomial logistic regression is used to model nominal outcome variables, in which the log odds of the outcomes are modeled as a linear combination of the predictor variables.

Table 2.1 Case Processing Summary

Variable	Categories	N	Marginal Percentage
Score of Stress	Below average	111	27.8%
	Average	87	21.8%
	Medium-High	125	31.2%
	High	77	19.2%
Daily Exercise In Minutes	No Exercise	198	49.5%
	20 Minute Exercise	90	22.5%
	40 Minute Exercise	85	21.2%
	60 Minute Exercise	27	6.8%
Number of Children's	No Child	74	18.5%
	1 Child	122	30.5%
	2 Child	169	42.2%
	3 Child	31	7.8%
	4 Child	4	1.0%
Gender	Female	197	49.2%
	Male	203	50.8%
Occupation	Business	57	14.2%
	Government Job	55	13.8%
	House wife	149	37.2%
	Private Job	139	34.8%
Family Type	Joint	141	35.2%
	Separate	259	64.8%
Family Status	Middle class	302	75.5%
	Upper middle class	70	17.5%
	High Class	28	7.0%
Marriage Type	Arrange marriage	358	89.5%
	Love marriage	42	10.5%
Education	Primary	14	3.5%
	Secondary	63	15.8%
	Higher Secondary	69	17.2%
	Graduation	163	40.8%
	Post-graduation	91	22.8%
Running Study	No	387	96.8%
	Yes	13	3.2%
History of Diseases	No	378	94.5%
	Yes	22	5.5%
Health	Bad	7	1.8%
	Medium	99	24.8%
	Good	230	57.5%
	Best	64	16.0%
Freedom of Decision Power	No	40	10.0%
	Yes	360	90.0%
Office Environment	Normal	23	5.8%
	Good	197	49.2%
	Nice	9	2.2%
	Not mentioned	171	42.8%
Income Source	Farming	6	1.5%
	Pension	9	2.2%
	Job	190	47.5%
	Business	54	13.5%
	Not mentioned	141	35.2%
Smoking	No	357	89.2%
	Yes	43	10.8%
Permanent Job	No	343	85.8%
	Yes	57	14.2%

According to the Table 2.1, the modal category is Below Average with 27.8% of the cases. Thus, the null model classifies correctly 27.8% of the time.

Table 2.2 : Model Fitting Information

Model	Model Fitting Criteria	Likelihood Ratio Tests		
	-2 Log Likelihood	Chi-Square	df	Sig.
Intercept Only	1094.563			
Final	886.187	208.376	33	.000

Table 2.2 shows likelihood ratio test of our model (Final) against one in which all the parameter coefficients are 0 (Null). The chi-square statistic is the difference between the -2 log-likelihoods of the Null and Final models. Since the significance level of the test is less than 0.05, we can conclude the Final model is outperforming the Null.

Table 2.3 : Goodness-of-Fit

	Chi-Square	df	Sig.
Pearson	1122.816	1164	.802
Deviance	886.187	1164	1.000

The goodness-of-fit table 2.3 represents two tests of the null hypothesis that the model adequately fits the data. If the null is true, the Pearson and deviance statistics have chi-square distributions with the displayed degrees of freedom.

Table 2.4 : Pseudo R-Square

Cox and Snell	.406
Nagelkerke	.434
McFadden	.190

In the table 2.4 linear regression model, the coefficient of determination, R^2, summarizes the proportion of variance in the dependent variable associated with the predictor (independent) variables, with larger R^2 values indicating that more of the variation is explained by the model, to a maximum of 1. For regression models with a categorical dependent variable, it is not possible to compute a single R^2 statistic that has all of the characteristics of R^2 in the linear regression model, so these approximations are computed instead. The following methods are used to estimate the coefficient of determination.

Cox and Snell's R^2 is based on the log likelihood for the model compared to the log likelihood for a baseline model. However, with categorical outcomes, it has a theoretical maximum value of less than 1, even for a "perfect" model. Nagelkerke's R^2 is an adjusted version of the Cox & Snell R-square that adjusts the scale of the statistic to cover the full range from 0 to 1.

McFadden's R^2 is another version, based on the log-likelihood kernels for the intercept-only model and the full estimated model. What constitutes a "good" R^2 value varies between different areas of application. While these statistics can be suggestive on their own, they are most useful when comparing competing models for the same data. The model with the largest R^2 statistic is "best" according to this measure.

Table 2.5 : Likelihood Ratio Tests

Effect	Model Fitting Criteria	Likelihood Ratio Tests		
	-2 Log Likelihood of Reduced Model	Chi-Square	df	Sig.
Intercept	886.187[a]	.000	0	.
Sleep	899.189	13.002	3	.005
Age at Marriage	897.322	11.135	3	.011
Yearly Income	889.216	3.029	3	.387
Permanent Job	912.402	26.215	3	.000
Family Status	905.067	18.880	6	.004
Exercise	937.016	50.828	9	.000
Smoking	896.218	10.031	3	.018
Monthly Outcome	900.756	14.569	3	.002

The chi-square statistic is the difference in -2 log-likelihoods between the final model and a reduced model. The reduced model is formed by omitting an effect from the final model. The null hypothesis is that all parameters of that effect are 0.

a. This reduced model is equivalent to the final model because omitting the effect does not increase the degrees of freedom.

The likelihood ratio test checks the contribution of each effect of to the model. Here, Sleep, Age at Marriage, Permanent job, Family Status, Exercise, Smoking, Monthly outcome are make model Significant. Some effects can be difficult to test. For example, the intercept cannot be tested in this model because removing the intercept simply causes one of the previously redundant factor levels to become non-redundant which all shown in table 2.5.

Table 2.6 : Classification

Observed	Predicted				
	Below average	Average	Medium-High	High	Percent Correct
Below average	78	11	18	4	70.3%
Average	21	28	28	10	32.2%
Medium-High	24	12	53	36	42.4%
High	9	2	32	34	44.2%
Overall Percentage	33.0%	13.2%	32.8%	21.0%	48.2%

The classification table 2.6 shows the practical results of using the multinomial logistic regression model. For each case, the predicted response category is chosen by selecting the category with the highest model-predicted probability. Here Cells on the diagonal are correct predictions and Cells on off diagonal are incorrect predictions. Overall, 48.2% of the cases are classified correctly.

Table 2.7 : Parameter Estimates

Score of Stress[a]		B	Std. Error	Wald	df	Sig.	Exp(B)	95% Confidence Interval for Exp(B)	
								Lower Bound	Upper Bound
Average	Intercept	-4.56	2.241	4.136	1	.042			
	Sleep	-.160	.147	1.173	1	.279	.852	.639	1.138
	Age at marriage	.116	.052	4.873	1	.027	1.123	1.013	1.244
	Yearly income	.000	.000	1.689	1	.194	1.000	1.000	1.000
	[Perm. job=1]	1.955	.507	14.880	1	.000	7.061	2.615	19.060
	[Perm. job=2]	0[b]	.	.	0	.	.	.	.
	[Family status=1]	1.993	.941	4.485	1	.034	7.335	1.160	46.376
	[Family status=2]	1.017	.916	1.233	1	.267	2.764	.459	16.628
	[Family status=3]	0[b]	.	.	0	.	.	.	.
	[Exercise=1]	1.043	.644	2.626	1	.105	2.838	.804	10.022
	[Exercise=2]	-.661	.673	.964	1	.326	.517	.138	1.931
	[Exercise=3]	-.767	.643	1.422	1	.233	.464	.132	1.638
	[Exercise=4]	0[b]	.	.	0	.	.	.	.
	[Smoking=1]	-.559	.480	1.355	1	.244	.572	.223	1.465
	[Smoking=2]	0[b]	.	.	0	.	.	.	.
	Monthly outcome	.000	.000	4.471	1	.034	1.000	1.000	1.000
Medium –High	Intercept	3.659	2.002	3.340	1	.068			
	Sleep	-.464	.146	10.06	1	.002	.629	.472	.838
	Age at marriage	-.004	.052	.006	1	.937	.996	.899	1.103
	Yearly income	.000	.000	.309	1	.578	1.000	1.000	1.000
	[Perm. job=1]	.932	.391	5.672	1	.017	2.540	1.179	5.470
	[Perm. job=2]	0[b]	.	.	0	.	.	.	.
	[Family status=1]	.857	.677	1.599	1	.206	2.355	.624	8.886
	[Family status=2]	-.343	.696	.243	1	.622	.709	.181	2.776
	[Family status=3]	0[b]	.	.	0	.	.	.	.
	[Exercise=1]	.635	.598	1.127	1	.288	1.887	.584	6.093
	[Exercise=2]	-.471	.600	.616	1	.432	.624	.192	2.025
	[Exercise=3]	-1.68	.622	7.263	1	.007	.187	.055	.633
	[Exercise=4]	0[b]	.	.	0	.	.	.	.
	[Smoking=1]	-.337	.470	.514	1	.473	.714	.284	1.793
	[Smoking=2]	0[b]	.	.	0	.	.	.	.
	Monthly outcome	.000	.000	2.961	1	.085	1.000	1.000	1.000
High	Intercept	-13.1	2.740	22.93	1	.000			
	Sleep	-.482	.180	7.120	1	.008	.618	.434	.880
	Age at marriage	-.072	.066	1.177	1	.278	.931	.818	1.059
	Yearly income	.000	.000	.028	1	.867	1.000	1.000	1.000
	[Perm. job=1]	2.886	1.068	7.309	1	.007	17.925	2.212	145.280

	[Perm. job=2]	0[b]	.	.	0	.	.	.	.
	[Family status=1]	.107	.921	.014	1	.907	1.113	.183	6.767
	[Family status=2]	-1.74	1.060	2.678	1	.102	.176	.022	1.409
	[Family status=3]	0[b]	.	.	0	.	.	.	.
	[Exercise=1]	1.919	1.175	2.669	1	.102	6.817	.681	68.190
	[Exercise=2]	.813	1.181	.474	1	.491	2.254	.223	22.802
	[Exercise=3]	-.689	1.235	.312	1	.577	.502	.045	5.649
	[Exercise=4]	0[b]	.	.	0	.	.	.	.
	[Smoking=1]	16.23	.000	.	1	.	11126925	11126925	11126925
	[Smoking=2]	0[b]	.	.	0	.	.	.	.
	Monthly outcome	.000	.000	8.408	1	.004	1.000	1.000	1.000

a. The reference category is: Below average.
b. This parameter is set to zero because it is redundant.

The parameter estimates table summarizes the effect of each predictor. The ratio of the coefficient to its standard error, squared, equals the Wald statistic. If the significance level of the Wald statistic is small (less than 0.05) then the parameter is different from 0.

Parameters with significant negative coefficients decrease the likelihood of that response category with respect to the reference category. Parameters with positive coefficients increase the likelihood of that response category. The parameters associated with the last category of each factor are redundant given the intercept term. If the intercept were not included in the model, parameters associated with the last category of would become non-redundant. This is shown in table 2.7.

V. RESULTS

Average Stress Level

A one-unit increase in the variable age at marriage is associated with a 0.116 increase in the relative log odds of being in average score of stress level versus below average score of stress level.

The relative log odds of being in average score of stress level versus below average score of stress level will increase by 1.955 if moving from the permanent job **[perm job = 2]** to no permanent job **[perm job = 1]**.

The relative log odds of being in average score of stress level versus below average score of stress level will increase by 1.993 if moving from the family status of high class **[family status = 3]** to family status of middle class**[family status = 1]**.

A one-unit increase in the variable **monthly outcome** is associated with a 0.0009 increase in the relative log odds of being in average score of stress level versus below average score of stress level.

Medium high Stress Level

A one-unit increase in the variable **sleep** is associated with a 0.464 decrease in the relative log odds of being in medium high score of stress level versus below average score of stress level.

The relative log odds of being in medium high score of stress level versus below average score of stress level will increase by 0.932 if moving from the permanent job **[perm job = 2]** to no permanent job **[perm job = 1]**.

The relative log odds of being in medium high score of stress level versus below average score of stress level will decrease by 1.676 if moving from the exercise of 60 minutes **[exercise = 4]** to exercise of 40 minutes **[exercise = 3]**.

High Stress Level

A one-unit increase in the variable **sleep** is associated with a 0.482 decrease in the relative log odds of being in high score of stress level versus below average score of stress level.

The relative log odds of being in high score of stress level versus below average score of stress level will increase by 2.886 if moving from the permanent job **[perm job = 2]** to no permanent job **[perm job = 1]**.

A one-unit increase in the variable **monthly outcome** is associated with a 0.000079 increase in the relative log odds of being in high score of stress level versus below average score of stress level.

VI. CONCLUSIONS

1. A one-unit increase in the variable age at marriage is associated with a 0.116 increase in the relative log odds of being in average score of stress level versus below average score of stress level.
2. The relative log odds of being in average score of stress level versus below average score of stress level will increase by 1.955 if moving from the permanent job **[perm job = 2]** to no permanent job **[perm job = 1]**.
3. The relative log odds of being in average score of stress level versus below average score of stress level will increase by 1.993 if moving from the family status of high class **[family status = 3]** to family status of middle class**[family status = 1]**.
4. A one-unit increase in the variable **monthly outcome** is associated with a 0.0009 increase in the relative log odds of being in average score of stress level versus below average score of stress level.
5. A one-unit increase in the variable **sleep** is associated with a 0.464 decrease in the relative log odds of being in medium high score of stress level versus below average score of stress level.
6. The relative log odds of being in medium high score of stress level versus below average score of stress level will increase by 0.932 if moving from the permanent job **[perm job = 2]** to no permanent job **[perm job = 1]**.

7. The relative log odds of being in medium high score of stress level versus below average score of stress level will decrease by 1.676 if moving from the exercise of 60 minutes **[exercise = 4]** to exercise of 40 minutes **[exercise = 3]**.
8. A one-unit increase in the variable **sleep** is associated with a 0.482 decrease in the relative log odds of being in high score of stress level versus below average score of stress level.
9. The relative log odds of being in high score of stress level versus below average score of stress level will increase by 2.886 if moving from the permanent job **[perm job = 2]** to no permanent job **[perm job = 1]**.
10. A one-unit increase in the variable **monthly outcome** is associated with a 0.000079 increase in the relative log odds of being in high score of stress level versus below average score of stress level.

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