Determination of Socio-economic Effects of Covid-19 Pandemic in Turkey Using Logistic Regression

Berna Yazıcı, Mustafa Çavuş, Emre Erdem

Eskişehir Science Faculty, Department of Statistics, Eskişehir/TURKEY

Abstract

Turkey met Covid-19 on March 11, 2020. Since then, the war against the virus continues with lockdowns, shot downs, regional lockdowns, online educations at every education level. After 1 year period, precautions are still being taken; Online education continues and lockdown is valid at the weekends since the number of new cases and the deaths are high. Bans have been toughened or loosened based on the number of cases.

This research was conducted in order to examine the socio-economic effects of the pandemic on Turkish people after 1 year from the beginning of the pandemic. An online survey was conducted between 1st Feb.-1st March 2022. 1425 respondents contributed to the study and data were analyzed. The results of nominal ordinal logistic regression were given in tables and they are also interpreted.

Key Words: Covid-19, Pandemic, Socio-economic Effects, Lockdown, Nominal Logistic Regression

1. Introduction

Covid-19 pandemic occurred in China in December 2019. This virus has not even been considered a threat by the Chinese government. But the pandemic has passed predictions along March and spread all over the World. All states have taken precautions to prevent the pandemic. These precautions are called "Covid-19 social isolation". The governments have enforced border shutdowns, travel restrictions and quarantine (Maria N., Zaid A., Catrin S., Ahmed K., Ahmed A., Christos I., Maliha A. and Riaz A., 2020). These precautions can be described as the largest mass precautions ever in the world history. Most of the countries, including the developed ones like the United States, Italy and United Kingdom, were not prepared enough to overcome this pandemic (Ranjan A. and Vaishali A., 2020). The Covid-19 lockdowns have caused social and economic difficulties at global level. People had trouble getting their salaries. Having to stay at home also negatively affected people's psychology (Autran G., and Luciano F., 2020). The Covid-19 pandemic has led to a dramatic loss of human lives. It is difficult to predict the impact and duration of the economic crisis on individuals in households, resulted from the pandemic.

The Covid-19 pandemic is a new and existing situation with an unknown time period. This makes it hard to expect and plan for the future. Covid-19 would lead to a huge economic shock to the system without any social protection (Amory M., Maryia M., Stephene H., Brian W., 2020). We need to develop long-term retainable strategies to health, food and economic (WHO, 2020). The overall loss to the economy and to different sectors depends on the severity and indelibility of crisis. Financial collapse, times like these call for resistive

and strong leadership in healthcare, business, government and wider society. Apart from firm economic measures, all National Health Programs should reconsolidate surge of communicable (Hema S., Anoop M., 2020).

International Social Workers Federation (IFSW) has announced what it should do to social workers for the Covid-19 pandemic. These precautions are planning to include disadvantaged and vulnerable individuals, to provide basic needs such as food and clean water, to maintain physical distance, to defend health and social practices against the inequality and socio-economic challenges created by Covid-19. States have made efforts to sustain social and more economic life.

2. Materials and Methods

An online survey study is conducted between 1st Feb and 1st March 2022 in order to determine the socio-economic effects of pandemic all over Turkey. 1425 respondents contributed to the study from different parts of the country. Firstly, demographic structure of the respondents is given. Then, logistic regression models are constructed and interpreted in terms of different variables.

2.1 Demographic Structure of the Covid-19 Survey
In the demographic questions section of the survey, question about gender, age, education, marital status and number of people in your home. Demographic structure of the respondents is given in Table 1.

Table 1: Demographic structure of the respondents

Variable of Interest	Response Frequencies	Percent
Gender		
Male	886	62.2
Female	539	37.8
Age		
18-25	609	42.7
26-35	256	18.0
36-45	251	17.6
46-55	215	15.1
56-65	73	5.1
65+	21	1.5
Education		
Primary School	87	6.1
High School	353	24.8
Bachelor	659	46.2

	Two-year Degree	168	11.8
	Post Graduate	158	11.1
Marital Status			
	Single	794	55.7
	Married	631	44.3
Number of people at home			
	Alone	69	4.8
	2-3	578	40.6
	4-5	682	47.9
	6+	96	6.7

1.2 The Logistic Regression Model

Logistic regression is used when the output variable is binary, nominal and ordinal. In process of the binary response variable, the regression model would take the following form:

$$y_i = x_i'\beta + \varepsilon_i \qquad (1)$$

where $x_i' = [1, x_{i1}, x_{i2}, \ldots, x_{ik}]$, $\beta = [\beta_0, \beta_1, \beta_2, \ldots, \beta_k]$ and the response y_i can only take on the values of 0 or 1.

$$y_i = 1, \qquad P(y_i = 1) = \pi_i$$
$$y_i = 0, \qquad P(y_i = 0) = \pi_i$$

When the response is binary, an s-shaped curve is used and this function is called the logistic response variable or logit. The form logit function is

$$E(y) = \pi = \frac{e^{g(x)}}{1 + e^{g(x)}} = \frac{1}{1 + e^{-g(x)}} \qquad (2)$$

Where $g(x) = x'\beta$. The $g(x)$ is defined as the linear predictor.

$$g(x) = \ln\frac{\pi}{1 - \pi} \qquad (3)$$

Response variable is binary but it is can be generalized for multi-level responses. When there are more than two nominal response categories, logistic regression fits a model used generalized logits.

$$h(x) = \log\left[\frac{\pi_j}{\pi_\gamma}\right] \qquad (4)$$

for j=1, 2, … , (r-1) nominal response categories. A logit is formed for the probability of each succeeding category over the last response category (Lawson and Montgomery, 2006). That is to say, the generalized logits for a five-level response would be

$$h(x)_1 = \log\left[\frac{\pi_1}{\pi_5}\right], h(x)_2 = \log\left[\frac{\pi_2}{\pi_5}\right], h(x)_3 = \log\left[\frac{\pi_3}{\pi_5}\right], h(x)_4 = \log\left[\frac{\pi_4}{\pi_5}\right]$$

Owing to the way in which the logits are calculated, the reference category becomes the category against which all the other responses are compared. The generalized linear predictor model is given as follows:

$$\hat{g}(x)_k = \beta_{ok} + x_i'\beta_k \qquad (5)$$

where k is the index of the logits (Lawson and Montgomery,2006).

2. Results and Discussion

Since all variables did not give a meaningful result in every question, different variables were used in each question. The question of knowledge Covid-19 was analyzed according to age and educational status variables. The option "Low level" has been chosen as a reference.

Table 2: The Probability of having high level of knowledge about Covid-19

Predictor	Coefficient	Standard error of coefficient	Z-Value	P-Value	Odds Ratio	95% CI Lower	95% CI Upper
Intercept	4.407	1.021	18.637	0.000			
Education(ps)	-2.690	1.111	5.862	0.015	0.068	0.008	0.599
Education(hs)	-1.923	1.048	3.370	0.066	0.146	0.019	1.139
Education(b)	-1.452	1.037	1.961	0.161	0.234	0.031	1.786
Education(tyd)	-0.007	1.421	0.000	0.996	0.993	0.061	16.105
Gender(female)	.6530	0.350	3.482	0.062	1.921	0.968	3.812

Logit 1 compares high level with low level. The odds ratio 0.68 indicates that the primary school graduates have 0.68 times more likely high-level knowledge about Covid-19.

$$\hat{g}(x)_1 = 4.407 - 2.690(Education - ps) - 1.923(Education - hs) - 1.452(Education - b) - 0.007(Education - tyd) + 0.653(Gender - female)$$

Table 3: Estimated probabilities for having high level of knowledge about Covid-19

Gender	Education	Probability of having a high-level knowledge about Covid-19
Female	Primary S.	9%
	High S.	4%
	Bachelor	2%
	Two-year D.	1%
	Postgraduate	1%
Male	Primary S.	15%

High S.	7%
Bachelor	5%
Two-year D.	1%
Postgraduate	1%

According to the results, if the respondent is primary school graduated and male, he would most probably (15%) have a high-level knowledge about Covid-19.

The question of positive family relationship in pandemic period was analyzed according to gender and age variables. The option "strongly agree" has been chosen as a reference.

Table 4: The Probability of Positive Family Relationship

Predictor	Coefficient	Standard error of coefficient	Z-Value	P-Value	Odds Ratio	95% CI Lower	95% CI Upper
Intercept	-1.682	1.100	2.340	0.126			
Age (18-25)	2.717	1.108	6.018	0.014	15.139	1.727	132.715
Age (26-35)	2.178	1.120	3.781	0.052	8.826	0.983	79.254
Age (36-45)	1.443	1.123	1.649	0.199	4.233	0.468	38.279
Age (46-55)	1.300	1.135	1.312	0.252	3.669	0.397	33.912
Age (56-65)	1.364	1.194	1.305	0.253	3.913	0.377	40.646
Gender(fema)	0.164	0.214	0.587	0.443	1.178	0.775	1.790

Logit 1 compares neutral with strongly agree. The odds ratio 15.139 indicates that 18-25 ages have 15.1 times more likely neutral for positive family relationship.

$$\hat{g}(\mathbf{x})_1 = -1.682 + 2.717\big(Age(18-25)\big) + 2.178\big(Age(26-35)\big) + 1.443\big(Age(36-45)\big) + 1.300\big(Age(46-55)\big) + 1.364\big(Age(56-65)\big) + 0.164(Gender-female)$$

Table 5: Estimated probabilities for positive family relationship

Gender	Age	Probability of neutral for positive family relationship
Female	18-25	23%
	26-35	34%
	36-45	51%
	46-55	55%
	56-65	53%
	65+	82%
Male	18-25	26%
	26-35	37%
	36-45	56%
	46-55	59%
	56-65	58%

	65+		84%			

According to the results, if the respondent is 65+ ages and male, he would most probably (85%) neutral for positive family relationship.

The question of my responsibilities increased in the family business department was analyzed according to gender and educational status variables. The option "strongly disagree" has been chosen as a reference.

Table 6: The Probability of Increased Responsibilities

Predictor	Coefficient	Standard error of coefficient	Z-Value	P-Value	Odds Ratio	95% CI Lower	95% CI Upper
Intercept	0.377	0.344	1.197	0.274			
Education(ps)	-1.527	0.45	11.522	0.001	0.217	0.09	0.525
Education(hs)	-0.905	0.361	6.286	0.012	0.404	0.199	0.821
Education(b)	0.187	0.363	0.265	0.607	1.206	0.592	2.458
Education(tyd)	-0.517	0.42	1.513	0.219	0.596	0.262	1.359
Gender(female)	1.234	0.204	36.62	0.000	3.434	2.303	5.121

Logit 1 compares strongly agree with strongly disagree. The odds ratio 0.404 indicates that the high school graduated have 0.4 times more increased responsibilities. Females have 3.43 times more likely increased responsibilities versus males.

$$\hat{g}(\mathbf{x})_1 = 0.377 - 1.527(Education - ps) - 0.905(Education - hs) + 0.187(Education - b) - 0.517(Education - tyd) + 1.234(Gender - female)$$

Table 7: Estimated probabilities for increased responsibilities

Gender	Education	Probability of strongly agree increased responsibilities
Female	Primary S.	47%
	High S.	33%
	Bachelor	14%
	Two-year D.	25%
	Postgraduate	16%
Male	Primary S.	76%
	High S.	63%
	Bachelor	36%
	Two-year D.	53%
	Postgraduate	40%

According to the results, if the respondent is primary school graduates and male, he would most probably (85%) strongly agree increased responsibilities.

The question of my psychology negatively affected in pandemic period was analyzed according to gender and age variables. The option "strongly agree" has been chosen as a reference.

<p align="center">Table 8: The Probability of Negative Psychology</p>

Predictor	Coefficient	Standard error of coefficient	Z-Value	P-Value	Odds Ratio	95% CI Lower	95% CI Upper
Intercept	1.333	0.822	2.628	0.105			
Age (18-25)	-2.407	0.833	8.358	0.004	0.09	0.018	0.461
Age (26-35)	-1.407	0.844	2.778	0.096	0.245	0.047	1.281
Age (36-45)	-1.134	0.852	1.772	0.183	0.322	0.061	1.709
Age (46-55)	-0.709	0.857	0.685	0.408	0.492	0.092	2.638
Age (56-65)	-1.269	0.914	Oca.93	0.165	0.281	0.047	1.685
Gender(female)	-0.618	0.186	11.079	0.001	0.539	0.375	0.776

Logit 1 compares strongly disagree with strongly agree. The odds ratio 0.004 indicates that the 18-25 ages have 0.004 times more positive psychology. Females have 0.53 times more likely positive psychology versus males.

$$\hat{g}(\mathbf{x})_1 = 1.333 - 2.407(Age(18-25)) - 1.407(Age(26-35)) - 1.134(Age(36-45)) - 0.709(Age(46-55)) - 1.269(Age(56-65)) - 0.618(Gender-female)$$

<p align="center">Table 9: Estimated probabilities for negative psychology</p>

Gender	Age	Probability of strongly disagree negatively affected
Female	18-25	84%
	26-35	67%
	36-45	60%
	46-55	49%
	56-65	63%
	65+	39%
Male	18-25	74%
	26-35	52%
	36-45	45%
	46-55	35%
	56-65	48%
	65+	20%

According to the results, if the respondents' age is between 18-25 and female, she would most probably (84%) strongly disagree in negatively psychologically affecting.

The question of the society conscious behavior towards Covid-19 was analyzed according to gender and age variables. The option "strongly agree" has been chosen as a reference.

Table 10: The Probability of Conscious Against Covid-19

Predictor	Coefficient	Standard error of coefficient	Z-Value	P-Value	Odds Ratio	95% CI Lower	95% CI Upper
Intercept	0.166	1.004	0.027	0.869			
Age (18-25)	0.264	1.014	0.068	0.795	1.302	0.178	9.501
Age (26-35)	0.603	1.027	0.344	0.558	1.827	0.244	13.686
Age (36-45)	0.568	1.033	0.302	0.582	1.765	0.233	13.367
Age (46-55)	0.192	1.034	0.034	0.853	1.211	0.16	9.188
Age (56-65)	-0.091	1.076	0.007	0.933	0.913	0.111	7.529
Gender(female)	-0.465	0.205	5.132	0.023	0.628	0.42	0.939

Logit 1 compares strongly disagree with strongly agree. The odds ratio 0.628 indicates that the females have 0.62 times more likely strongly disagree conscious behavior against Covid-19.

$$\hat{g}(\mathbf{x})_1 = 0.166 + 0.264\big(Age(18-25)\big) + 0.603\big(Age(26-35)\big) + 0.568\big(Age(36-45)\big) + 0.192\big(Age(46-55)\big) - 0.091\big(Age(56-65)\big) - 0.465\big(Gender-female\big)$$

Table 11: Estimated probabilities for conscious against Covid-19

Gender	Age	Probability of strongly disagree conscious behavior
Female	18-25	50%
	26-35	42%
	36-45	43%
	46-55	52%
	56-65	60%
	65+	57%
Male	18-25	39%
	26-35	32%
	36-45	32%
	46-55	41%
	56-65	48%
	65+	45%

According to the results, if the respondent is 56-65 ages and female, she would most probably (60%) strongly disagree conscious behavior.

The question of work only emergency departments of hospitals benefit to society was analyzed according to gender and educational status variables. The option "strongly agree" has been chosen as a reference.

Table 12: The Probability of Benefit of Hospital Policy to Society

Predictor	Coefficient	Standard error of coefficient	Z-Value	P-Value	Odds Ratio	95% CI Lower	95% CI Upper
Intercept	1.119	0.345	10.498	0.001			
Education(ps)	-1.153	0.549	4.405	0.036	0.316	0.108	0.927
Education(hs)	-0.869	0.367	5.619	0.018	0.419	0.204	0.86
Education(b)	-0.509	0.344	2.190	0.139	0.601	0.307	1.179
Education(tyd)	-1.246	0.412	9.146	0.002	0.288	0.128	0.645
Gender(female)	0.042	0.191	0.049	0.824	1.043	0.718	1.517

Logit 1 compares neutral with strongly agree. The odds ratio 0.419 indicates that the high school graduates have 0.41 times more likely neutral for benefit of hospital policy to society.

$$\hat{g}(\mathbf{x})_1 = 1.119 - 1.153(Education - ps) - 0.869(Education - hs) - 0.509(Education - b) - 1.246(Education - tyd) + 0.042(Gender - female)$$

Table 13: Estimated probabilities for benefit of hospital policy of society

Gender	Education	Probability of neutral for benefit of hospital policy to society
Female	Primary S.	49%
	High S.	43%
	Bachelor	34%
	Two-year D.	52%
	Postgraduate	24%
Male	Primary S.	51%
	High S.	44%
	Bachelor	35%
	Two-year D.	53%
	Postgraduate	25%

According to the results, if the respondent is two-year degree graduate and male, he would most probably (53%) neutral benefit of hospital policy to society.

The question of technological device usage increased in pandemic period was analyzed according to gender and age variables. The option "strongly agree" has been chosen as a reference.

Table 14: The Probability of Technological Device Usage Increased

Predictor	Coefficient	Standard error of coefficient	Z-Value	P-Value	Odds Ratio	95% CI Lower	95% CI Upper
Intercept	0.432	0.613	0.498	0.481			
Age (18-25)	-1.890	0.627	9.080	0.003	0.151	0.044	0.516
Age (26-35)	-1.152	0.639	3.247	0.072	0.316	0.09	1.106
Age (36-45)	-0.947	0.642	2.175	0.140	0.388	0.11	1.365
Age (46-55)	-1.002	0.644	2.419	0.120	0.367	0.104	1.298
Age (56-65)	-1.526	0.742	4.230	0.040	0.217	0.051	0.931
Gender(female)	-0.637	0.178	12.872	0.000	0.529	0.373	0.749

Logit 1 compares strongly disagree with strongly agree. The odds ratio 0.388 indicates that the 36-45 ages have 0.38 times more likely strongly disagree of technological device usage increased. Females have 0.5 times more likely strongly disagree of technological device usage increased.

$$\hat{g}(\mathbf{x})_1 = 0.432 - 1.890\big(Age(18-25)\big) - 1.152\big(Age(26-35)\big) - 0.947\big(Age(36-45)\big) - 1.002\big(Age(46-55)\big) - 1.526\big(Age(56-65)\big) - 0.637\big(Gender-female\big)$$

Table 15: Estimated probabilities for technological device usage increased

Gender	Age	Probability of strongly disagree technological device usage increased
Female	18-25	89%
	26-35	80%
	36-45	76%
	46-55	77%
	56-65	85%
	65+	55%
Male	18-25	81%
	26-35	67%
	36-45	63%
	46-55	64%
	56-65	75%
	65+	39%

According to the results, if the respondent is 18-25 ages and female, she would most probably (89%) strongly disagree technological device usage increased.

The question of ending home visits positively affected the pandemic was analyzed according to gender and educational status variables. The option "strongly agree" has been chosen as a reference.

Table 16: The Probability of Ending Home Visits Positively Effect

Predictor	Coefficient	Standard error of coefficient	Z-Value	P-Value	Odds Ratio	95% CI Lower	95% CI Upper
Intercept	0.432	0.613	0.498	0.481			
Education(ps)	-1.890	0.627	9.080	0.003	0.151	0.044	0.516
Education(hs)	-1.152	0.639	3.247	0.072	0.316	0.09	1.106
Education(b)	-0.947	0.642	2.175	0.140	0.388	0.11	1.365
Education(tyd)	-1.002	0.644	2.419	0.120	0.367	0.104	1.298
Gender(female)	-0.637	0.178	12.872	0.000	0.529	0.373	0.749

Logit 1 compares disagree with strongly agree. The odds ratio 0.151 indicates that the primary school graduates have 0.15 times more likely disagree of ending home visits positively affected the pandemic. Females have 0.52 times more likely disagree of ending home visits positively affected the pandemic.

$$\hat{g}(\mathbf{x})_1 = 0.432 - 1.890(Education - ps) - 1.152(Education - hs) - 0.947(Education - b) - 1.002(Education - tyd) - 0.647(Gender - female)$$

Table 17: Estimated probabilities for ending home visits positively effect

Gender	Education	Probability of disagree ending home visits positively affected
Female	Primary S.	89%
	High S.	80%
	Bachelor	76%
	Two-year D.	77%
	Postgraduate	55%
Male	Primary S.	81%
	High S.	67%
	Bachelor	63%
	Two-year D.	64%
	Postgraduate	39%

According to the results, if the respondent is primary school graduate and female, she would most probably (53%) disagree ending home visits positively affected the pandemic.

The question of from a sociological point of view, what kind of feelings do you think of "the new normal" and "our life will continue new normal standards" was analyzed according to age and educational status variables. The option "Uncertainty" has been chosen as a reference.

Table 18: The Probability of Sociological Sentiments

Predictor	Coefficient	Standard error of coefficient	Z-Value	P-Value	Odds Ratio	95% CI Lower	95% CI Upper
Intercept	-1.069	0.256	17.470	0.000			
Education(ps)	0.170	0.402	0.178	0.673	1.185	0.539	2.608
Education(hs)	-0.052	0.282	0.034	0.855	0.95	0.546	1.651
Education(b)	-0.985	0.290	11.558	0.001	0.373	0.212	0.659
Education(tyd)	-0.544	0.358	2.312	0.128	0.581	0.288	Oca.17
Gender(female)	-0.580	0.187	9.642	0.002	0.56	0.388	0.807

Logit 1 compares looking to the future more positively and hope with uncertainty. The odds ratio 0.560 indicates that the females have 0.56 times more likely positively and hope versus males. For the bachelor graduates, the probability of positively and hope have 0.37 times that uncertainty.

$$\hat{g}(\mathbf{x})_1 = -1.069 + 0.170(Education - ps) - 0.052(Education - hs) - 0.985(Education - b) - 0.544(Education - tyd) - 0.580(Gender - female)$$

Table 19: Estimated probabilities for sociological sentiments

Gender	Education	Positively and hope
Female	Primary S.	81%
	High S.	84%
	Bachelor	93%
	Two-year D.	90%
	Postgraduate	84%
Male	Primary S.	71%
	High S.	75%
	Bachelor	88%
	Two-year D.	83%
	Postgraduate	74%

According to results, if the respondent is postgraduate and male, he most probably (78%) fear and stress. If the bachelor and female, she would most probably (93%) positively and hope.

The question of economically affected was analyzed according to gender and educational status variables. The option "not affected" has been chosen as a reference.

Table 20: The Probability of Encounter Financial Difficulty

Predictor	Coefficient	Standard error of coefficient	Z-Value	P-Value	Odds Ratio	95% CI Lower	95% CI Upper
Intercept	-2.006	0.32	39.244	0.000			
Education(ps)	0.200	0.224	0.791	0.374	1.221	0.786	1.895
Education(hs)	1.209	0.574	4.442	0.035	12844	1.088	10.314

Education(b)	0.962	0.371	6.706	0.010	2.616	1.263	5.417
Education(tyd)	0.438	0.325	1.817	0.178	1.549	0.820	2.927
Gender(female)	1.246	0.405	9.471	0.002	3.477	1.572	7.691

Logit 1 compares I did not get salary and no affected. For the high school graduate are 3.35 and the bachelor graduate have 2.61 times more could not get salary. Females have 3.47 times more likely could not get salary versus males.

$$\hat{g}(\mathbf{x})_1 = -2.006 + 0.200(Education - ps) + 1.209(Education - hs) + 0.962(Education - b) + 0.438(Education - tyd) + 1.246(Gender - female)$$

Table 21: Estimated probabilities for encounter financial difficulty

Gender	Education	Probability of did not get salary
Female	Primary S.	63%
	High S.	38%
	Bachelor	44%
	Two-year D.	57%
	Postgraduate	68%
Male	Primary S.	85%
	High S.	68%
	Bachelor	73%
	Two-year D.	82%
	Postgraduate	88%

According to the results, if the postgraduate and female, she most probably (88%) did not get salary. If the primary school graduate and male, he most probably (90%) could not open workplace.

The question of working performance in home was analyzed according to gender and number of people in home. The option "do not have work online" has been chosen as a reference.

Table 22: The Probability of Home-working Performance

Predictor	Coefficient	Standard error of coefficient	Z-Value	P-Value	Odds Ratio	95% CI Lower	95% CI Upper
Intercept	-2.685	1.058	6.446	0.011			
Num_People(alone)	3.192	1.213	6.919	0.009	24.328	2.256	262.362
Num_People(2-3)	2.127	1.058	4.045	0.044	8.389	1.056	66.661
Num_People(4-5)	1.954	1.060	3.401	0.065	7.058	0.885	56.315

Gender(female)	0.414	0.223	3.429	0.064	1.512	0.976	2.344

Logit 1 compares performance has decreased and do not have work online. The odds ratio 24.328 indicates that those who live alone 24.3 times more likely performance has decreased.

$$\hat{g}(\mathbf{x})_1 = -2.685 + 3.192(Numpeople - alone) + 2.127(Numpeople(2 - 3)) + 1.954(Numpeople(4 - 5)) + 0.414(Gender - female)$$

Table 23: Estimated probabilities for home-working performance

Gender	Number of people in home	Probability of performance decreased
Female	Alone	28%
	2-3	53%
	4-5	57%
	6+	90%
Male	Alone	37%
	2-3	63%
	4-5	67%
	6+	93%

According to the results, if the respondent is those who live 6+ and male, he would most probably (89%) performance improved. If the respondent is who live 6+ and female, she would most probably (89%) performance decreased.

The question of positive effects of home-working to economy was analyzed according to marital status and educational status variables. The option "no, there is no such situation" has been chosen as a reference.

Table 24: The Probability of Home-working Effects Personal Economy

Predictor	Coefficient	Standard error of coefficient	Z-Value	P-Value	Odds Ratio	95% CI Lower	95% CI Upper
Intercept	-1.179	0.282	17.411	0.000			
Education(ps)	-1.788	1.063	2.830	0.093	0.167	0.021	1.343
Education(hs)	-0.919	0.403	5.207	0.022	0.399	0.181	0.878
Education(b)	-0.755	0.326	5.375	0.020	0.470	0.248	0.890
Education(tyd)	-0.687	0.466	2.174	0.140	0.503	0.202	1.254
Marital(single)	0.477	0.264	3.256	0.071	1.612	0.960	2.706

Logit 1 compares personal economy positive effect with personal economy remained stable. For the high school graduate, the probability of positive effect 0.39 and bachelor graduate, the probability of positive effect 0.47.

$$\hat{g}(\mathbf{x})_1 = -1.179 - 1.788(Education - ps) - 0.919(Education - hs) - 0.755(Education - b) - 0.687(Education - tyd) + 0.477(Marital - single)$$

Table 25: Estimated probabilities for home-working effects personal economy

Marital status	Education	Probability of positive effect
Single	Primary S.	92%
	High S.	83%
	Bachelor	81%
	Two-year D.	50%
	Postgraduate	67%
Married	Primary S.	95%
	High S.	89%
	Bachelor	87%
	Two-year D.	86%
	Postgraduate	76%

According to the results, if the respondent is primary school graduates and married, he/she would most probably (95%) positively effect personal economy. If the respondent is high school and single, he/she would most probably (86%) spend money for requirements pandemic.

The question of making exercises that prevent loss of motivation was analyzed according to gender and age variables. The option "I heard first time but I would try" has been chosen as a reference.

Table 26: The Probability of Making Exercises for Motivation

Predictor	Coefficient	Standard error of coefficient	Z-Value	P-Value	Odds Ratio	95% CI Lower	95% CI Upper
Intercept	-0.229	1.430	0.026	0.873			
Age (18-25)	-0.334	1.471	0.052	0.820	0.716	0.040	12.783
Age (26-35)	-0.283	1.448	0.038	0.845	0.754	0.044	12.867
Age (36-45)	-0.459	1.456	0.099	0.753	0.632	0.036	10.964
Age (46-55)	-0.058	1.462	0.002	0.968	0.943	0.054	16.564
Age (56-65)	1.279	1.639	0.609	0.435	3.594	0.145	89.279
Gender(female)	0.879	0.278	10.008	0.002	2.408	1.397	4.149

Logit 1 compares making exercise with would try. The odds ratio 2.498 indicates that females have 2.4 times more likely make exercise for motivation versus males.

$$\hat{g}(\mathbf{x})_1 = -0.229 - 0.334\big(Age(18-25)\big) - 0.283\big(Age(26-35)\big) - 0.459\big(Age(36-45)\big) - 0.058\big(Age(46-55)\big) + 1.279\big(Age(56-65)\big) + 0.879(Gender-female)$$

Table 27: Estimated probabilities for making practices for motivation

Gender	Age	Probability of making exercise for motivation
Female	18-25	42%
	26-35	41%
	36-45	45%
	46-55	33%
	56-65	12%
	65+	34%
Male	18-25	63%
	26-35	62%
	36-45	66%
	46-55	54%
	56-65	26%
	65+	55%

According to the results, if the respondent is male and 36-45, he would most probably (66%) be making exercise for motivation.

The question of the impact of the pandemic when looking for a job was analyzed according to gender and marital status variables. The option "I did not look for a job" has been chosen as a reference.

Table 28: The Probability of Negative Effect When Looking for a Job

Predictor	Coefficient	Standard error of coefficient	Z-Value	P-Value	Odds Ratio	95% CI Lower	95% CI Upper
Intercept	-1.766	0.278	40.435	0.000			
Gender (female)	-0.234	0.285	0.678	0.41	0.791	0.453	1.382
Marital (Single)	2.222	0.265	70.264	0.000	9.221	5.485	15.502

Logit 1 compares negative effect with did not look for a job. The odds ratio 9.221 indicates that single have 9.2 times less likely saw many negative effects versus married.

$$\hat{g}(\mathbf{x})_1 = -1.766 - 0.234(Gender-female) + 2.222(Marital-single)$$

Table 29: Estimated probabilities for negative effect when looking for a job

Marital status	Education	Probability of negative effect when looking for a job
Single	Female	44%
	Male	39%
Married	Female	88%
	Male	85%

According to the results, if the respondent is female and married, she would most probably (88%) encounter negative effects.

The question of food spending and change bills was analyzed according to age and marital status variables. The option "expenses decreased" has been chosen as a reference.

Table 30: The Probability of Change of Expenses

Predictor	Coefficient	Standard error of coefficient	Z-Value	P-Value	Odds Ratio	95% CI Lower	95% CI Upper
Intercept	1.014	0.616	2.710	0.100			
Age (18-25)	19.975	0.743	722.547	0.000			
Age (26-35)	19.791	0.728	738.019	0.000			
Age (36-45)	1.606	0.762	4.440	0.035	4.984	1.119	22.208
Age (46-55)	1.267	0.734	2.980	0.084	3.551	0.842	14.973
Age (56-65)	0.532	0.727	0.537	0.464	1.703	0.41	7.077
Marital(single)	-0.356	0.573	0.386	0.535	0.701	0.228	2.153

Logit 1 compares expenses increased with expenses decreased. The odds ratio 4.984 indicates that 36-45 ages have 4.9 times expenses increased.

$$\hat{g}(\mathbf{x})_1 = 1.014 + 19.975\big(Age(18-25)\big) + 19.791\big(Age(26-35)\big) + 1.606\big(Age(36-45)\big) + 1.267\big(Age(46-55)\big) + 0.532\big(Age(56-65)\big) - 0.356(Marital-single)$$

Table 31: Estimated probabilities for change on expenses

Marital Status	Age	Probability of expenses increased
Single	36-45	9%
	46-55	12%
	56-65	23%
	65+	34%
Married	36-45	6%
	46-55	9%
	56-65	17%

	65+		26%	

According to the results, if the respondent is 65+ ages and married, he/she would most probably (34%) expenses increased.

The question of getting financial support from government or boss in pandemic period was analyzed according to gender and educational status variables. The option "I wanted but did not get help" has been chosen as a reference.

Table 32: The Probability of Getting Financial Support

Predictor	Coefficient	Standard error of coefficient	Z-Value	P-Value	Odds Ratio	95% CI Lower	95% CI Upper
Intercept	0.608	0.468	1.690	0.194			
Education(ps)	-1.246	0.641	3.777	0.052	0.288	0.082	1.011
Education(hs)	-1.022	0.492	4.316	0.038	0.360	0.137	0.944
Education(b)	-0.97	0.474	4.194	0.041	0.379	0.15	0.959
Education(tyd)	-0.974	0.522	3.474	0.062	0.378	0.136	1.052
Gender(female)	-0.073	0.227	0.105	0.746	0.929	0.596	1.449

Logit 1 compares got help with did not get help. For the high school graduates, the probability of got help have 0.36 and the bachelor graduates, the probability of got help have 0.37.

$$\hat{g}(\mathbf{x})_1 = 0.608 - 1.246(Education - ps) - 1.022(Education - hs) - 0.97(Education - b) - 0.974(Education - tyd) - 0.073(Gender - female)$$

Table 33: Estimated probabilities for getting financial support

Gender	Education	Probability of got help
Female	Primary S.	67%
	High S.	61%
	Bachelor	60%
	Two-year D.	18%
	Postgraduate	36%
Male	Primary S.	65%
	High S.	60%
	Bachelor	58%
	Two-year D.	17%
	Postgraduate	35%

According to the results, if the respondent is primary school graduate and female, she would most probably (67%) got help. If the respondent is high school graduate and male, he would most probably (18%) did not get help.

The question of anyone else contribute to the family budget was analyzed according to gender and age variables. The option "no" has been chosen as a reference.

Table 34: The Probability of Contribution to the Budget

Predictor	Coefficient	Standard error of coefficient	Z-Value	P-Value	Odds Ratio	95% CI Lower	95% CI Upper
Intercept	-0.514	0.448	1.314	0.252			
Age (18-25)	1.631	0.458	12.671	0.000	5.107	2.081	12.534
Age (26-35)	0.807	0.465	3.007	0.083	2.241	0.900	5.578
Age (36-45)	0.741	0.466	2.524	0.112	2.098	0.841	5.232
Age (46-55)	0.46	0.466	0.975	0.324	1.585	0.635	3.953
Age (56-65)	0.755	0.508	2.207	0.137	2.128	0.786	5.763
Gender(female)	0.58	0.123	22.195	0.000	1.786	1.403	2.274

Logit 1 compares yes with no. The odds ratio 5.107 indicates that 18-25 ages are 5.1 times more likely someone who contributes to the family budget. Females are 1.7 times more someone who contributes to the family budget versus males.

$$\hat{g}(\mathbf{x})_1 = -0.514 + 1.631\big(Age(18-25)\big) + 0.807\big(Age(26-35)\big) + 0.741\big(Age(36-45)\big) + 0.460\big(Age(46-55)\big) + 0.755\big(Age(56-65)\big) + 0.580(Gender-female)$$

Table 35: Estimated probabilities for contribution to the budget

Gender	Age	Probability of someone contributes to the family budget
Female	18-25	15%
	26-35	29%
	36-45	30%
	46-55	37%
	56-65	31%
	65+	48%
Male	18-25	24%
	26-35	42%
	36-45	44%
	46-55	51%
	56-65	44%
	65+	62%

According to the results, if the respondent is 65+ ages and male, his would most probably (67%) has someone who contribute to the family budget.

The question of family members impressed economically was analyzed according to gender and educational status variables. The option "no" has been chosen as a reference.

Table 36: The Probability of Family Members Affected Economically

Predictor	Coefficient	Standard error of coefficient	Z-Value	P-Value	Odds Ratio	95% CI Lower	95% CI Upper
Intercept	-0.184	0.178	1.074	0.300			
Education(ps)	1.180	0.297	15.777	0.000	3.256	1.818	5.829
Education(hs)	0.974	0.198	24.110	0.000	2.648	1.795	3.905
Education(b)	0.663	0.179	13.675	0.000	1.940	1.366	2.757
Education(tyd)	1.240	0.242	26.256	0.000	3.455	2.150	5.552
Gender(female)	0.199	0.117	2.878	0.090	1.220	0.970	1.535

Logit 1 compares yes with no. The odds ratio 3.455 indicates that two-year degree graduates have 3.4 times more likely family members affected economically.

$$\hat{g}(\mathbf{x})_1 = -0.184 + 1.180(Education - ps) + 0.974(Education - hs) + 0.663(Education - b) + 1.240(Education - tyd) + 0.199(Gender - female)$$

Table 37: Estimated probabilities for family members affected economically

Gender	Education	Probability of family member affected economically
Female	Primary S.	23%
	High S.	27%
	Bachelor	33%
	Two-year D.	22%
	Postgraduate	49%
Male	Primary S.	27%
	High S.	31%
	Bachelor	38%
	Two-year D.	26%
	Postgraduate	54%

According to the results, if the respondent is postgraduate and male, his would most probably (54%) family member affected economically.

The question of getting sick due to inactivity was analyzed according to gender and age variables. The option "no" has been chosen as a reference.

Table 38: The Probability of Getting Sick Due to Inactivity

Predictor	Coefficient	Standard error of coefficient	Z-Value	P-Value	Odds Ratio	95% CI Lower	95% CI Upper
Intercept	0.804	0.527	2.333	0.127			
Age (18-25)	-0.179	0.535	0.113	0.737	0.836	0.293	2.385
Age (26-35)	-0.429	0.545	0.620	0.431	0.651	0.224	1.894

Age (36-45)	-0.253	0.547	0.213	0.644	0.777	0.266	2.269
Age (46-55)	-0.300	0.548	0.299	0.584	0.741	0.253	2.168
Age (56-65)	-0.628	0.583	1.163	0.281	0.534	0.17	1.671
Gender(female)	0.654	0.125	27.388	0.000	1.924	1.506	2.458

Logit 1 compares yes with no. The odds ratio 1.924 indicates that females have 1.9 times more getting sick versus males.

$$\hat{g}(\mathbf{x})_1 = 0.804 - 0.179(Age(18-25)) - 0.429(Age(26-35)) - 0.253(Age(36-45)) - 0.300(Age(46-55)) - 0.628(Age(56-65)) + 0.654(Gender-female)$$

Table 39: Estimated probabilities for getting sick due to inactivity

Gender	Age	Probability of getting sick due to inactivity
Female	18-25	21%
	26-35	26%
	36-45	23%
	46-55	24%
	56-65	30%
	65+	18%
Male	18-25	35%
	26-35	41%
	36-45	36%
	46-55	37%
	56-65	46%
	65+	31%

According to the results, if the respondent is 56-65 ages and male, he would most probably (46%) getting sick due to inactivity.

The question of contact with friends during pandemic period was analyzed according to gender and age variables. The option "completely online (phone, pc, etc.)" has been chosen as a reference.

Table 40: The Probability of Communication

Predictor	Coefficient	Standard error of coefficient	Z-Value	P-Value	Odds Ratio	95% CI Lower	95% CI Upper
Intercept	-1.244	0.562	4.899	0.027			
Age (18-25)	1.506	0.568	7.024	0.008	4.507	1.480	13.721
Age (26-35)	0.943	0.577	2.672	0.102	2.568	0.829	7.959
Age (36-45)	0.891	0.578	2.374	0.123	2.438	0.785	7.573
Age (46-55)	0.610	0.580	1.106	0.293	1.841	0.59	5.742
Age (56-65)	0.488	0.620	0.620	0.431	1.629	0.483	5.491
Gender(female)	-0.401	0.118	11.551	0.001	0.67	0.532	0.844

Logit 1 compares both online and face to face with completely online. The odds ratio 4.507 indicates that 18-25 ages have 4.5 times more likely contact with friends during pandemic period. Females have 0.6 times more contact with friends during pandemic period versus males.

$$\hat{g}(\mathbf{x})_1 = -1.244 + 1.506\big(Age(18-25)\big) + 0.943\big(Age(26-35)\big) + 0.891\big(Age(36-45)\big) + 0.610\big(Age(46-55)\big) + 0.488\big(Age(56-65)\big) - 0.401(Gender - female)$$

Table 41: Estimated probabilities for communication

Gender	Age	Probability of contact with friends online and face to face
Female	18-25	53%
	26-35	66%
	36-45	68%
	46-55	73%
	56-65	76%
	65+	83%
Male	18-25	43%
	26-35	57%
	36-45	59%
	46-55	65%
	56-65	68%
	65+	77%

According to the results, if respondent is 65+ ages and female, she would most probably (83%) contact with friends online and face to face.

The question of go on vacation was analyzed according to gender and educational status variables. The option "I wanted to go but I could not" has been chosen as a reference.

Table 42: The Probability of Vacation

Predictor	Coefficient	Standard error of coefficient	Z-Value	P-Value	Odds Ratio	95% CI Lower	95% CI Upper
Intercept	0.846	0.257	10.838	0.001			
Education(ps)	-2.142	0.424	25.515	0.000	0.117	0.051	0.270
Education(hs)	-0.837	0.276	9.217	0.002	0.433	0.252	0.743
Education(b)	-0.548	0.261	4.425	0.035	0.578	0.347	0.963
Education(tyd)	-0.529	0.327	2.621	0.105	0.589	0.311	1.118
Gender(female)	0.338	0.152	4.923	0.026	1.402	1.040	1.889

Logit 1 compares I went with I wanted to go but I could not. The odds ratio 0.589 indicates that two-year degree graduates have 0.5 times more likely went on holiday. Females have 1.4 times more went on holiday versus males.

$$\hat{g}(\mathbf{x})_1 = 0.846 - 2.142(Education - ps) - 0.837(Education - hs) \\ - 0.548(Education - b) - 0.529(Education - tyd) \\ + 0.338(Gender - female)$$

Table 43: Estimated probabilities for vacation

Gender	Education	Probability of went on vacation
Female	Primary S.	72%
	High S.	41%
	Bachelor	34%
	Two-year D.	34%
	Postgraduate	23%
Male	Primary S.	78%
	High S.	50%
	Bachelor	43%
	Two-year D.	42%
	Postgraduate	30%

According to the results, if the respondent is primary school graduate and male, he would most probably (54%) go on vacation.

The question of catching Covid-19 was analyzed according to age and educational status variables. The option "I stayed in contact quarantine" has been chosen as a reference.

Table 44: The Probability of Catching Covid-19

Predictor	Coefficient	Standard error of coefficient	Z-Value	P-Value	Odds Ratio	95% CI Lower	95% CI Upper
Intercept	3.012	0.409	54.253	0.000			
Education(ps)	-0.014	0.195	0.005	0.943	0.986	0.673	1.446
Education(hs)	-0.437	0.605	0.522	0.470	0.646	0.198	2.114
Education(b)	-0.890	0.429	4.309	0.038	0.411	0.177	0.951
Education(tyd)	-0.848	0.411	4.264	0.039	0.428	0.191	0.958
Gender(female)	-1.156	0.456	6.414	0.011	0.315	0.129	0.77

Logit 1 compares no with stayed in contact quarantine. The odds ratio 0.411 indicates that the bachelor graduate has 0.41 and two-year degree graduate has 0.42 times more likely do not catch Covid-19. Female have 0.31 times more likely do not catch Covid-19 versus males.

$$\hat{g}(\mathbf{x})_1 = 3.012 - 0.014(Education - ps) - 0.437(Education - hs) - \\ 0.890(Education - b) - 0.848(Education - tyd) - 1.156(Gender - female)$$

Table 45: Estimated probabilities for catching Covid-19

Gender	Education	Probability of do not catching Covid-19
Female	Primary S.	13%

	High S.	19%
	Bachelor	27%
	Two-year D.	26%
	Postgraduate	13%
Male	Primary S.	4%
	High S.	7%
	Bachelor	11%
	Two-year D.	10%
	Postgraduate	4%

According to the result if the respondent has bachelor degree and female, she has the highest probability (%27) of not catching Covid-19.

4. Conclusions

In this study the data set obtained from an online survey is analyzed. Using that data set, nominal logistic regression models are constructed in order to examine the socio-economic effects of Covid-19 pandemic. For the part of the gender, age, education, marital status and number of people in home as the predictor variables. It is seen that all models are significant.

According to the results of the study, primary school graduates and males have a high-level knowledge about Covid-19. specially 65+ ages males have not been affected in terms of the family relationship. The responsibilities of women increased 3.43 times more comparing the males. The restrictions for 65+ psychologically negatively affected them. The youngest group of respondents (18-25) are the least affected ones psychologically.
It is found that, the females, especially the ones between 56-65, are more conscious about Covid-19 comparing the other age groups and males. The probability of believing that the hospital policy to society is useful increases, when the education level increase.
As an interesting result of the study, the technological device usage increased only for the older respondents. Especially for 18-25 age group, the use of technological device usage did not increase.

As another result of the study, as the education level increase the males are affected negatively from ending home visits. According to the results, mostly females 65+ wanted to contact with her friends online or face to face. During the first year of the pandemic in Turkey, mostly primary school graduated males went on vacation. Among the respondents, the ones who are most positive and hopeful for the future are the bachelor graduate females. Economically, females are 3.47 times more affected than the males. They mentioned that they could not get their salaries during the pandemic. Also, the ones who have masters or PhD degree are the most disadvantages ones in terms of salary.

According to the results, the ones who live alone and who do not have to work online performances decreased. The married ones and the primary school graduates are more positively affected in terms of personal economy, comparing to other groups.
In order to be more motivated, males between 36-45 make more exercises comparing the other age groups and females.

Especially the jobless group is dramatically affected from the pandemic. The research showed that the married females are the most negatively affected ones. The expense amount changes sharply for different age groups and marital status. According to that, especially the ones who are 65+ and single, say that their expenses increased with the pandemic. According to the results, mostly the females who are primary school graduates, get the financial support from the government. The 65+ females contributed someone's budget. Economically the most effected group are the ones who have master or PhD degree. The probability of getting sick at the first year of the pandemic is found highest for males between 56-65. Bachelor graduated females are the ones who have the lowest probability of catching Covid-19.

References

Lawson C., and D.C. Montgomery. Logistic Regression Analysis of Customer Satisfaction Data. Quality and Reliability Engineering International 22: 971-984.

Fatma Kocabas, Yener Sisman and Berna Yazıcı, Evaluation of a Survey Using Nominal and Ordinal Logistic Regression, Interstat, April 2010

İpekyolu Kalkınma Ajansı, Covid-19 Salgını TRC1 Bölgesi Sosyo-Ekonomik İlk Etkileri, Gaziantep, April 2020

Autran Gomez and Luciano Favorito, The Social and Sanitary Impact of Covid-19 Pandemic, UERJ, Brasil, 27/07/2020: vol46

Mehmet Birinci, Tunahan Bulut, Covid-19'un Sosyo-Ekonomik Yönden Dezavantajlı Gruplar Üzerindeki Etkileri: Sosyal Hizmet Bakış Açısından Bir Değerlendirme, DergiPark, Istanbul, 2020, 4(1): 62-68

Sedat Bostan, Ramazan Erdem, Yunus Emre Öztürk, Taşkın Kılıç, Ali Yılmaz, The Effect of Covid-19 Pandemic on the Turkish Society, Electronic Journal of General Medicine, 2020, 17(6), em237

Vanessa Ratten, Coronavirus (Covid-19) and Entrepreneurship: Changing Life and Work Landscape, Journal of Small Business & Entrepreneurship, 21/07/2020: 503-516

World Health Organization, Impact of Covid-19 on People's Livelihoods Their Health and Our Food Systems, Switzerland, 2020

Amory Martin, Maryia Markhvida, Stephene Hallegatte, Brian Walsh, Socio-economic Impacts of Covid-19 on Household Consumption and Property, Economic of Disasters and Climate Change, 2020: 453-479

Maria N., Zaid A., Catrin S., Ahmed K., Ahmed A., Christos I., Maliha A. and Riaz A., The Socio-economic Implications of the Coronavirus Pandemic: A Review, Elsevier Public Health Emergency Collection, 2020, 78:185-193

Ranjan Aneja, Vaishali Ahuja, An Assessment of Socioeconomic Impact of Covid-19 Pandemic in India, Journal of Public Affairs, 15/10/2020

Rahmiye Figen Ceylan, Burhan Ozkan, Esra Mulazimugullari, Historical Evidence for Economic Effect of Covid-19, Springer Nature, 2020, 21:817-823

Hema S. Gopalan, Anoop Misra, Covid-19 Pandemic and Challenges for Soccio-economic Issues, Healthcare and National Health Programs in India, Diabetes &Metabloic Syndrome: Research, 2020, vol14: 757-759

Survey on Impact of Covid-19 on Enterprises and Needs, Hedeflar Iş Dunyasi, Istanbul, 31/03/2020